# Indirect and Cumulative Effects Analysis Discipline Report

Washington State Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

## SR 520: I-5 to Medina Bridge Replacement and HOV Project Supplemental Draft EIS

# Indirect and Cumulative Effects Discipline Report

Prepared for

Washington State Department of Transportation
Federal Highway Administration


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# Contents

**Acronyms and Abbreviations** ..... **vii**
**Introduction** ..... **1**
What are indirect and cumulative effects? ..... 2
Why are indirect and cumulative effects considered in an EIS? ..... 3
What is the I-5 to Medina: Bridge Replacement and HOV Project? ..... 3
What are the project alternatives? ..... 4
**Approach** ..... **17**
How did the analysts identify and evaluate indirect effects? ..... 17
How did the analysts identify and evaluate cumulative effects? ..... 18
How was the scope of the study defined? ..... 20
How was the baseline condition of each resource determined? ..... 24
How were other current and reasonably foreseeable actions identified? ..... 25
**Affected Environment** ..... **26**
What is the history of the project area? ..... 26
How is the region expected to change by 2030? ..... 35
What other projects exist or are proposed in the project area? ..... 38
**Indirect and Cumulative Effects** ..... **49**
Transportation ..... 50
Land Use ..... 57
Economic Activity ..... 61
Social Elements ..... 62
Environmental Justice ..... 64
Recreation ..... 71
Visual Quality and Aesthetics ..... 77
Cultural Resources ..... 81
Noise ..... 85
Air Quality ..... 88
Greenhouse Gas Energy Consumption and Greenhouse Gas Emissions ..... 92
Water Resources ..... 99
Ecosystems ..... 103
Geology and Soils ..... 119
Hazardous Materials ..... 121
Navigation ..... 122
**References** ..... **127**

## Attachments

1 Reasonably Foreseeable Future Actions—Land Use Plans or Projects

2 Reasonably Foreseeable Future Actions—Transportation-Related Projects

## List of Exhibits

1 Project Vicinity Map

2 No Build Alternative Cross Section

3 6-Lane Alternative Cross Section

4 Options A, K, and L: Montlake and University of Washington Areas

5 6-Lane Alternative at the Evergreen Point Bridge (Common to all Options)

6 Possible Towing Route and Pontoon Outfitting Locations

7 Geographic Areas along SR 520 and Project Phasing

8 Eight-Step Approach for Indirect Effects Assessment Summarized from NCHRP Report 466

9 Eight-Step Approach for Cumulative Effects Assessment Summarized from Guidance on Preparing Cumulative Impact Analyses

10 Indirect and Cumulative Effects Study Area

11 Resource-Specific Study Areas for Indirect and Cumulative Effects

12 Map Showing Major Drainages and Water Bodies of the Seattle Area

13 1905 Geodetic Survey Map Showing Location of the 1885 Portage Cut and Lake Depth in Feet

14 Population Growth by Regional Geography and County 2000-2040

15 Employment Growth by Regional Geography and County 2000-2040

16 Population and Employment Growth between 2000 and 2040

17a—17d Reasonably Foreseeable Future Actions - Land Development

18a—18b Reasonably Foreseeable Future Actions - Transportation

# Acronyms and Abbreviations

| | |
|---|---|
| AASHTO | American Association of State Highway and Transportation Officials |
| BMPs | best management practices |
| BROTS | Bellevue/Redmond Overlake Transportation Study |
| BRT | Bus Rapid Transit |
| Btu | British thermal unit(s) |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| CTR | Commute Trip Reduction |
| DAHP | Department of Archaeological and Historic Preservation |
| dB | decibel |
| dBA | A-weighted decibel |
| dBA $L_{eq}$ | equivalent sound pressure level in A-weighted decibels |
| dBA $L_{max}$ | maximum sound pressure level in A-weighted decibels |
| DNR | Department of Natural Resources |
| Ecology | Washington State Department of Ecology |
| EIS | environmental impact statement |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |
| FHWA | Federal Highway Administration |
| GHG | greenhouse gas |
| HCT | high-capacity transit |
| HOV | high-occupancy vehicle |
| HSWA | Hazardous and Solid Waste Amendments |

| | |
|---|---|
| I-5 | Interstate 5 |
| I-5 to Medina project | I-5 to Medina: Bridge Replacement and HOV Project |
| I-90 | Interstate 90 |
| I-405 | Interstate 405 |
| $L_{eq}$ | equivalent sound pressure level |
| $L_{max}$ | maximum sound pressure level |
| LEP | limited-English proficient |
| LWCFA | Land and Water Conservation Fund Act |
| MBtu | million British thermal units |
| Medina to SR 202 project | Medina to SR 202: Eastside Transit and HOV Project |
| $MtCO_2e$ | metric tons of carbon dioxide equivalent |
| MOHAI | Museum of History and Industry |
| mpg | miles per gallon |
| NAAQS | National Ambient Air Quality Standards |
| NAC | noise abatement criteria |
| NCHRP | National Cooperative Highway Research Program |
| NEPA | National Environmental Policy Act |
| NICU | neonatal intensive care unit |
| NOAA | National Oceanic and Atmospheric Administration |
| NRHP | National Register of Historic Places |
| PSCAA | Puget Sound Clean Air Agency |
| PSRC | Puget Sound Regional Council |
| Pub.L. | Public Law |
| RCW | Revised Code of Washington |
| RTP | Regional Transportation Plan |

| | |
|---|---|
| SAFETEA-LU | *Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for User* (2005) |
| SDEIS | Supplemental Draft Environmental Impact Statement |
| SIP | State Implementation Plan |
| SPCC | Spill Prevention Control and Countermeasures |
| SPUI | single-point urban interchange |
| SR | State Route |
| SR 520 Program | State Route 520 Bridge Replacement and HOV Program |
| SUV | sport utility vehicle |
| TIP | Transportation Improvement Program |
| TSS | total suspended solids |
| USACE | U.S. Army Corps of Engineers |
| VMT | vehicle miles traveled |
| WRIA | Water Resource Inventory Area |
| WSDOT | Washington State Department of Transportation |

# Introduction

This discipline report describes indirect and cumulative effects expected to be associated with the proposed Interstate 5 (I-5) to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project (I-5 to Medina project) and discusses potential mitigation measures.

This chapter defines indirect and cumulative effects, explains why they are considered in an environmental impact statement (EIS) and describes the project alternatives being evaluated and compared.

The Approach chapter describes the process the analysts used to identify, evaluate, and compare the indirect and cumulative effects expected to be associated with the project and, in some cases, specific alternatives. This approach complies with Washington State Department of Transportation (WSDOT) and federal guidance.

The Affected Environment chapter provides a broad overview of the project area, including the historical context and trends, present conditions, and current and reasonably foreseeable actions.

The Indirect and Cumulative Effects chapter provides concise discussions of potential indirect effects of the project and potential project contributions to cumulative effects on the following disciplines or resources:

- Transportation
- Land use
- Economic activity
- Social elements
- Environmental justice
- Recreation
- Visual quality
- Cultural resources
- Noise
- Air quality
- Greenhouse gas emissions and energy consumption
- Water resources
- Ecosystems
- Geology and soils
- Hazardous materials
- Navigation

The final chapter provides references for the sources cited in this discipline report.

# What are indirect and cumulative effects?

***Indirect effects*** (sometimes called secondary impacts or effects) are defined as effects that:

> ... are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).

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Indirect effects result from one project but, unlike direct effects, typically involve a chain of cause-and-effect relationships that can take time to develop and can occur at a distance from the project site. This makes some indirect effects difficult to predict accurately, although they must be reasonably foreseeable, and usually requires a qualitative estimate more general than predictions of direct effects.

***Cumulative effects*** (also called cumulative impacts) are defined as:

> ... the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

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A cumulative effect is the project's direct and indirect effects on a particular resource, combined with the past, present, and future effects of other human activities on that same resource. The result is the expected future condition of the resource when all of the external factors known or likely to affect it are taken into account.

# Why are indirect and cumulative effects considered in an EIS?

Federal regulations (40 CFR 1502.16, 1508.7, 1508.8) require that indirect and cumulative effects be considered in an EIS because they inform the public and decision-makers about possible unintended consequences of a project that are not always revealed by examining direct effects alone. This information places the proposed action in context with other development and transportation improvement projects planned throughout a region, and provides a brief assessment of each resource's present condition and how it is likely to change in the future as a result of the cumulative effect.

# What is the I-5 to Medina: Bridge Replacement and HOV Project?

The I-5 to Medina: Bridge Replacement and HOV Project is part of the SR 520 Bridge Replacement and HOV Program (SR 520 Program) (detailed in the text box on the following page) and encompasses parts of three main geographic areas—Seattle, Lake Washington, and the Eastside. The project area includes the following:

- Seattle communities: Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park
- Eastside communities: Medina, Hunts Point, Clyde Hill, and Yarrow Point
- The Lake Washington ecosystem and associated wetlands
- Usual and accustomed fishing areas of tribal nations that have historically used the area's aquatic resources and have treaty rights

The SR 520 Bridge Replacement and HOV Project Draft EIS, published in August 2006, evaluated a 4-Lane Alternative, a 6-Lane Alternative, and a No Build Alternative. Since the Draft EIS was published, circumstances surrounding the SR 520 corridor have changed in several ways. These changes have resulted in decisions to forward advance planning for potential catastrophic failure of the Evergreen Point Bridge, respond to increased demand for transit service on the Eastside, and evaluate a new set of community-based designs for the Montlake area in Seattle.

What is the SR 520 Program?

The SR 520 Bridge Replacement and HOV Program will enhance safety by replacing the aging floating bridge and keep the region moving with vital transit and roadway improvements throughout the corridor. The 12.8-mile program area begins at I-5 in Seattle and extends to SR 202 in Redmond.

In 2006, WSDOT prepared a Draft EIS—published formally as the SR 520 Bridge Replacement and HOV Project—that addressed corridor construction from the I-5 interchange in Seattle to just west of I-405 in Bellevue. Growing transit demand on the Eastside and structure vulnerability in Seattle and Lake Washington, however, led WSDOT to identify new projects, each with a separate purpose and need, that would provide benefit even if the others were not built. These four independent projects were identified after the Draft EIS was published in 2006, and these now fall under the umbrella of the entire SR 520 Bridge Replacement and HOV Program:

- I-5 to Medina: Bridge Replacement and HOV Project replaces the SR 520 roadway, floating bridge approaches, and floating bridge between I-5 and the eastern shore of Lake Washington. This project spans 5.2 miles of the SR 520 corridor.
- Medina to SR 202: Eastside Transit and HOV Project completes and improves the transit and HOV system from Evergreen Point Road to the SR 202 interchange in Redmond. This project spans 8.6 miles of the SR 520 corridor.
- Pontoon Construction Project involves constructing the pontoons needed to restore the Evergreen Point Bridge in the event of a catastrophic failure and storing those pontoons until needed.
- Lake Washington Congestion Management Project, through a grant from the U.S. Department of Transportation, improves traffic using tolling, technology and traffic management, transit, and telecommuting.

To respond to these changes, WSDOT and the Federal Highway Administration (FHWA) initiated new projects to be evaluated in separate environmental documents. Improvements to the western portion of the SR 520 corridor—known as the I-5 to Medina: Bridge Replacement and HOV Project—are being evaluated in a Supplemental Draft EIS (SDEIS); this discipline report is a part of that SDEIS. Project limits for this project extend from I-5 in Seattle to 92nd Avenue NE in Yarrow Point, where it transitions into the Medina to SR 202: Eastside Transit and HOV Project (the *Medina to SR 202 project*). Exhibit 1 shows the project vicinity.

Exhibit 1. Project Vicinity Map

# What are the project alternatives?

As noted above, the Draft EIS evaluated a 4-Lane Alternative, a 6-Lane Alternative (including three design options in Seattle), and a No Build Alternative. In 2006, following Draft EIS publication, Governor Gregoire identified the 6-Lane Alternative as the state's preference for the SR 520 corridor, but urged that the affected communities in Seattle develop a common vision for the western portion of the corridor. Accordingly, a mediation group convened at the direction of the state legislature to evaluate the corridor alignment for SR 520 through Seattle. The mediation group identified three 6-lane design options for SR 520 between I-5 and the floating span of the

Evergreen Point Bridge; these options were documented in a Project Impact Plan (Parametrix 2008). The SDEIS evaluates the following:

- No Build Alternative
- 6-Lane Alternative
  - Option A
  - Option K
  - Option L

These alternatives and options are summarized below. The 4-Lane Alternative and the Draft EIS 6-lane design options have been eliminated from further consideration. More information on how the project has evolved since the Draft EIS was published in 2006, as well as more detailed information on the design options, is provided in the Description of Alternatives Discipline Report (WSDOT 2009a).

## What is the No Build Alternative?

Under the No Build Alternative, SR 520 would continue to operate between I-5 and Medina as it does today: as a 4-lane highway with nonstandard shoulders and without a bicycle/pedestrian path. (Exhibit 2 depicts a cross section of the No Build Alternative.) No new facilities would be added to SR 520 between I-5 and Medina, and none would be removed, including the unused R.H. Thomson Expressway ramps near the Washington Park Arboretum. WSDOT would continue to manage traffic using its existing transportation demand management and intelligent transportation system strategies.

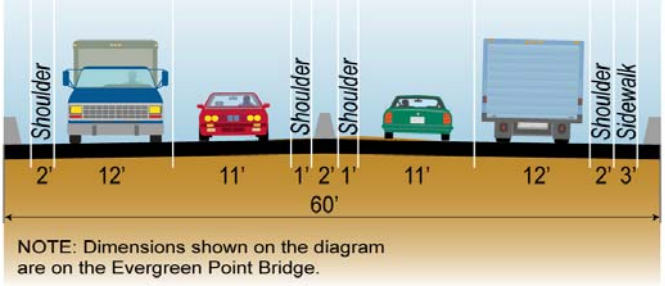
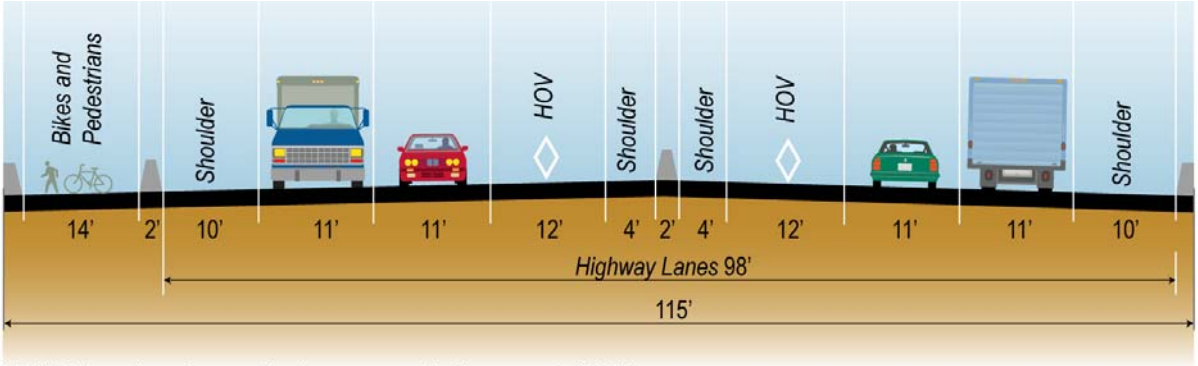



Exhibit 2. No Build Alternative Cross Section

The No Build Alternative assumes that the Portage Bay and Evergreen Point bridges would remain standing and functional through 2030 and that no catastrophic events, such as earthquakes or extreme storms, would cause major damage to the bridges. The No Build Alternative also assumes completion of the Medina to SR 202 project as well as other regionally planned and programmed transportation projects. The No Build Alternative provides a baseline against which project analysts can measure and compare the effects of each 6-Lane Alternative build option.

## What is the 6-Lane Alternative?

The 6-Lane Alternative would complete the regional HOV connection (3+ HOV occupancy) across SR 520. This alternative would include six lanes (two 11-foot-wide outer general-purpose lanes and one 12-foot-wide inside HOV lane in each direction), with 4-foot-wide inside and 10-foot-wide outside shoulders (Exhibit 3). The proposed width of the roadway would be approximately 18 feet narrower than the one described in the Draft EIS, reflecting public comment from local communities and the City of Seattle.




NOTE: Dimensions shown on the diagram are on the Evergreen Point Bridge.

Exhibit 3. 6-Lane Alternative Cross Section

SR 520 would be rebuilt from I-5 to Evergreen Point Road in Medina and restriped and reconfigured from Evergreen Point Road to 92nd Avenue NE in Yarrow Point. A 14-foot-wide bicycle/pedestrian path would be built along the north side of SR 520 through the Montlake area and across the Evergreen Point Bridge, connecting to the regional path on the Eastside. A bridge maintenance facility and dock would be built underneath the east approach to the Evergreen Point Bridge.

The sections below describe the 6-Lane Alternative and design options in each of the three geographical areas the project would encompass.

### Seattle

#### Elements Common to the 6-Lane Alternative Options

SR 520 would connect to I-5 in a configuration similar to the way it connects today. Improvements to the I-5/SR 520 interchange would include a new reversible HOV ramp connecting the new SR 520 HOV lanes to existing I-5 reversible express lanes. WSDOT would replace the Portage Bay Bridge and the Evergreen Point Bridge (including the west approach and floating span), as well as the existing local street bridges

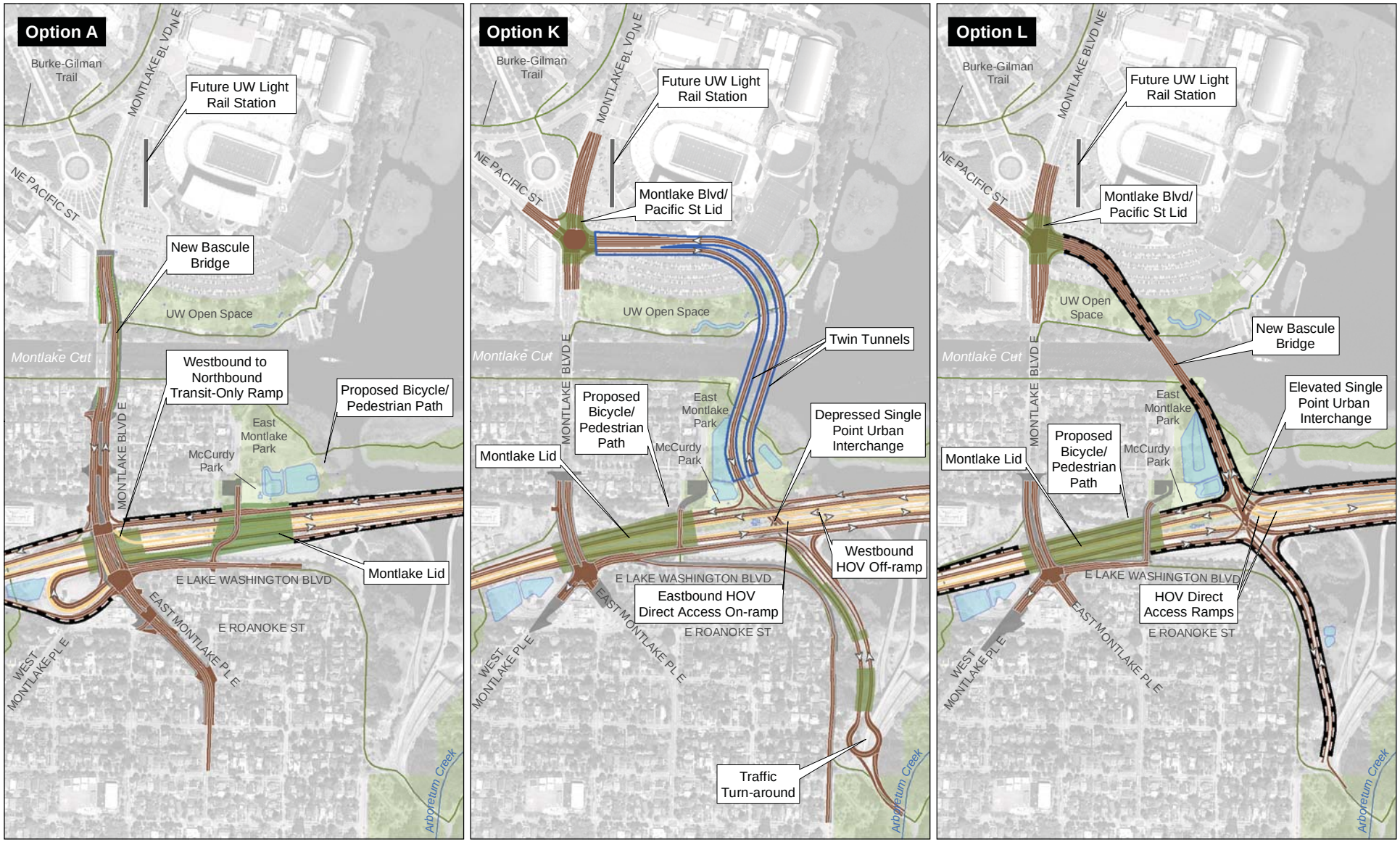
across SR 520. New stormwater facilities would be constructed for the project to provide stormwater retention and treatment. The project would include landscaped lids across SR 520 at I-5, 10th Avenue East and Delmar Drive East, and in the Montlake area to help reconnect the communities on either side of the roadway. The project would also remove the Montlake Freeway Transit Station.

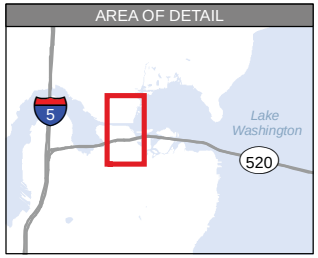
The most substantial differences among the three options are the interchange configurations in the Montlake and University of Washington areas. Exhibit 4 depicts these key differences in interchange configurations, and the following text describes elements unique to each option.

### Option A

Option A would replace the Portage Bay Bridge with a new bridge that would include six lanes (four general-purpose lanes, two HOV lanes) plus a westbound auxiliary lane. WSDOT would replace the existing interchange at Montlake Boulevard East with a new, similarly configured interchange that would include a transit-only off-ramp from westbound SR 520 to northbound Montlake Boulevard. The Lake Washington Boulevard ramps and the median freeway transit stop near Montlake Boulevard East would be removed, and a new bascule bridge (i.e., drawbridge) would be added to Montlake Boulevard NE, parallel to the existing Montlake Bridge. SR 520 would maintain a low profile through the Washington Park Arboretum and flatten out east of Foster Island, before rising to the west transition span of the Evergreen Point Bridge. Citizen recommendations made during the mediation process defined this option to include sound walls and/or quieter pavement, subject to neighborhood approval and WSDOT's reasonability and feasibility determinations.

Suboptions for Option A would include adding an eastbound SR 520 on-ramp and a westbound SR 520 off-ramp to Lake Washington Boulevard, creating an intersection similar to the one that exists today but relocated northwest of its current location. The suboption would also include adding an eastbound direct access on-ramp for transit and HOV from Montlake Boulevard East, and providing a constant slope profile from 24th Avenue East to the west transition span.




- Potential Sound Wall
- Existing Regional Bicycle/Pedestrian Path
- Tunnel
- Lid or Landscape Feature
- Proposed Bicycle/Pedestrian Path
- Stormwater Facility
- General-Purpose Lane
- HOV, Direct Access, and/or Transit-Only Lane
- Future UW Light Rail Station
- Park

N

0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo, King County (2005) GIS Data (Streams), City of Seattle (1994) GIS Data (Bike/Ped Trail), Seattle Bicycle Map (2008) GIS Data (Bike/Ped Trail) CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 4. **Options A, K, and L: Montlake and University of Washington Areas**

I-5 to Medina: Bridge Replacement and HOV Project

### Option K

Option K would also replace the Portage Bay Bridge, but the new bridge would include four general-purpose lanes and two HOV lanes with no westbound auxiliary lane. In the Montlake area, Option K would remove the existing Montlake Boulevard East interchange and the Lake Washington Boulevard ramps and replace their functions with a depressed, single-point urban interchange (SPUI) at the Montlake shoreline. Two HOV direct-access ramps would serve the new interchange, and a tunnel under the Montlake Cut would move traffic from the new interchange north to the intersection of Montlake Boulevard NE and NE Pacific Street. SR 520 would maintain a low profile through Union Bay, make landfall at Foster Island, and remain flat before rising to the west transition span of the Evergreen Point Bridge. A land bridge would be constructed over SR 520 at Foster Island. Citizen recommendations made during the mediation process defined this option to include only quieter pavement for noise abatement, rather than the sound walls that were included in the 2006 Draft EIS. However, because quieter pavement has not been demonstrated to meet all FHWA and WSDOT avoidance and minimization requirements in tests performed in Washington State, it cannot be considered as noise mitigation under WSDOT and FHWA criteria. As a result, sound walls could be included in Option K. The decision to build sound walls depends on neighborhood interest, the findings of the Noise Discipline Report (WSDOT 2009b), and WSDOT's reasonability and feasibility determinations.

A suboption for Option K would include constructing an eastbound off-ramp to Montlake Boulevard East configured for right turns only.

Is it a highrise or a transition span?

A transition span is a bridge span that connects the fixed approach bridge to the floating portion of the bridge. The Evergreen Point Bridge has two transition spans, one at the west end of the floating bridge transitioning traffic on and off of the west approach, and one on the east end of the floating bridge transitioning traffic on and off of the east approach. These spans are often referred to as the "west highrise" (shown) and the "east highrise" during the daily traffic report, and the west highrise even has a traffic camera mounted on it.

Today's highrises have two characteristics—large overhead steel trusses and navigation channels below the spans where boat traffic can pass underneath the Evergreen Point Bridge. The new design for the floating bridge would not include overhead steel trusses on the transition spans, which would change the visual character of the highrise. For the SDEIS, highrise and transition span are often used interchangeably to refer to the area along the bridge where the east and west approach bridges transition to the floating bridge.

### Option L

Under Option L, the Montlake Boulevard East interchange and the Lake Washington Boulevard ramps would be replaced with a new, elevated SPUI at the Montlake shoreline. A bascule bridge (drawbridge) would span the east end of the Montlake Cut, from the new interchange to the intersection of Montlake Boulevard NE and NE Pacific Street. This option would also include a ramp connection to Lake Washington Boulevard and two HOV direct-access ramps providing service to and from the new interchange. SR 520 would maintain a low, constant slope profile from 24th Avenue East to just west of the west transition span of the floating bridge. Noise mitigation identified for this option would include sound walls as defined in the Draft EIS.

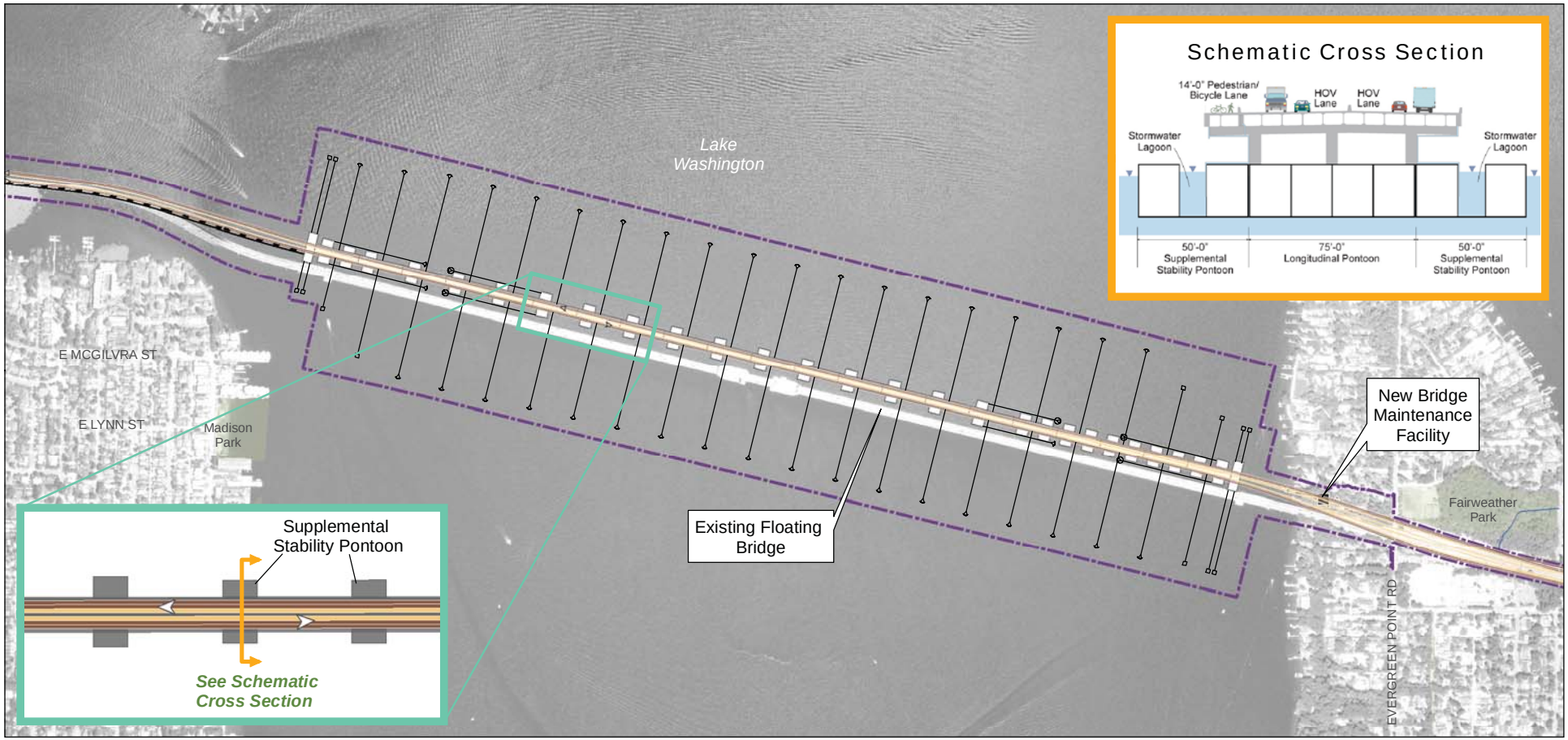
Suboptions for Option L would include adding a left-turn movement from Lake Washington Boulevard for direct access to SR 520 and adding capacity on northbound Montlake Boulevard NE to NE 45th Street.

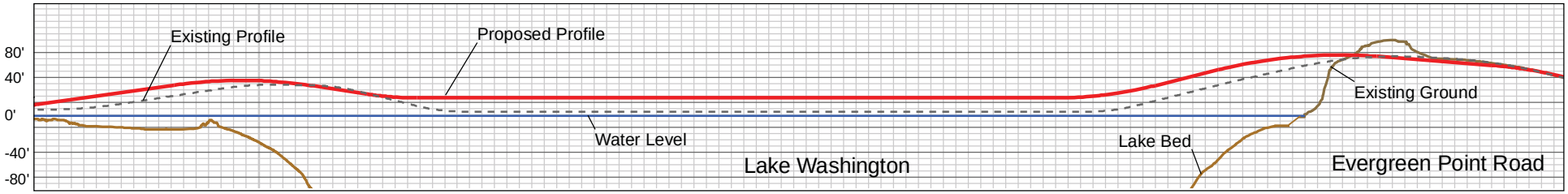
## Lake Washington

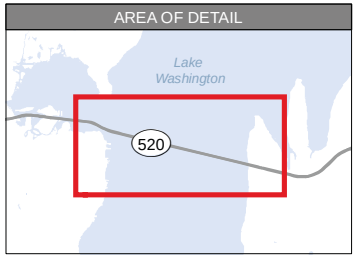
### Floating Bridge

The floating span would be located approximately 190 feet north of the existing bridge at the west end and 160 feet north at the east end (Exhibit 5). Rows of three 10-foot-tall concrete columns would support the roadway above the pontoons, and the new spans would be approximately 22 feet higher than the existing bridge. A 14-foot-wide bicycle/pedestrian path would be located on the north side of the bridge.

The design for the new 6-lane floating bridge includes 21 longitudinal pontoons, two cross pontoons, and 54 supplemental stability pontoons. A single row of 75-foot-wide by 360-foot-long longitudinal pontoons would support the new floating bridge. One 240-foot-long by 75-foot-wide cross-pontoon at each end of the bridge would be set perpendicularly to the longitudinal pontoons. The longitudinal pontoons would be bolstered by the smaller supplemental stability pontoons on each side for stability and buoyancy.




Anchor and Cable
Pontoons
Limits of Construction
Proposed Bicycle/Pedestrian Path
General-Purpose Lanes
HOV, Direct Access, and/or Transit-Only Lane
Park

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 250 500 1,000 Feet

Exhibit 5. **6-Lane Alternative at the Evergreen Point Bridge (Common to All Options)**

I-5 to Medina: Bridge Replacement and HOV Project

The longitudinal pontoons would not be sized to carry future high-capacity transit (HCT), but would be equipped with connections for additional supplemental stability pontoons to support HCT in the future. As with the existing floating bridge, the floating pontoons for the new bridge would be anchored to the lake bottom to hold the bridge in place.

Near the east approach bridge, the roadway would be widened to accommodate transit ramps to the Evergreen Point Road transit stop. Exhibit 5 shows the alignment of the floating bridge, the west and east approaches, and the connection to the east shore of Lake Washington.

### Bridge Maintenance Facility

Routine access, maintenance, monitoring, inspections, and emergency response for the floating bridge would be based out of a new bridge maintenance facility located underneath SR 520 between the east shore of Lake Washington and Evergreen Point Road in Medina. This bridge maintenance facility would include a working dock, an approximately 7,200-square-foot maintenance building, and a parking area.

## Eastside Transition Area

The I-5 to Medina project and the Medina to SR 202 project overlap between Evergreen Point Road and 92nd Avenue NE in Yarrow Point. Work planned as part of the I-5 to Medina project between Evergreen Point Road and 92nd Avenue NE would include moving the Evergreen Point Road transit stop west to the lid (part of the Medina to SR 202 project) at Evergreen Point Road, adding new lane and ramp striping from the Evergreen Point lid to 92nd Avenue NE, and moving and realigning traffic barriers as a result of the new lane striping. The restriping would transition the I-5 to Medina project improvements into the improvements to be completed as part of the Medina to SR 202 project.

## Pontoon Construction and Transport

If the floating portion of the Evergreen Point Bridge does not fail before its planned replacement, WSDOT would use the pontoons constructed and stored as part of the Pontoon Construction Project in the I-5 to Medina project. Up to 11 longitudinal pontoons built and stored in Grays Harbor as part of the Pontoon Construction Project would be towed from a moorage location in Grays Harbor to Puget Sound for outfitting (see the sidebar to the right for an explanation of pontoon *outfitting*). All outfitted pontoons, as well as the

> What is Outfitting?
>
> Pontoon outfitting is a process by which the columns and elevated roadway of the bridge are built directly on the surface of the pontoon.

remaining pontoons stored at Grays Harbor would be towed to Lake Washington for incorporation into the floating bridge. Towing would occur as weather permits during the months of March through October. Exhibit 6 illustrates the general towing route from Grays Harbor to Lake Washington, and identifies potential outfitting locations.

Exhibit 6. Possible Towing Route and Pontoon Outfitting Locations

The I-5 to Medina project would build an additional 44 pontoons needed to complete the new 6-lane floating bridge. The additional pontoons could be constructed at the existing Concrete Technology Corporation facility in Tacoma, and/or at a new facility in Grays Harbor that is also being developed as part of the Pontoon Construction Project. The new supplemental stability pontoons would be towed from the construction location to Lake Washington for incorporation into the floating bridge. For additional information about pontoon construction, please see the Construction Techniques Discipline Report (WSDOT 2009c).

## Would the project be built all at once or in phases?

Revenue sources for the I-5 to Medina project would include allocations from various state and federal sources and from future tolling, but there

remains a gap between the estimated cost of the project and the revenue available to build it. Because of these funding limitations, there is a strong possibility that WSDOT would construct the project in phases over time.

If the project is phased, WSDOT would first complete one or more of those project components that are vulnerable to earthquakes and windstorms; these components include the following:

- The floating portion of the Evergreen Point Bridge, which is vulnerable to windstorms. This is the highest priority in the corridor because of the frequency of severe storms and the high associated risk of catastrophic failure.
- The Portage Bay Bridge, which is vulnerable to earthquakes. This is a slightly lower priority than the floating bridge because the frequency of severe earthquakes is significantly less than that of severe storms.
- The west approach of the Evergreen Point Bridge, which is vulnerable to earthquakes (see comments above for the Portage Bay Bridge).

Exhibit 7 shows the vulnerable portions of the project that would be prioritized, as well as the portions that would be constructed later. The vulnerable structures are collectively referred to in the SDEIS as the Phased Implementation scenario. It is important to note that, while the new bridge(s) might be the only part of the project in place for a certain period of time, WSDOT's intent is to build a complete project that meets all aspects of the purpose and need.

The Phased Implementation scenario would provide new structures to replace the vulnerable bridges in the SR 520 corridor, as well as limited transitional sections to connect the new bridges to existing facilities. This scenario would include stormwater facilities, noise mitigation, and the regional bicycle/pedestrian path, but lids would be deferred until a subsequent phase. WSDOT would develop and implement all mitigation needed to satisfy regulatory requirements.

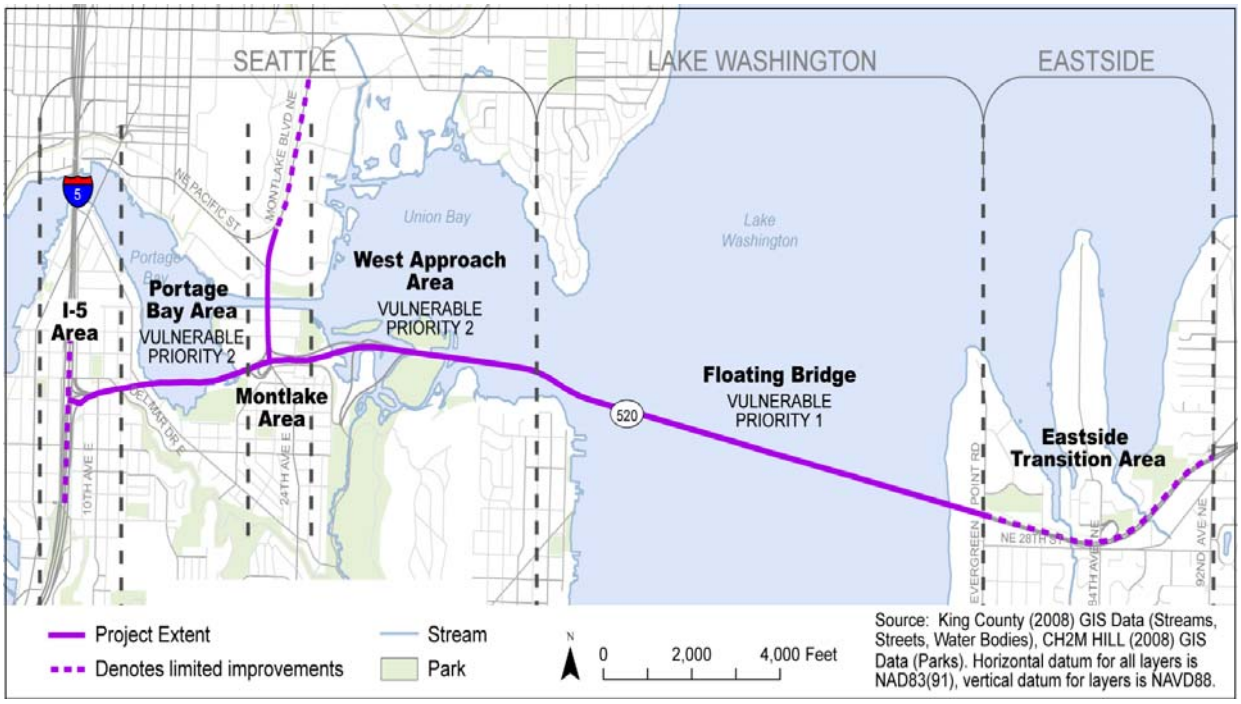



Exhibit 7. Geographic Areas along SR 520 and Project Phasing

To address the potential for phased project implementation, the SDEIS evaluates the Phased Implementation scenario separately as a subset of the "full build" analysis. The evaluation focuses on how the effects of phased implementation would differ from those of full build and on how constructing the project in phases might have different effects from constructing it all at one time. Impact calculations for the physical effects of phased implementation (for example, acres of wetlands and parks affected) are presented alongside those for full build where applicable.

# Approach

This section summarizes the approach the analysts used to identify, evaluate, and compare the indirect and cumulative effects expected to be associated with the project and, in some cases, specific alternatives. This approach complies with WSDOT and federal guidance.

## How did the analysts identify and evaluate indirect effects?

The analysts followed WSDOT and FHWA guidance to conduct the indirect effects assessments summarized in this discipline report. They characterized potential indirect effects by probable location and extent; magnitude and duration; whether beneficial (an improvement over existing conditions) or adverse (a decline from existing conditions); and, if adverse, how WSDOT could avoid or minimize the effect. Section 412 of the WSDOT *Environmental Procedures Manual* (WSDOT 2009d) and FHWA Technical Advisory T 6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987) provide general guidance for identifying, evaluating, and documenting indirect effects of transportation projects. More specifically, WSDOT's *Environmental Procedures Manual* (2009d) and FHWA's *Indirect Effects Analysis Checklist* (FHWA 2009) recommend the eight-step approach presented in National Cooperative Highway Research Program (NCHRP) Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (Louis Berger Group Inc. 2002). The analysts used the eight-step approach for the indirect effects analyses (Exhibit 8).

The analysts completed Steps 1 through 4 before and during the direct effects analyses. The resource-specific discipline reports and technical memoranda supporting the SDEIS document these steps. In Steps 5 through 8, the analysts went beyond the direct effects assessments and focused on the intermediate cause-and-effect relationships and interconnections among resources that can lead to indirect effects. The Indirect and Cumulative Effects section summarizes these indirect effects assessments.

Exhibit 8. Eight-Step Approach for Indirect Effects Assessment Summarized from NCHRP Report 466

| No. | Step |
|---|---|
| 1 | **Scoping—**Determine study approach, level of effort required, and location and extent of study area. |
| 2 | **Identify Study Area Directions and Goals—**Assemble information on trends and goals within study area. |
| 3 | **Inventory Notable Features—**Identify specific environmental issues within indirect effects study area. |
| 4 | **Identify Impact-Causing Activities of Proposed Action and Alternatives—**Break down activities into individual, impact-causing components for analysis. |
| 5 | **Identify Potentially Significant Indirect Effects for Analysis—**Catalog indirect effects by component activities; identify cause-effect linkages and interconnections that can delay and/or disperse effects; flag potentially significant indirect effects meriting further analysis. |
| 6 | **Analyze Indirect Effects—**Use quantitative and qualitative tools to determine magnitude, probability of occurrence, timing and duration, and degree to which the effect can be controlled or mitigated. |
| 7 | **Evaluate Analysis Results—**Evaluate assumptions and uncertainty associated with results and implications for indirect and cumulative effects assessments. |
| 8 | **Assess Consequences and Develop Appropriate Mitigation and Enhancement Strategies—**Assess consequences of indirect effects and develop strategies to address unacceptable outcomes. |

Sources: Louis Berger Group, Inc. (2002), FHWA (2009).

# How did the analysts identify and evaluate cumulative effects?

To identify and evaluate likely cumulative effects and the extent to which the project would contribute to them, the analysts first reviewed the general guidance in Section 412 of the WSDOT *Environmental Procedures Manual* (WSDOT 2009d) and in FHWA Technical Advisory T 6640.8A (FHWA 1987). Next, they followed the eight-step procedure set forth in *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008), shown in Exhibit 9. The analysts made two general assumptions in following the guidance: first, they considered construction-related effects to be short-term and temporary in relation to the long-term trends affecting the resources. And second, they considered operational effects of the project to be long-term and permanent through the project design year, 2030. On the basis of these two assumptions, the analysts considered only direct or indirect effects

of operating the completed facility as potential project contributions to cumulative effects. This was because in most cases, only these permanent effects would have the potential to influence long-term trends in the condition of the resources. The analysts did recognize, however, that in the case of a resource already under severe environmental stress, short-term construction effects added to the effects of other past, present, and reasonably foreseeable future actions could tip the balance and adversely affect the resource. No such case was found in the cumulative effects assessments conducted for this project.

Exhibit 9. Eight-Step Approach for Cumulative Effects Assessment Summarized from Guidance on Preparing Cumulative Impact Analyses

| No. | Step |
|---|---|
| 1 | **Identify the resources to consider in the analysis—**List each resource for which the project could cause direct or indirect effects. If the project will not cause a direct or indirect effect on a resource, it cannot contribute to a cumulative effect on that resource. Make a statement to that effect, and stop. |
| 2 | **Define the study area for each resource—**Define the geographic resource study area and the temporal resource study area for each resource. |
| 3 | **Describe the current status/viability and historical context for each resource—**Characterize the current condition of the resource and trends affecting it, and briefly summarize the historical context and past actions that have had a lasting effect on the resource. |
| 4 | **Identify direct and indirect impacts of the project that might contribute to a cumulative impact—**Summarize the direct and indirect impacts already identified. The project's contribution to a cumulative effect would be the residual direct or indirect effect(s) remaining after mitigation. |
| 5 | **Identify other current and reasonably foreseeable actions—**Ask what other present and reasonably foreseeable actions (development projects) are affecting your resource today or could affect it in the future. A reasonably foreseeable action is a private or public project already funded, permitted, or under regulatory review, or included in an approved final planning document. |
| 6 | **Identify and assess cumulative impacts—**Review the information gathered, describe the cumulative impact(s), and draw conclusions that put into perspective the extent to which the project will add to, interact with, or reduce the cumulative impact. |
| 7 | **Document the Results—**Describe the analyses, methods, or processes used; explain the assumptions; and summarize the results of each analysis, all the steps in adequate detail to disclose its strengths and weaknesses, your conclusions, and how and why you reached those conclusions. |
| 8 | **Assess the need for mitigation—**WSDOT does not mitigate cumulative effects, because many entities contribute to them in ways that are beyond WSDOT's jurisdiction. But WSDOT does disclose the project's likely contribution to each identified cumulative effect and suggest practicable ways by which the cumulative effect could be mitigated. |

Source: WSDOT, FHWA, and EPA (2008).

# How was the scope of the study defined?

## Resources

Analysts performed indirect and cumulative effects assessments on the same resources and disciplines they evaluated for the project's potential direct effects. The analyst responsible for each resource or discipline conducted the direct, indirect, and cumulative effects assessments in that order. The assessments addressed the 6-Lane Alternative design options and the No Build Alternative, but they distinguished among individual 6-Lane Alternative design options only in cases where the project's contribution to an indirect or cumulative effect would differ appreciably from one option to another.

## Study Areas and Time Frames

For the indirect and cumulative effects assessments, the geographic study area for most resources was the central Puget Sound region as defined by the Puget Sound Regional Council's (PSRC's) *Transportation 2040 Draft Environmental Impact Statement* (PSRC 2009a), which includes portions of King, Kitsap, Pierce, and Snohomish counties. This study area is shown in Exhibit 10. Certain disciplines had resource-specific study areas, and these are shown in Exhibit 11. The start of the time frame depended on the specific discipline or resource and the nature of the effect being evaluated, but the time frame for every discipline or resource ended in the year 2030, the project design year. The following subsections discuss the reasons for selecting study areas and time frames for indirect and cumulative effects that are different from those used to assess direct effects.

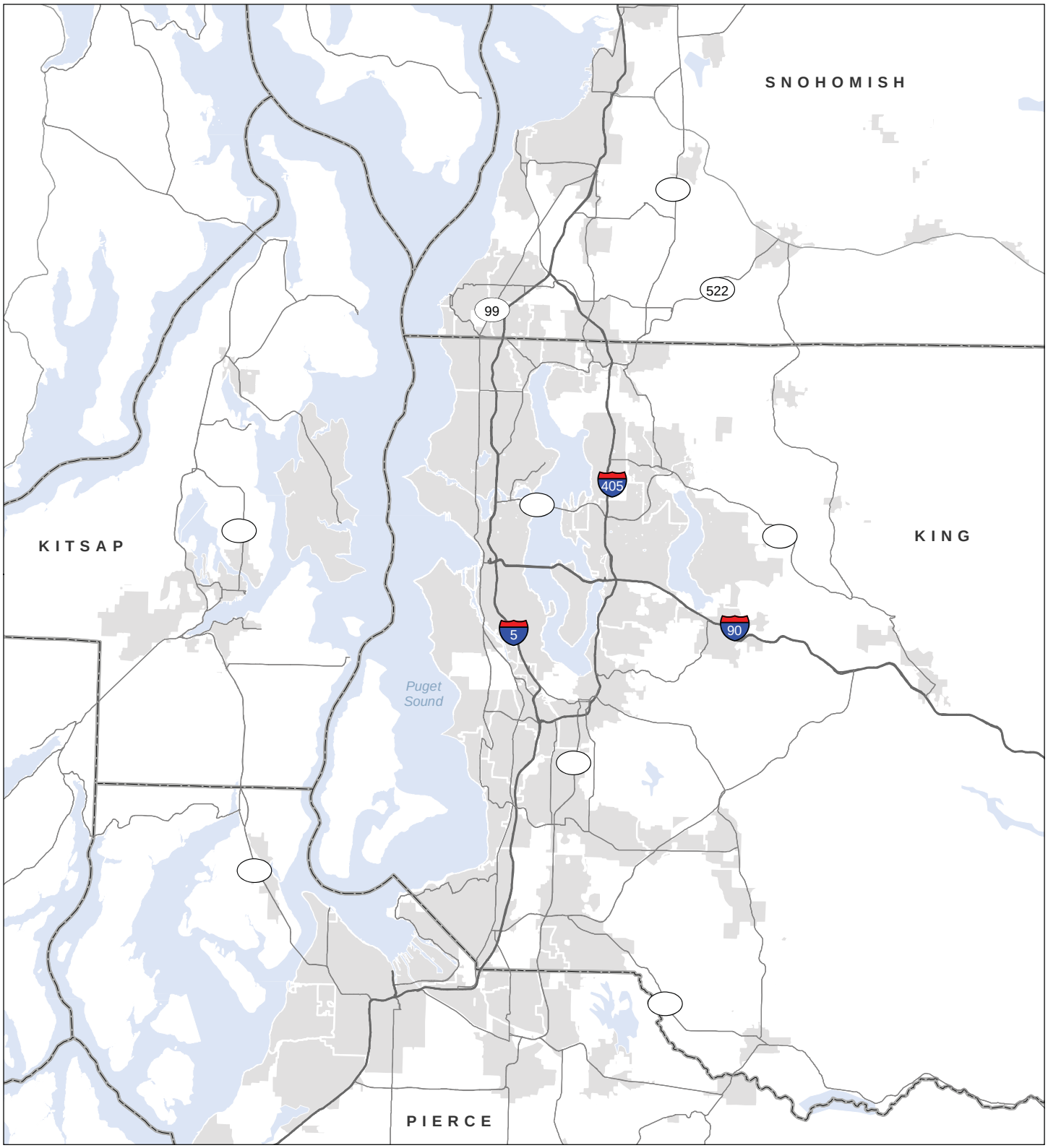
For most disciplines and resources, the analysts used the project design year (2030) as an appropriate end point for the time frame.

## Indirect Effects

### Indirect Effects Study Area

The study area used to assess potential indirect effects on each resource or discipline was the same as the study area applied to that same resource or discipline for the cumulative effects assessment. Indirect effects can occur through a series of cause-and-effect relationships that can place them farther from the project site than direct effects. They can also occur across disciplines in complex ways that make it difficult to predetermine the

The study area used to assess potential indirect effects on each resource or discipline was the same as the study area applied to that same resource or discipline for the cumulative effects assessment.



City Limit

County Boundary

Source: WSDOT (1995) GIS Data (Counties), WSDOT (2001) GIS Data (County and State Route), King County (2007) GIS Data (Water Bodies). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 2.5 5 10 Miles

Exhibit 10. **Indirect and Cumulative Effects Study Area**

I-5 to Medina: Bridge Replacement and HOV Project

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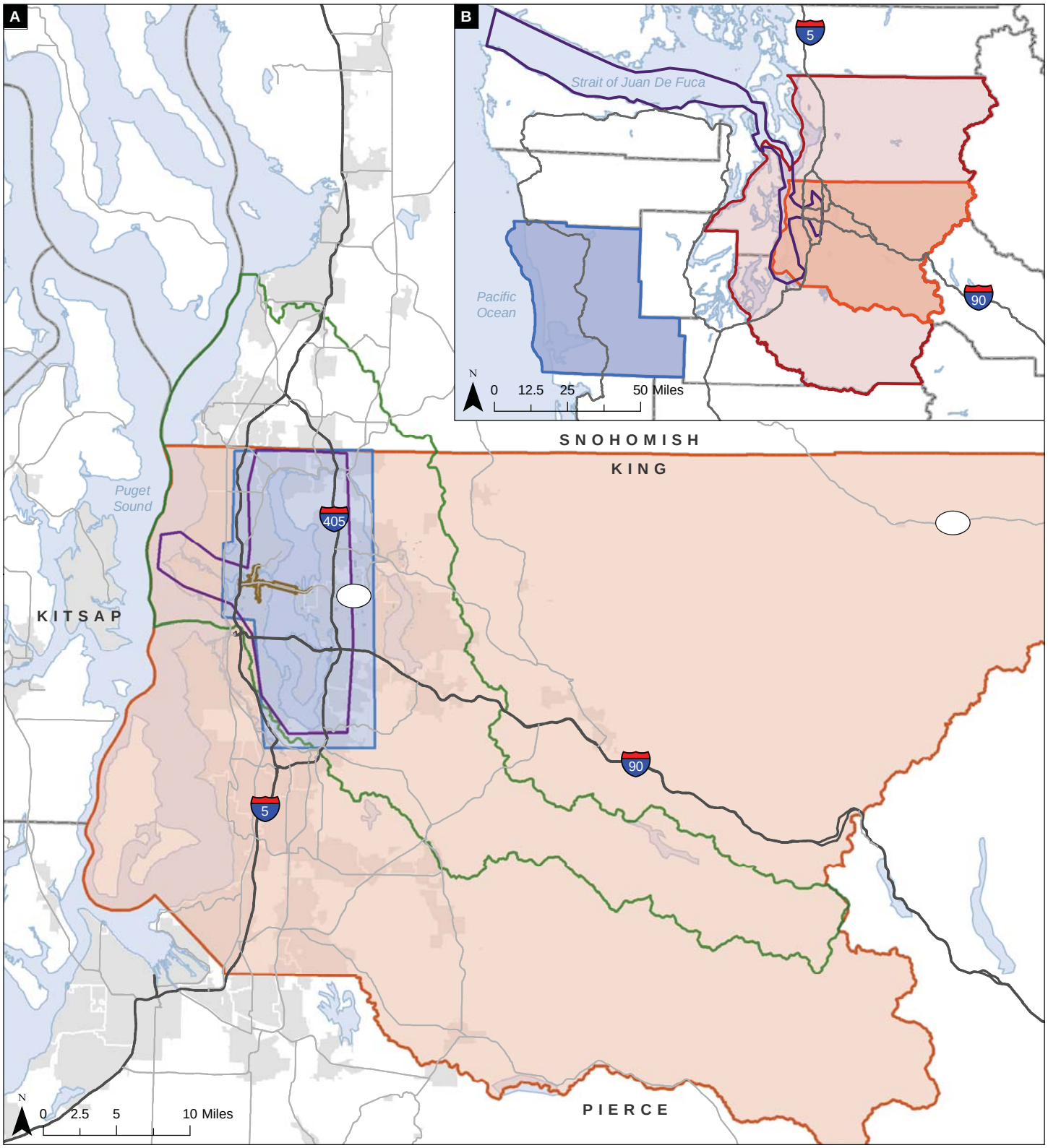
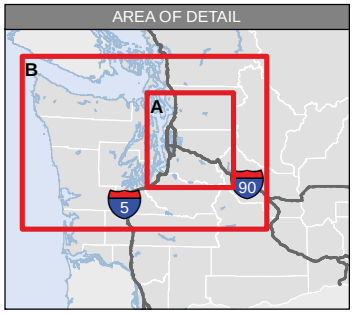



Cultural Resources

Ecosystems

Water Resources

Environmental Justice, Hazardous Materials, Land Use, and Visual Quality

Navigable Waterways

Air Quality, Economics, Geology, Soils and Transportation

Source: WSDOT (1995) GIS Data (Counties), WSDOT (2001) GIS Data (County and State Route), King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies) . Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 11. **Resource-Specific Stud Areas for Indirect and Cumulative Effects**

I-5 to Medina: Bridge Replacement and HOV Project

study area boundaries. The cumulative effects study area typically extends well beyond the direct effects study area and is defined in terms specifically relevant to each resource—such as habitat boundaries, air quality attainment areas, census tracts, state highway and local road systems, traffic analysis zones, jurisdictional boundaries, or other appropriate areas. Therefore, cumulative effects study area satisfies criteria applicable to indirect effects as well (Louis Berger Group, Inc. 2002).

### Indirect Effects Time Frame

Like the study area, the time frame used to assess indirect effects must also be appropriate to the nature of the effect. Some indirect effects can occur relatively quickly (for example, purchases by vendors that construction contractors hire to supply goods and services). Other indirect effects can take months or years to become apparent (for example, a change in wetland plant succession following a construction-related drainage alteration). Because indirect effects must be reasonably foreseeable, the time frame for their analysis has to be short enough to anticipate reasonably foreseeable outcomes, but also long enough to capture effects that become apparent only within longer time horizons. For most disciplines and resources, the analysts used the project design year (2030) as an appropriate end point for the time frame (Louis Berger Group, Inc. 2002).

## Cumulative Effects

### Cumulative Effects Study Area

The cumulative effects study area is the total area of the resource or discipline that could be influenced by the direct or indirect effects of the project in combination with the effects of other past actions, present actions, and reasonably foreseeable future actions. To define each cumulative effects study area, the analysts started with the direct effects study area for the resource. They expanded that area to include the larger region within which indirect effects of the project and the effects of other past actions, present actions, and reasonably foreseeable future actions could influence the resource (WSDOT et al. 2008). Thus, the cumulative effects study area for each resource was determined (1) by the distribution of the resource itself, and (2) by the area within that distribution where the resource could be affected by the project in combination with actions external to the project. As previously noted, the cumulative effects study area for a

> The **cumulative effects study area** is the total area of the resource or discipline that could be influenced by the direct or indirect effects of the project in combination with the effects of other past actions, current actions, and reasonably foreseeable future actions.

particular resource or discipline was also the study area for indirect effects of the project on that same resource or discipline. In most cases, the analysts found that the central Puget Sound region (PSRC 2009a) was an appropriately large area for assessing indirect and cumulative effects.

### Cumulative Effects Time Frame

Cumulative effects assessment focuses on the future: it begins at the same baseline applied to direct and indirect effects—the start of the proposed action. It continues far enough into the future to account for the potential direct and indirect effects of the project along with other reasonably foreseeable actions, discussed later in this subsection. However, because the cumulative effect on the resource also includes persisting influences from past actions, the analyst must take the past into account when characterizing the baseline condition. Therefore, the time frame for cumulative effects assessment starts at a representative year or decade when a past action or actions began to change the health or status of the resource from its original condition, setting a trend that is still evident in the present and likely to continue into the reasonably foreseeable future.

> The **time frame** for cumulative effects assessment starts at a representative year or decade when a past action or actions began to change the health or status of the resource from its original condition, setting a trend that is still evident in the present and likely to continue into the reasonably foreseeable future. In most cases, the time frame ended in 2030, the project design year.

The time frame must extend far enough into the future to include the construction periods and at least portions of the operational periods of the proposed action and relevant reasonably foreseeable actions. The time frame can stop at the project design year (for this project, 2030) or at a future year determined by the characteristics of the particular discipline or resource under study. For example, the end point could be based on a characteristic response time of a plant or wildlife species to environmental stressors or, for land use or transportation, the planning horizon in a comprehensive plan or long-range transportation plan (WSDOT et al. 2008).

## How was the baseline condition of each resource determined?

For the cumulative effects assessments, the analysts characterized the baseline (present) condition of each resource by describing its current status within the cumulative effects study area and by providing historical context for understanding how the resource got to its current state (WSDOT et al. 2008; see Exhibit 9, Step 3). The analysts used information from field surveys, interviews, and

> The **baseline** (present) condition of each resource by describing its current health, condition, or status within the cumulative effects study area and by providing historical context for understanding how the resource got to its current state.

literature searches to assess the current condition of the resource, relying especially on baseline information presented in the *Transportation 2040 Draft EIS* PSRC issued in May 2009 (PSRC 2009a). Past actions and trends affecting the resource were reviewed to "tell the story of the resource" (WSDOT et al. 2008). The analysts did not address the past in detail, but prepared a brief summary to place the resource in its historical context and provide a comparative basis for the cumulative effects assessment.

## How were other current and reasonably foreseeable actions identified?

To identify other current and reasonably foreseeable actions (see Exhibit 9, Step 5), the analysts reviewed comprehensive land use planning documents, long-range transportation plans, projections presented in the *Transportation 2040 Draft EIS* (PSRC 2009a), and agency Web sites to obtain publicly available information. They also interviewed agency and tribal officials, representatives of private companies and organizations, and members of the public during the scoping process conducted for this environmental process. The Agency Coordination and Public Involvement Discipline Report (WSDOT 2009e) provides information about the scoping process and meetings.

Reasonably foreseeable actions were defined as actions or projects with a reasonable expectation of actually happening, as opposed to potential developments expected only based on speculation. Accordingly, the analysts applied the following criteria (WSDOT et al. 2008):

> **Reasonably foreseeable actions** were defined as actions or projects with a reasonable expectation of actually happening, as opposed to potential developments expected only based on speculation.

- Is the proposed project included in a financially constrained plan?
- Is it permitted or in the permit process?
- How reasonable is it to assume that the proposed project will be constructed?
- Is the action identified as high priority?

Applying these criteria, the analysts compiled lists of current and reasonably foreseeable actions to support the discipline-specific cumulative effects assessments conducted for those areas. The Affected Environment chapter provides maps of current and reasonably foreseeable actions, and Attachments 1 and 2 list those actions.

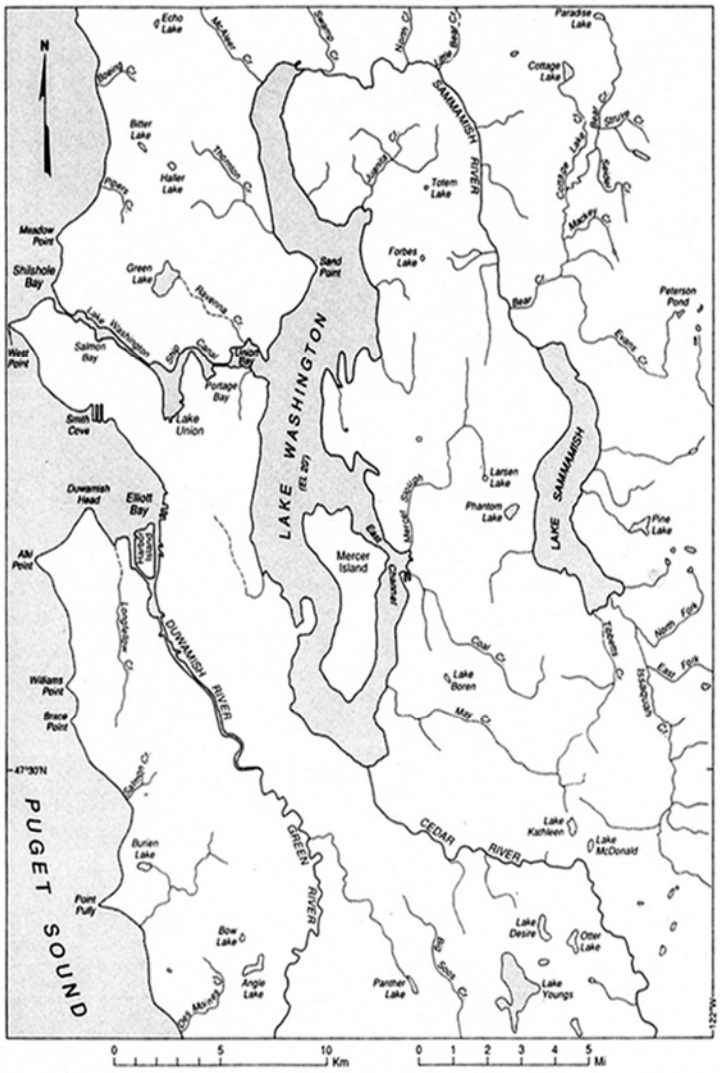
# Affected Environment

The following summaries provide background on the project area, including historical context, present condition, and current and reasonably foreseeable future land development and transportation projects. Detailed descriptions of the area and its history, from which the following information is excerpted and summarized, are presented with citations to source material in the Ecosystems Discipline Report (WSDOT 2009f), and the Cultural Resources Discipline Report (WSDOT 2009g).

## What is the history of the project area?

### Natural Setting

Retreating glaciers shaped the topography of the project area at the end of the most recent Ice Age, from about 20,000 to 15,000 years ago. The shorelines, deltas, and intertidal zones of Puget Sound acquired their shapes as sea levels rose and the land adjusted to the removal of glacial ice. The landforms of the region typically comprise a series of north-south trending ridges and valleys showing the direction of glacial advance and retreat. During these advances and retreats, the glaciers deposited a thick layer of unsorted material, including clays, sands, gravels, silts, and boulders. This material, called till, can be several thousands of feet thick in some areas (Alt and Hyndman 1984). More recently, rivers, springs, streams, and lakes have occupied the low-lying areas, creating a complex landscape dominated by water (Exhibit 12).




Source: Galster and Laprade 1991, p.245.

Exhibit 12. Map Showing Major Drainages and Water Bodies of the Seattle Area

Pollen in sediment cores from Lake Washington and the Puget Sound area indicates that the initial post-glacial climate was cooler and drier than today, with vegetation forming an open parkland of lodgepole pine and spruce, grasses, and bracken fern, with scattered hazel and cedar. By about 11,700 to 7,800 years ago, vegetation included open forest with a mosaic of grasses, bracken fern, and scattered Douglas fir, alder, lodgepole pine, and hemlock trees. Cedar, alder, and willow were on wetter landforms, such as lake margins and alluvial floodplains.

An increase in western red cedar pollen indicates the beginning of a cooler, moister climate regime around 7,800 years ago in the Lake Washington basin. A closed canopy forest with western red cedar, western hemlock, and Douglas fir similar to today's tree cover is likely to have existed in the Lake Washington vicinity by about 6,500 years ago.

Forested and shrub wetlands in the study area support a mixture of native and introduced woody plant species. Red alder, black cottonwood, western red cedar, and Oregon ash generally dominate the forested wetlands. Dominant species in shrub wetlands include various willows, Himalayan blackberry, red-osier dogwood, rose spirea, and salmonberry. Along Lake Washington and in wetlands with standing water, non-native white water lilies, cattails, rushes, horsetails, and various native and non-native grasses dominate.

Lake Washington serves as the primary source of water for all the wetlands in the study area. The U.S. Army Corps of Engineers (USACE) controls water levels in Lake Washington and Lake Union at the Ballard Locks. The USACE lowers the water level by approximately 2 feet each winter. This vertical fluctuation is the dominant hydrologic change in these wetlands, which otherwise have very stable water levels.

Forested wetland on Lake Washington.

The Lake Washington watershed supports a diverse group of fish species, including several species of native salmon and trout. Many of these species are an integral part of the economy and culture of the Pacific Northwest. Large-scale alteration and destruction of fish habitat within the Lake Washington watershed has occurred over the last 100 years, reducing

local fish populations such as Chinook and coho salmon, steelhead, and bull trout by altering their spawning, rearing and migration habitats.

Because of its habitat diversity and complex shoreline and wetland ecosystems, the project area supports diverse wildlife species that include invertebrates, amphibia, reptiles, birds, and mammals. Wildlife species in the project area are described in the Ecosystems Discipline Report (WSDOT 2009f).

## Early Human History

The project area lies within lands and waters once occupied by several Puget Sound tribes. Their descendants are represented by federally recognized Indian Tribes, including the Suquamish, Muckleshoot, Snoqualmie, Yakama, and Tulalip tribes, as well as the non-federally recognized Duwamish. Because of the historical presence of these Puget Sound tribes, the project area is considered to have a high level of archaeological sensitivity.

The earliest occupation of Puget Sound occurred between 13,000 and 6,000 years ago, beginning with the glacial retreat from the region. For the period from 6,000 to 2,500 years ago, the archaeological record shows differences between coastal and inland sites that probably reflect differing food procurement strategies (marine versus terrestrial) and perhaps localized cultural development. From 2,500 to 250 years ago, archaeological sites reveal further specialization in the focus of resource procurement—the full-scale development of the maritime cultures (recorded ethnographically) and land-mammal hunting and upriver fishing groups. Few sites from 250 to 150 years ago (just before people of European descent settled the region) have been examined.

As previously noted, the project area includes springs, streams, and freshwater lakes and bays. Salmon Bay, Lake Union, Lake Washington, and their tributary streams formed a series of connected waterways that could be entered from Puget Sound only at Shilshole, along a meandering course through fresh water lakes and overland portages, or by the Duwamish and Black rivers. A group of Duwamish inhabited this area. The Euro-American settlers knew them as the Lakes people, and Lake Washington was first called Lake Duwamish in recognition of the aboriginal Duwamish people. Other groups in what is now the greater Seattle area included the Muckleshoot and Suquamish.

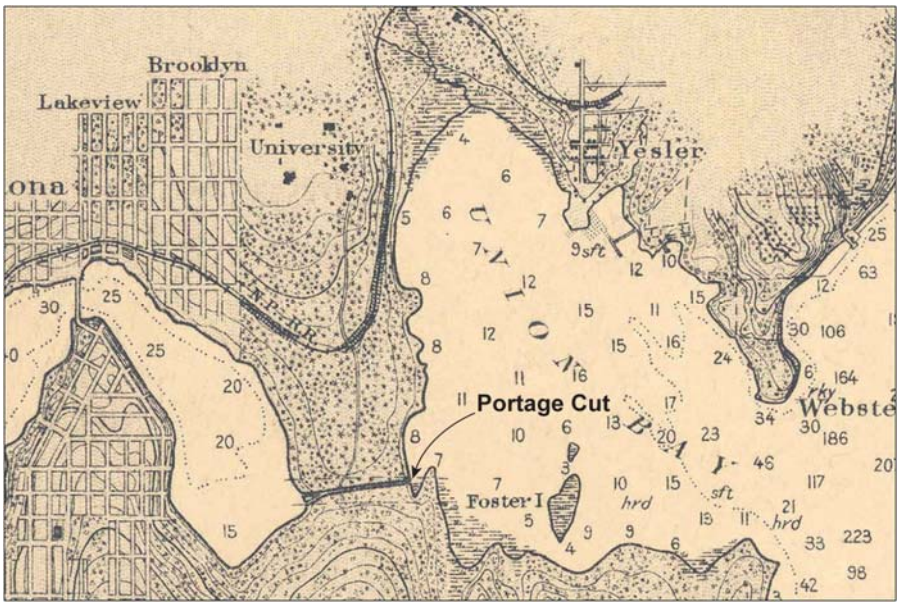
The Oregon Treaty of 1846 defined the boundary between the United States and Canada at the 49th parallel, spurring settlement by Euro-

Americans throughout the Pacific Northwest. The Oregon Territory was created as part of the United States shortly afterward (in 1848). In 1853, the Washington Territory was formed from the northern part of the Oregon Territory. The Donation Land Claim Act of 1850 and the Homestead Act of 1869 spurred population growth in the area, luring settlers with the promise of free land. In the fall of 1851, a group of Midwestern settlers, led by Arthur Denny, arrived at Alki Point in present-day West Seattle. They found a region thickly forested with tall, large-diameter Douglas fir, western red cedar, and western hemlock, along with red alder and cottonwood on river floodplains. That same year, the settlers relocated to the east and named their settlement for the local Native American leader, Chief Seattle.

## Seattle and Lake Washington

The early economy of Seattle was based on timber and coal, and the opportunities available brought more and more settlers. By 1883, Seattle had grown to over 3,000 citizens, making it the second largest municipality in the Washington Territory.

At first, logging activities focused along waterways to take advantage of these areas for transporting logs to the sawmills. To meet the needs of bustling timber and sawmill operations, in 1885, builders excavated a shallow, 16-foot-wide canal for passing logs between Union Bay on Lake Washington and Portage Bay on Lake Union. Known locally as the Portage Cut, this narrow canal took advantage of the natural difference in the lake-water levels, which produced a current facilitating the westward transport of logs through the chute from the higher Lake Washington to Portage Bay. Exhibit 13 shows the location of the Portage Cut. (For further detail, see the Cultural Resources Discipline Report, WSDOT 2009g).




Source: Coast and Geodetic Survey 1905; University of Washington Libraries Map Collection.

Exhibit 13. 1905 Geodetic Survey Map Showing Location of the 1885 Portage Cut and Lake Depth in Feet

By the 1890s, most of the area on the west side of Lake Washington had been logged. Within the next 10 years, all of the timber had been cut from the shores of Lake Washington (BOAS 2007).

Fueled by continuing population growth, the introduction of cable cars and streetcars in the 1880s fed the push for residential development beyond the Seattle city center. The Klondike Gold Rush in 1897 added to the growth of Seattle.

Over the summer of 1909, the Alaska-Yukon-Pacific Exposition showcased the city and celebrated its achievements and economic potential. The Olmsted Brothers designed the exposition, which was held on the grounds of the University of Washington. Part of the plan remains today, incorporated into the current campus. By 1910, only 60 years after its founding, Seattle had grown to 230,000 people.

In 1910, construction began on a navigable Ship Canal between Lake Union and Lake Washington. An excavation known as the Montlake Cut was completed between Union Bay on Lake Washington and Portage Bay on Lake Union in 1916. As a result of the Montlake Cut, Lake Washington was lowered about 10 feet.

Most of the Seattle portion of the project area was developed in the early decades of the twentieth century.

- **Capitol Hill.** Capitol Hill, named in 1901 by James Moore (its main developer), had been clearcut in the 1880s. By 1912, Capitol Hill had more than 40 platted additions, including Moore's original 7 tracts.
- **Eastlake.** The Eastlake neighborhood was surveyed in 1855, but not platted until the 1870s. The arrival of the streetcar in 1885 spurred development there. The original developers, David T. Denny and Henry Fuhrman, platted the north end of Eastlake, along with the area now known as Roanoke Park, as part of the 1890 Denny-Fuhrman Addition to the City of Seattle. This area encompassed all the land north of Roanoke Street to Lake Union. By the early 1890s, David Denny had established a streetcar line through the area along Eastlake Avenue that connected with downtown Seattle and points north, facilitating the residential development of the neighborhood.
- **Roanoke Park.** The City of Seattle acquired the land that is now Roanoke Park in 1908 and developed it as a park in 1910 (Sherwood 1974). The residences of the Roanoke Park neighborhood were mostly constructed between 1908 and 1912. Construction of I-5 and SR 520 in the 1960s physically separated the neighborhoods of

Eastlake, Capitol Hill, and Roanoke Park into their current distinct areas.

- **Montlake.** Eastward across Portage Bay, people began developing the Montlake neighborhood in 1905, with the main era of construction from the 1910s through the 1940s. In December 1905, John Boyer of the Interlaken Land Company platted the area of Montlake south of SR 520. The area now north of SR 520 was originally known as Union City, so named by Harvey Pike in 1861. The City of Seattle incorporated it in 1891. With the Alaska-Yukon-Pacific Exposition in 1909 at the University of Washington campus, the area received extensive exposure and benefited from increased public transit to the area. Two brothers, Calvin and William Hagan, with partner James Corner, originated the name "Montlake" as they developed "Montlake Park, An Addition to the City of Seattle" in July of 1909. This development, which occupied the area between the present day Montlake Cut and SR 520, encompassed the eight blocks originally platted as H.L. Pike's First Addition to Union City in 1870. While Boyer preferred the name "Interlaken" for the neighborhood he helped develop, he later agreed to "Montlake" as the name for the entire neighborhood (Gould 2000), which is generally accepted today.
- **Washington Park Arboretum.** The Washington Park Arboretum, one of the city's first parks (created from 1900 through 1904), borders Montlake. The Puget Mill Company deeded the first piece of the arboretum to the City of Seattle in 1900. (The company had originally planned to develop it along with the adjacent area that is now known as Broadmoor.) By 1916, the park totaled 165.22 acres. In March 1924, Washington Park Arboretum was officially set aside as a botanical garden and arboretum.
- **Open space and waterfront.**

## East Side of Lake Washington

On the east side of Lake Washington, coal was discovered in the Coal Creek area in 1867. Extensive mining began there at the Newcastle Coal Mine, bringing in settlers. William Meydenbauer and Aaron Mercer staked large claims on the east side of Lake Washington in 1869, becoming some of the first non-Native American settlers there. German-born Meydenbauer, who owned a prosperous bakery in Seattle, settled next to what is now Meydenbauer Bay. Mercer had the

land around what is now known as the Mercer Slough (Rochester 1998). In 1871, Warren Wentworth Perrigo and Captain Luke McRedmond staked the first land claims on Lake Sammamish in present day Redmond (GRCC 2009). During the 1870s, Seattle businesspeople and real estate investors began to buy property on what came to be known as the Eastside. Marshall Blinn purchased the land on what would become Hunt's Point. Jacob Furth (a banker) and Bailey Gatzert (mayor of Seattle) also purchased property there.

Logging, almost by necessity, became a primary occupation on the Eastside, as the settlers who came to pursue agriculture needed to clear land for their farms. The timber industry arrived on the Eastside in earnest when logger Albert King and his brothers homesteaded nearby Groat Point and Eastland in 1875 (Rochester 1998). Throughout the late nineteenth century, settlers came to the Eastside, including Civil War veterans awarded homesteads for their service (City of Bellevue 2006).

The Seattle Lake Shore and Eastern Railroad reached Redmond in 1889, ensuring the economic success of the Eastside timber industry (Stein 1998a). That same year, Washington achieved statehood and, by 1890, about 20 families had settled in the Points area of the Eastside from Medina to Kirkland. In June 1900, the Federal Census of the Bellevue Precinct in King County, encompassing about the same area, counted 254 people (City of Clyde Hill 2009).

Much of the Eastside area became a haven for berry growing and fruit orchards. Bellevue's first permanent school was built in 1892, and the town of Bellevue was platted in 1904. By then Bellevue was already the center for berry growing in King County, supported by a thriving Japanese community (Stein 1998b). Kirkland incorporated in 1905 and, although it never succeeded as the steel mill town Mr. Kirk had envisioned, it prospered through shipbuilding and wool milling (Stein 1998c). The City of Redmond incorporated in 1912 and began to transition from a lumber economy to an agricultural one (Stein 1998a).

With the creation of the Montlake Cut and the lowering of the water level in Lake Washington, property owners in Medina found that they had additional lakeshore acreage in front of their homes, while others suddenly had additional acreage for planting (Rochester 1998). The Furth property on Yarrow Point gained rich land along its waterfront boundary, and the Furth family leased 16 acres of it to the Saiki family to farm (Knauss 2003). The additional shoreline of Yarrow Bay created a natural wetlands area and, on Hunt's Point, the marshlands of Cozy

Cove and Fairweather Bay were formed (Knauss 2003, Town of Hunts Point 2006).

By the 1920s, a road system connected the Eastside communities, and ferries linked them to Seattle. The fruits and produce grown on the Eastside filled the Seattle markets. Many families still used Eastside property for summer vacations. The ferry landing in Kirkland served the most popular route, bringing people and goods to or from Seattle in just over 30 minutes (Stein 1998c).

The relative isolation of the Eastside ended in 1940 with the opening of the Lacey V. Murrow Bridge just south of Bellevue. This was the first floating bridge across Lake Washington (the present-day route of the Interstate 90 [I-90] bridge) (Wilma 2001). The bridge spurred tremendous growth in the Eastside communities, resulting in increased property values. After the United States entered World War II, the Japanese-American residents of the area had their land confiscated and were sent to internment camps. These two actions signaled the end of the agricultural era of the Eastside and the beginning of its suburban development (City of Bellevue 2006).

World War II brought more growth to the area, particularly with the influx of workers at Boeing Field. In 1946, developer Kemper Freeman opened Bellevue Square shopping center, the first shopping center in the region and one of the first in the country (Stein 1998b). Housing and commercial developments on the Eastside mushroomed. Bellevue and Clyde Hill both incorporated in 1953, followed by Medina and Hunt's Point in 1955 and Yarrow Point in 1959 (Stein 1998b, City of Clyde Hill 2009, City of Medina 2008).

The second span across Lake Washington, 4 miles north of the Lacey V. Murrow Bridge, was the Evergreen Point Bridge. As part of the original SR 520 project, construction on the Evergreen Point Bridge began in August 1960. The bridge officially opened in August 1963 (Hobbs and Holstine 2005). It was officially renamed the Governor Albert D. Rosellini Bridge in 1988. At the time of its construction, at 1.4 miles long, the Evergreen Point Bridge was the largest floating span in the world. With the sinking of the original Lake Washington floating bridge in November 1990, it became the oldest remaining floating bridge across Lake Washington, exemplifying an engineering feat of outstanding proportions. For the Eastside communities, the new bridge would lead to even more residents and greater development pressures.

Throughout the first half of the twentieth century, farming remained the most important industry on the Eastside. However, the opening of the Lacey V. Murrow Bridge across Lake Washington in 1940 changed the area from a collection of small rural communities to much denser, more developed communities, many of which function today as Seattle suburbs. While Bellevue, Kirkland, and Redmond have embraced this intense growth, Medina and the Points communities have focused instead on remaining quiet residential enclaves. Medina has become one the most affluent residential communities in the region. Today Bellevue, Kirkland, and Redmond are prosperous and growing commercial and residential communities.

## Physical Modifications

With development of the Montlake Cut, between August and October 1916, Lake Washington was gradually lowered about 10 feet to the level of Lake Union. The lowering of Lake Washington eliminated the lake's outlet to the Black River, and the Cedar River was diverted into Lake Washington. This lowering of the lake level led to exposure of broad, wave-cut terraces around the perimeter of the lake and development of marshes in the southern portion of Union Bay. In some areas, waterfront homes now occupy this terrace. Foster Island significantly increased in size at this time.

Because the new canal required a channeled approach, USACE dredged a straight channel between the Montlake Cut and the eastern edge of Union Bay. Dredging also continued in Union Bay after completion of the Montlake Cut, largely in soft mud and sand. Dredged material was deposited in shallow water about 75 feet beyond channel lines. Some of this dredged material was probably placed in shallow water north of the Washington Park Arboretum or in the marshes that emerged in 1916 around Foster Island.

On the western side of Montlake, filling in the 1930s created some of the original Montlake Playfield area along the southern shore of Portage Bay. Beginning in 1960, the playfield was again filled and expanded northward. Fill placement continued until the late 1960s, as material was brought into the park from projects around the Seattle area, including the original SR 520 project.

Low-lying portions of the project area were also used for landfill. Prior to the late 1960s, steep ravines, low-lying swampy areas, former borrow pits, and tidal areas were frequently used as dump sites in the Seattle

area. The largest dump site in the project area was an area now known as the Montlake Landfill, established in 1925. This site occupied a 200-acre swampy area on the north side of Union Bay. The Montlake Landfill was closed in 1966, and the University of Washington acquired it in 1972. The University of Washington now operates the 73.5-acre Union Bay Natural Area on a portion of the former landfill (Howell and Hough-Snee 2009).

Significant cutting and filling also occurred during the original construction of SR 520. In Seattle, major areas of cutting occurred on north Capitol Hill, through the Montlake neighborhood, and along the route of the old portage canal across Montlake. The old portage canal land has mostly been removed, except for a segment near the National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center and the Museum of History and Industry (MOHAI). The Washington Park Arboretum lost approximately 60 acres of lagoon area to the SR 520 project.

Great expanses of the marshes surrounding Foster Island were dredged prior to construction of the Evergreen Point Bridge footings, to allow access for a pile driver. At least some of the dredged peat was cast to the side adjacent to the dredged areas. Dredging operations also removed some of the garbage fill material and underlying peat from the Miller Street Landfill site. Dredging extended up to the western and eastern edges of Foster Island.

# How is the region expected to change by 2030?

*Vision 2040* (PSRC 2008) provides comprehensive planning guidelines for the region (Snohomish, King, Pierce, and Kitsap counties) for the near future (through 2040). As documented in *Vision 2040*, population in the region is expected to increase from approximately 3.6 million in 2007 to nearly 5 million in 2040. Employment will increase from about 2 million jobs in 2007 to more than 3 million in 2040.

PSRC has based regional transportation planning on *Vision 2040's* allocation of population and employment volumes and densities around Puget Sound. The *Transportation 2040 Draft EIS (*PSRC 2009a) analyzes transportation alternatives that will be used for developing the Transportation 2040 Plan itself. The *Transportation*

Growth Centers are….

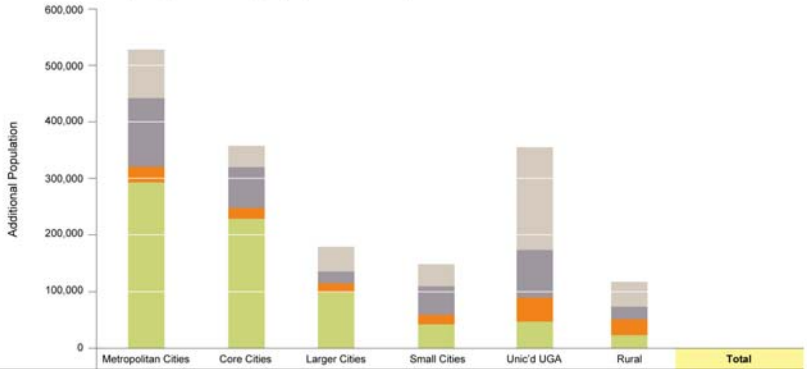
*Vision 2040* calls for the creation of central places with a mix of uses and activities. These centers are locations of more compact, pedestrian-oriented development with a mix residences, jobs, retail, and entertainment. They are identified to receive a greater portion of the region's population and employment growth.

Centers are designed as places for improved accessibility and mobility — especially for walking, bicycling, and transit. As a result, they also play a key transportation role.

*2040 Draft EIS (*PSRC 2009a) notes that population and employment growth is anticipated to be concentrated in 27 regional growth centers within *Vision 2040*'s designated metropolitan and core cities. Smaller-scale centers in smaller jurisdictions will also play an important and increased role over time as places that accommodate growth.

Exhibits 14 and 15, excerpts from *Vision 2040* (PSRC 2008), show the changes in population and employment projected for the region as a whole.

**Population Growth by Regional Geography and County 2000-2040**



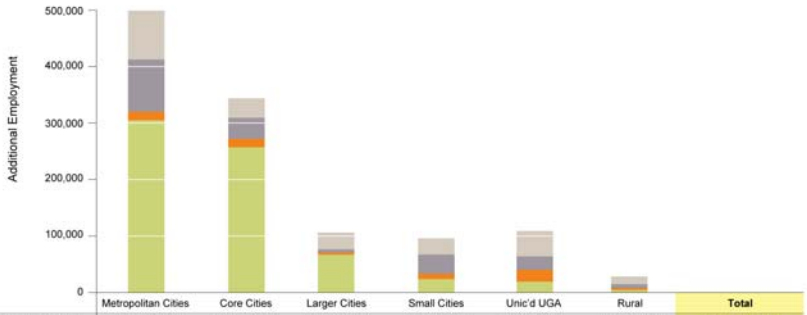

| | Metropolitan Cities | Core Cities | Larger Cities | Small Cities | Unic'd UGA | Rural | Total |
|---|---|---|---|---|---|---|---|
| Snohomish County | 20% – 89,000 | 9% – 40,000 | 10% – 44,000 | 9% – 40,000 | 42% – 187,000 | 10% – 46,000 | **26% – 446,000** |
| Pierce County | 32% – 127,000 | 19% – 75,000 | 6% – 23,000 | 15% – 57,000 | 22% – 87,000 | 6% – 24,000 | **23% – 393,000** |
| Kitsap County | 20% – 30,000 | 12% – 18,000 | 11% – 16,000 | 8% – 12,000 | 30% – 45,000 | 19% – 28,000 | **9% – 149,000** |
| King County | 41% – 294,000 | 32% – 230,000 | 14% – 98,000 | 5% – 39,000 | 6% – 43,000 | 3% – 20,000 | **42% – 724,000** |
| **Total Increase** | **32% – 540,000** | **21% – 363,000** | **11% – 181,000** | **9% – 148,000** | **21% – 362,000** | **7% – 118,000** | **100% – 1,712,000** |
| 2,000 Base | 996,000 | 589,000 | 331,000 | 264,000 | 604,000 | 493,000 | **3,276,000** |

Source: Vision 2040 (Puget Sound Regional Council 2008). Due to rounding, percentages may not sum up to 100.

Source: *Vision 2040* (PSRC 2008)

Exhibit 14. Population Growth by Regional Geography and County 2000-2040

**Employment Growth by Regional Geography and County 2000-2040**




| | Metropolitan Cities | Core Cities | Larger Cities | Small Cities | Unic'd UGA | Rural | Total |
|---|---|---|---|---|---|---|---|
| Snohomish County | 36% – 89,000 | 14% – 35,000 | 13% – 31,000 | 12% – 30,000 | 19% – 47,000 | 6% – 14,000 | **20% – 246,000** |
| Pierce County | 46% – 97,000 | 19% – 40,000 | 3% – 6,000 | 18% – 37,000 | 12% – 25,000 | 3% – 7,000 | **17% – 212,000** |
| Kitsap County | 22% – 14,000 | 23% – 15,000 | 8% – 5,000 | 12% – 8,000 | 28% – 19,000 | 8% – 5,000 | **5% – 65,000** |
| King County | 45% – 311,000 | 38% – 262,000 | 10% – 69,000 | 4% – 25,000 | 3% – 23,000 | 1% – 5,000 | **57% – 695,000** |
| **Total Increase** | **42% – 511,000** | **29% – 352,000** | **9% – 111,000** | **8% – 100,000** | **29% – 113,000** | **3% – 31,000** | **100% – 1,219,000** |
| 2,000 Base | 923,000 | 521,000 | 121,000 | 106,000 | 117,000 | 64,000 | **1,853,000** |

Source: Vision 2040 (Puget Sound Regional Council 2008). Due to rounding, percentages may not sum up to 100.

Source: *Vision 2040* (PSRC 2008)

Exhibit 15. Employment Growth by Regional Geography and County 2000-2040

that different types of planning areas are expected to experience between 2000 and 2040 (Exhibit 16).

Exhibit 16. Population and Employment Growth between 2000 and 2040

| Type of Area | Population Increase | Employment Increase |
|---|---|---|
| **Metropolitan Cities** (Bellevue, Bremerton, Everett, Seattle, Tacoma) | 540,000—32% | 511,000—42% |
| **Core Cities & Silverdale** (Auburn, Bothell, Burien, Federal Way, Kent, Kirkland, Lakewood, Lynnwood, Puyallup, Redmond, Renton, SeaTac, Silverdale [unincorporated], Tukwila) | 363,000—21% | 352,000—29% |
| **Large Cities** (Arlington, Bainbridge Island, Des Moines, Edmonds, Fife, Issaquah, Kenmore, Maple Valley, Marysville, Mercer Island, Mill Creek, Monroe, Mountlake Terrace, Mukilteo, Sammamish, Shoreline, University Place, Woodinville) | 181,000—11% | 111,000—9% |
| **Small Cities and Small Residential Towns** (Algona, Black Diamond, Bonney Lake, Brier, Covington, Du Pont, Edgewood, Fircrest, Gig Harbor, Lake Forest Park, Lake Stevens, Medina, Milton, Newcastle, Normandy Park, Orting, Pacific, Port Orchard, Poulsbo, Ruston, Steilacoom, Sumner, Beaux Arts, Clyde Hill, Hunts Point, Woodway, Yarrow Point, Buckley, Carbonado, Carnation, Darrington, Duvall, Eatonville, Enumclaw, Gold Bar, Granite Falls, Index, North Bend, Roy, Skykomish, Snohomish, Snoqualmie, South Prairie, Stanwood, Sultan, Wilkeson) | 148,000—9% | 100,000—8% |
| **Unincorporated Area** | 362,000—21% | 113,000—9% |
| **Rural Area** | 118,000—7% | 31,000—3% |

Source: *Transportation 2040 Draft Environmental Impact Statement* (PSRC 2009a)

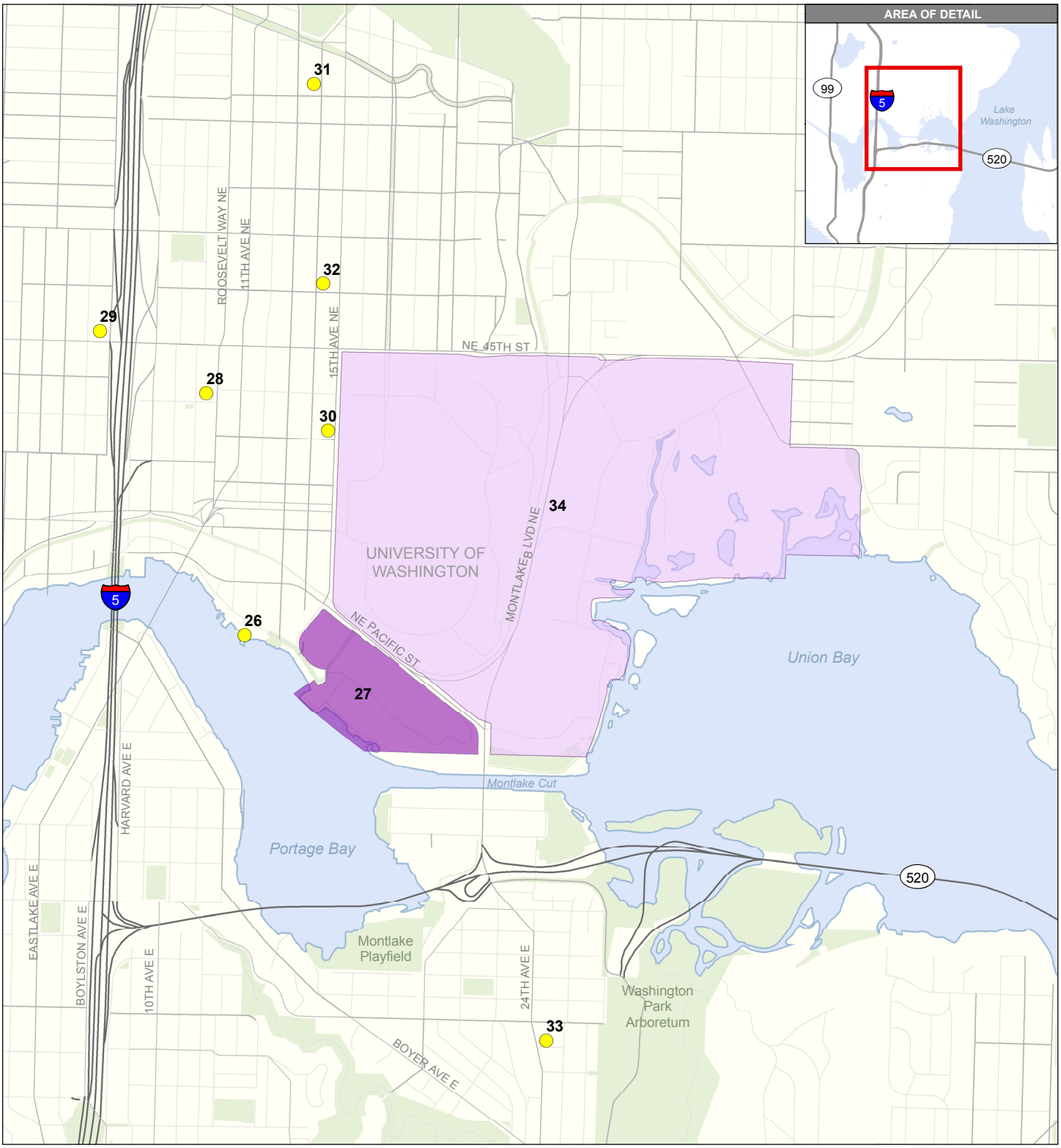
Continued growth in the region is seen as an opportunity to restore watersheds, develop more environmentally sensitive approaches to treating stormwater, enhance habitat, and pioneer new technologies and industries that benefit both the environment and the regional economy (PSRC 2008). The conclusion of the Vision 2040 planning effort is that future land use and transportation development can occur in a sustainable manner, accommodating the expected economic growth and increased population, without resulting in deterioration of the environment. The approach in the *Transportation 2040 Draft EIS* (PSRC 2009a) is intended to be consistent with that of *Vision 2040* (PSRC 2008).

# What other projects exist or are proposed in the project area?

The National Environmental Policy Act (NEPA) process requires an analysis that accounts for the incremental effect of a proposed project when added to other past actions, present actions, and reasonably foreseeable future actions. Within the *Transportation 2040 Draft EIS* (PSRC 2009a), the analysts made assumptions about the specific development and transportation projects that would occur between now and 2040. Therefore, those analyzing cumulative and indirect effects for this project used the regional transportation planning process and associated assumptions about development as a baseline. The analysts then developed an updated list of development and transportation actions and projects—the reasonably foreseeable future actions previously discussed. This process is consistent with the coordination of planning actions envisioned by the *Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users* (SAFETEA-LU 2005, 23 USC 507 Section 6001), which encourages community planning in advance of the NEPA process.

The identified reasonably foreseeable future actions include projects by local governments in the project area as well as private developments. Exhibits 17a through 17d and 18a and 18b show the general locations of the projects and the Indirect and Cumulative Effects chapter discusses specific interactions of the 6-Lane Alternative with the listed projects, if applicable.

Attachment 1 shows and describes the development-related reasonably foreseeable future actions that analysts considered for this indirect and cumulative effects analysis. The term "development" refers to the construction of new residential, commercial, industrial, and civic projects other than transportation projects. The analysts evaluated private mixed-use developments near the west side of the project area and one boat launch on Portage Bay. They considered the master plans the University of Washington is implementing for redevelopment of the campus and the medical center. The analysts also reviewed the Washington Park Arboretum Master Plan (City of Seattle, University of Washington, and The Arboretum Foundation 2001), including recent and planned improvement projects. Full implementation of the Arboretum Master Plan is likely by 2040; recent projects such as the Japanese Garden entry and the initial phase of the Pacific Connections project have increased visitors to the Arboretum and have also




| ID | Project |
|---|---|
| 26 | Car Top Boat Launch and Portage Bay Vista |
| 27 | University of Washington Medical Center Master Plan |
| 28 | Mixed Use Development |
| 29 | Mixed Use Development |
| 30 | Mixed Use Development |
| 31 | Mixed Use Development |
| 32 | Mixed Use Development |
| 33 | Mixed Use Development |
| 34 | University of Washington Campus Master Plan |

Land Development or Redevelopment Project

University of Washington Campus Master Plan

University of Washington Medical Center Master Plan

Park

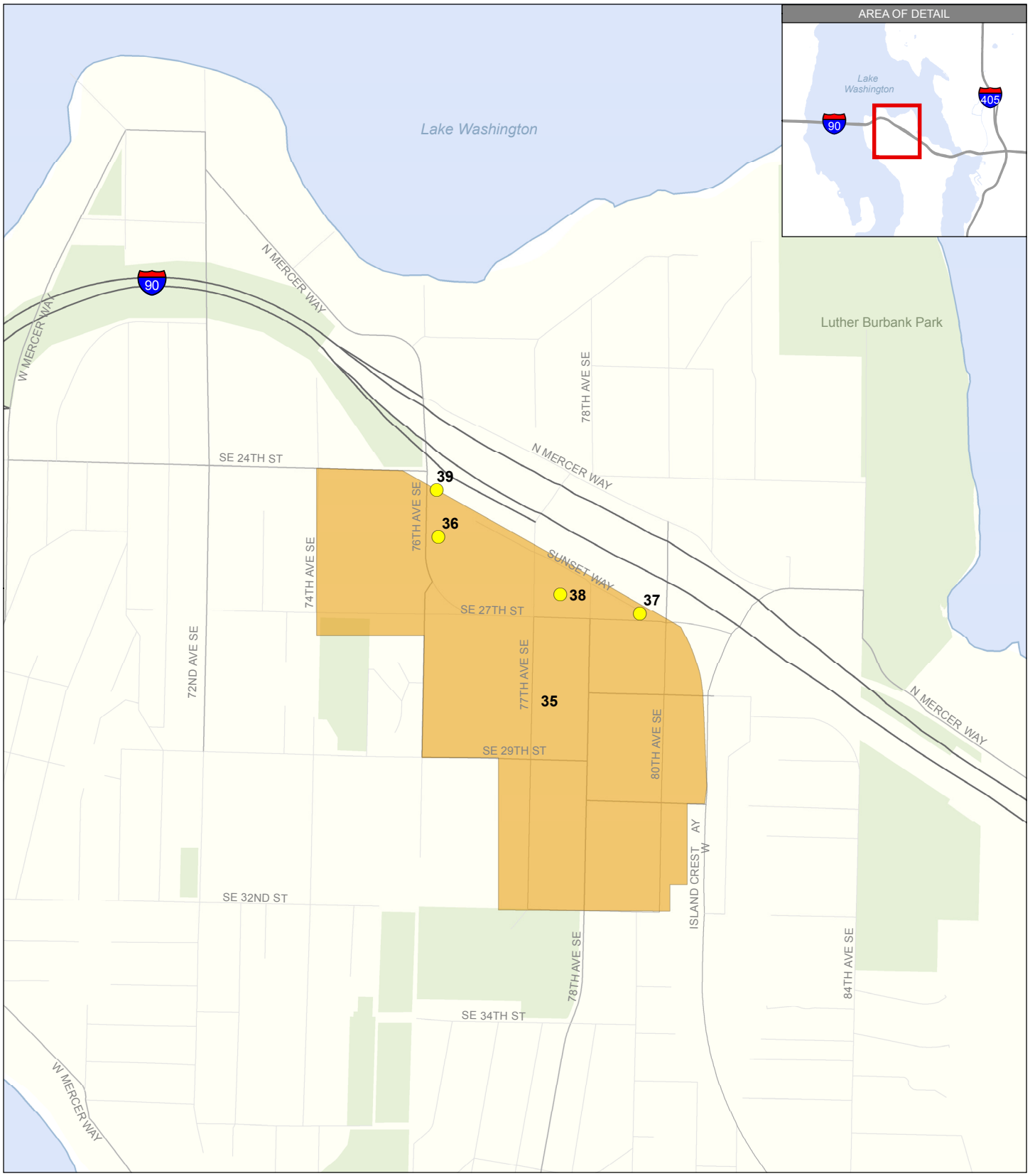
Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 500 1,000 2,000 Feet

Exhibit 17a. **Reasonably Foreseeable Future Actions - Land Development**

I-5 to Medina: Bridge Replacement and HOV Project




| ID | Project |
|---|---|
| 35 | Town Center District Plan |
| 36 | Aljoya at Mercer Island (ERA Living Senior Housing) |
| 37 | 7800 Plaza |
| 38 | 7700 Central |
| 39 | BRE |

Land Development or Redevelopment Project

Mercer Island Town Center District Plan

Park

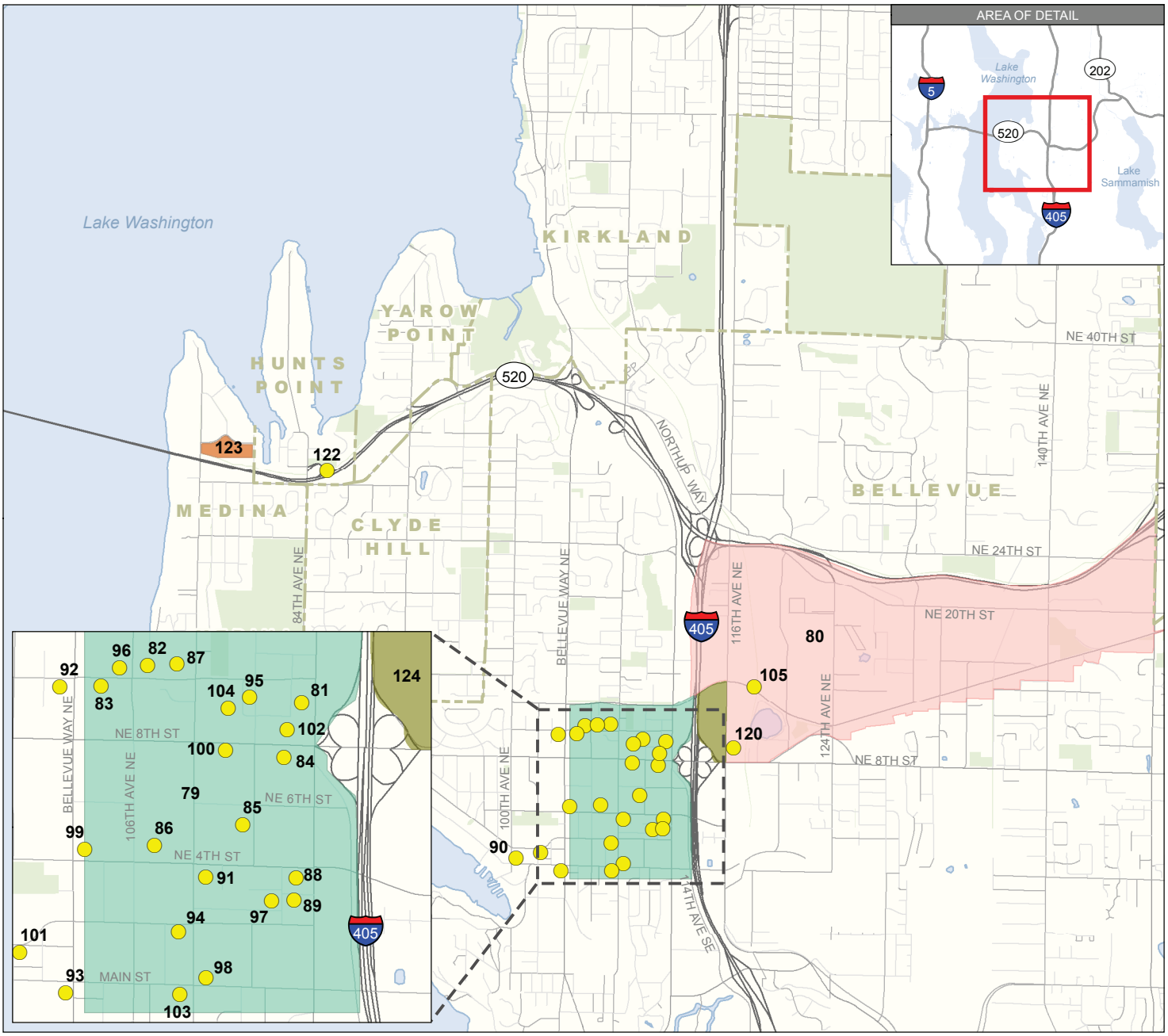
N

0 250 500 1,000 Feet

Source: King County (2005) GIS Data (Streams, Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 17b. **Reasonably Foreseeable Future Actions - Land Development**

I-5 to Medina: Bridge Replacement and HOV Project




| ID | Project |
|---|---|
| 80 | Bel-Red Corridor |
| 81 | Ashwood II |
| 82 | Belcarra Apartments |
| 83 | Bellevue Place Hyatt Hotel |
| 84 | Bravern |
| 85 | City Center East |
| 86 | Bellevue Towers |
| 87 | The Ashton |
| 88 | Metro 112 |
| 89 | Meydenbauer Inn |
| 90 | One Main |
| 91 | The Summit Building C |
| 92 | Avalon at NE 10th Street |
| 93 | Bellevue at Main Street |
| 94 | Bellevue Plaza |
| 95 | Euro Tower I |
| 96 | Hanover Bellevue Cadillac |
| 97 | Marriott Hotel |
| 98 | Legacy Apartments |
| 99 | Lincoln Square II |
| 100 | 8th Street Office Highrise |
| 101 | The Essex |
| 102 | Vida Condominiums |

| ID | Project |
|---|---|
| 103 | Vantana on Main |
| 104 | Pacific Regent Phase II |
| 105 | NE 112th Substation |
| 120 | Bellevue/Redmond Overlake Transportation (BROTS)(Bellevue/Redmond) |
| 122 | Expressway Nature Trail |
| 123 | Fairweather Nature Preserve Long Range Park Improvements |
| 124 | Overlake Hospital Master Plan |

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

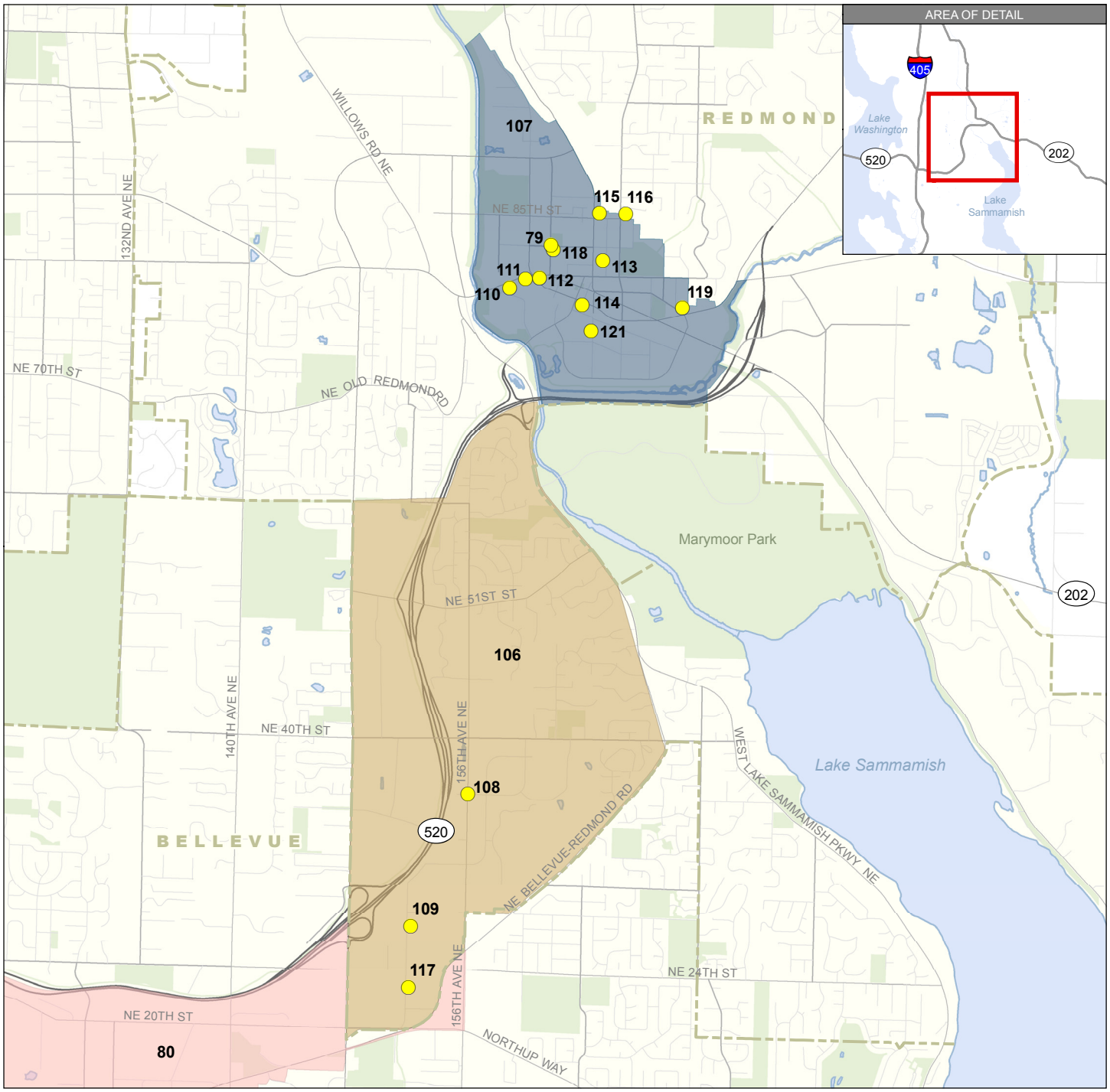
N

0 1,500 3,000 6,000 Feet

- Land Development or Redevelopment Project
- Bel-Red Corridor Project
- Downtown Implemention and Subarea Plan
- Fairweather Nature Preserve Long Range Park Improvements
- Overlake Hospital Master Plan
- Park

Exhibit 17c. **Reasonably Foreseeable Future Actions - Land Development**

I-5 to Medina: Bridge Replacement and HOV Project




| ID | Project |
|---|---|
| 79 | Downtown Implementation and Subarea Plan |
| 80 | Bel-Red Corridor Plan |
| 106 | Overlake Neighborhood Plan Update and Implementation (Redmond) |
| 107 | Redmond Downtown Neighborhood Plan |
| 108 | Microsoft Expansion (Microsoft/Redmond) |
| 109 | Group Health Property |
| 110 | Redmond River Park |
| 111 | Cleveland Street West |
| 112 | Cleveland Street East |
| 113 | Portula'ca |
| 114 | Center Pointe |
| 115 | Tudor Manor |
| 116 | Perrigo Park |
| 117 | White Swan |
| 118 | Redmond Court |
| 119 | Parkside Apartments |
| 121 | Redmond Transit Oriented Development |

- Land Development or Redevelopment Project
- Bel-Red Corridor Project
- Overlake Neighborhood Plan
- Redmond Downtown Neighborhood Plan
- Park

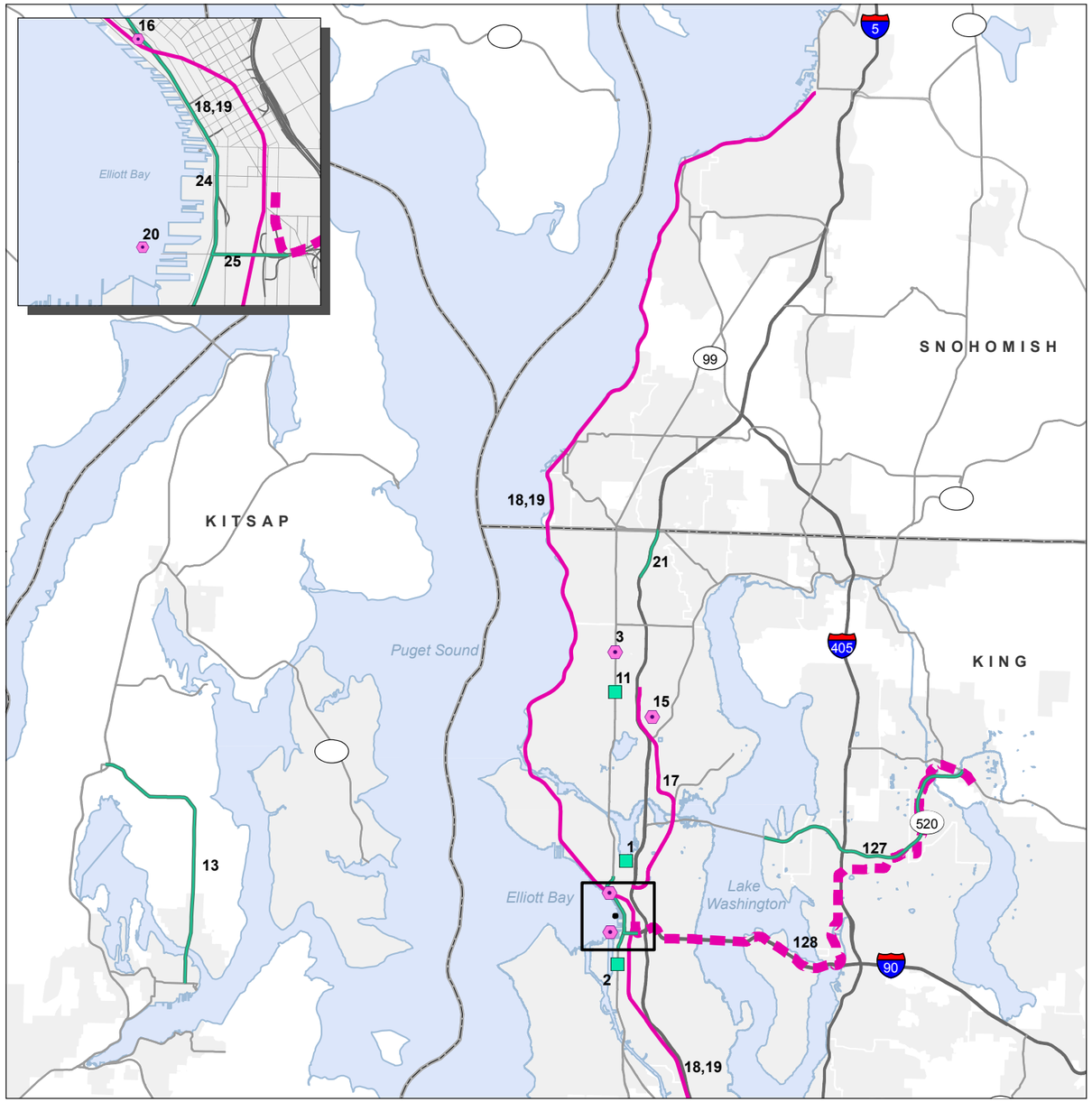
Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

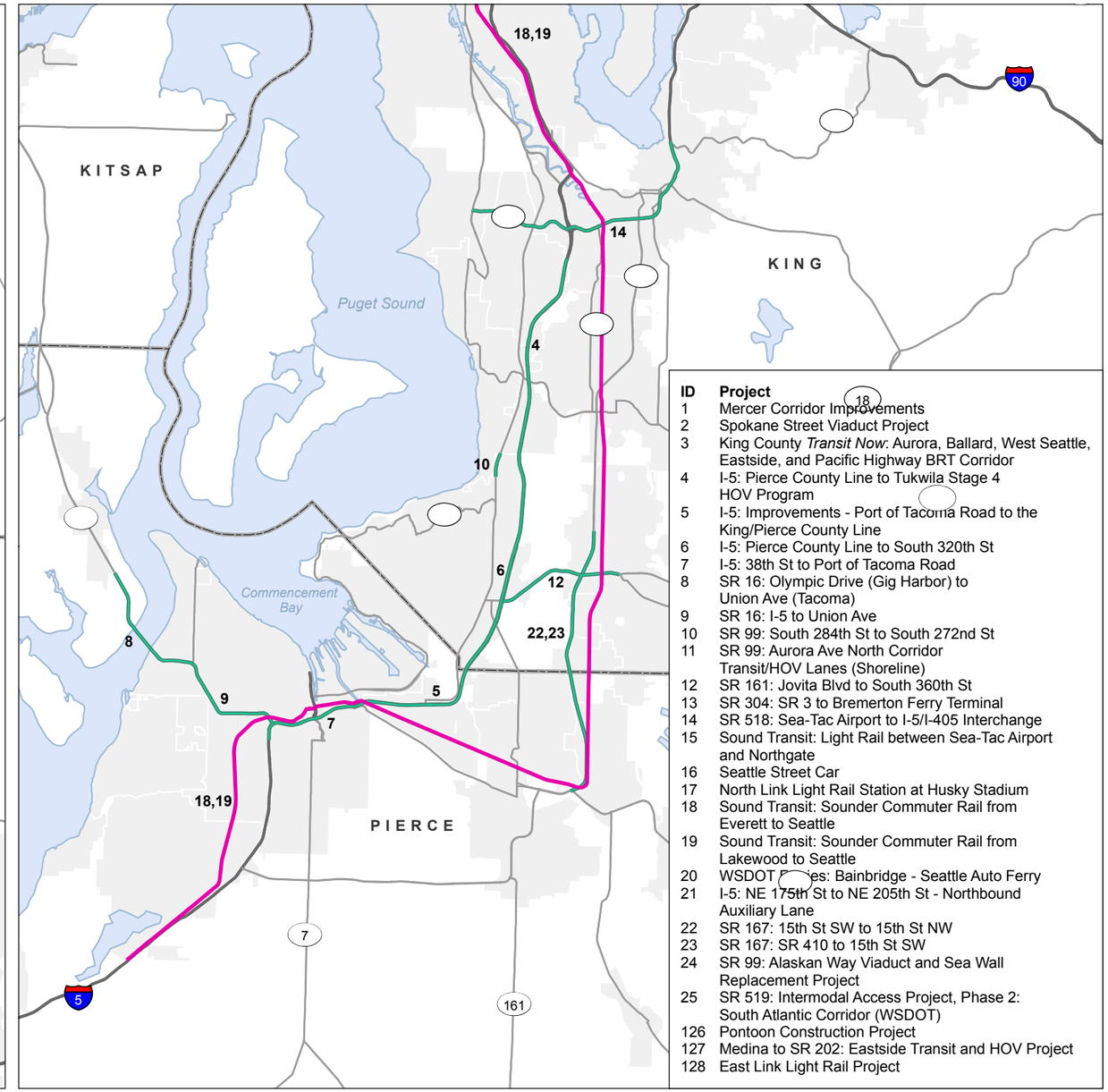
N

0 1,000 2,000 4,000 Feet

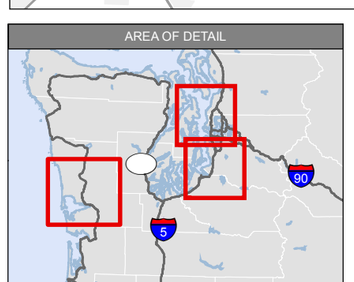
Exhibit 17d. **Reasonably Foreseeable Future Actions - Land Development**

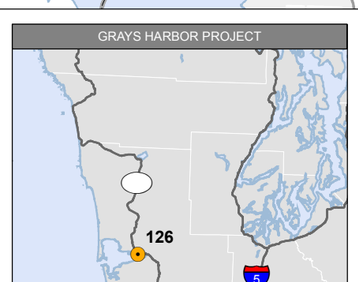
I-5 to Medina: Bridge Replacement and HOV Project




| ID | Project |
|---|---|
| 1 | Mercer Corridor Improvements |
| 2 | Spokane Street Viaduct Project |
| 3 | King County *Transit Now*: Aurora, Ballard, West Seattle, Eastside, and Pacific Highway BRT Corridor |
| 4 | I-5: Pierce County Line to Tukwila Stage 4 HOV Program |
| 5 | I-5: Improvements - Port of Tacoma Road to the King/Pierce County Line |
| 6 | I-5: Pierce County Line to South 320th St |
| 7 | I-5: 38th St to Port of Tacoma Road |
| 8 | SR 16: Olympic Drive (Gig Harbor) to Union Ave (Tacoma) |
| 9 | SR 16: I-5 to Union Ave |
| 10 | SR 99: South 284th St to South 272nd St |
| 11 | SR 99: Aurora Ave North Corridor Transit/HOV Lanes (Shoreline) |
| 12 | SR 161: Jovita Blvd to South 360th St |
| 13 | SR 304: SR 3 to Bremerton Ferry Terminal |
| 14 | SR 518: Sea-Tac Airport to I-5/I-405 Interchange |
| 15 | Sound Transit: Light Rail between Sea-Tac Airport and Northgate |
| 16 | Seattle Street Car |
| 17 | North Link Light Rail Station at Husky Stadium |
| 18 | Sound Transit: Sounder Commuter Rail from Everett to Seattle |
| 19 | Sound Transit: Sounder Commuter Rail from Lakewood to Seattle |
| 20 | WSDOT Ferries: Bainbridge - Seattle Auto Ferry |
| 21 | I-5: NE 175th St to NE 205th St - Northbound Auxiliary Lane |
| 22 | SR 167: 15th St SW to 15th St NW |
| 23 | SR 167: SR 410 to 15th St SW |
| 24 | SR 99: Alaskan Way Viaduct and Sea Wall Replacement Project |
| 25 | SR 519: Intermodal Access Project, Phase 2: South Atlantic Corridor (WSDOT) |
| 126 | Pontoon Construction Project |
| 127 | Medina to SR 202: Eastside Transit and HOV Project |
| 128 | East Link Light Rail Project |




- Roadway or Arterial Project
- Transit Project
- SR 520 Pontoon Project
- Roadway or Arterial Project
- Transit Project
- East Link Light Rail - Alternatives Still Under Study
- City Limits

N

0 2.5 5 10 Miles

Source: King County (2004) GIS Data (City Limits), WSDOT (2004) GIS Data (State Routes), CH2M HILL (2008) GIS Data (Park), Ecology (2001) GIS Data (Shoreline). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 18a. **Reasonably Foreseeable Future Actions - Transportation**

I-5 to Medina: Bridge Replacement and HOV Project

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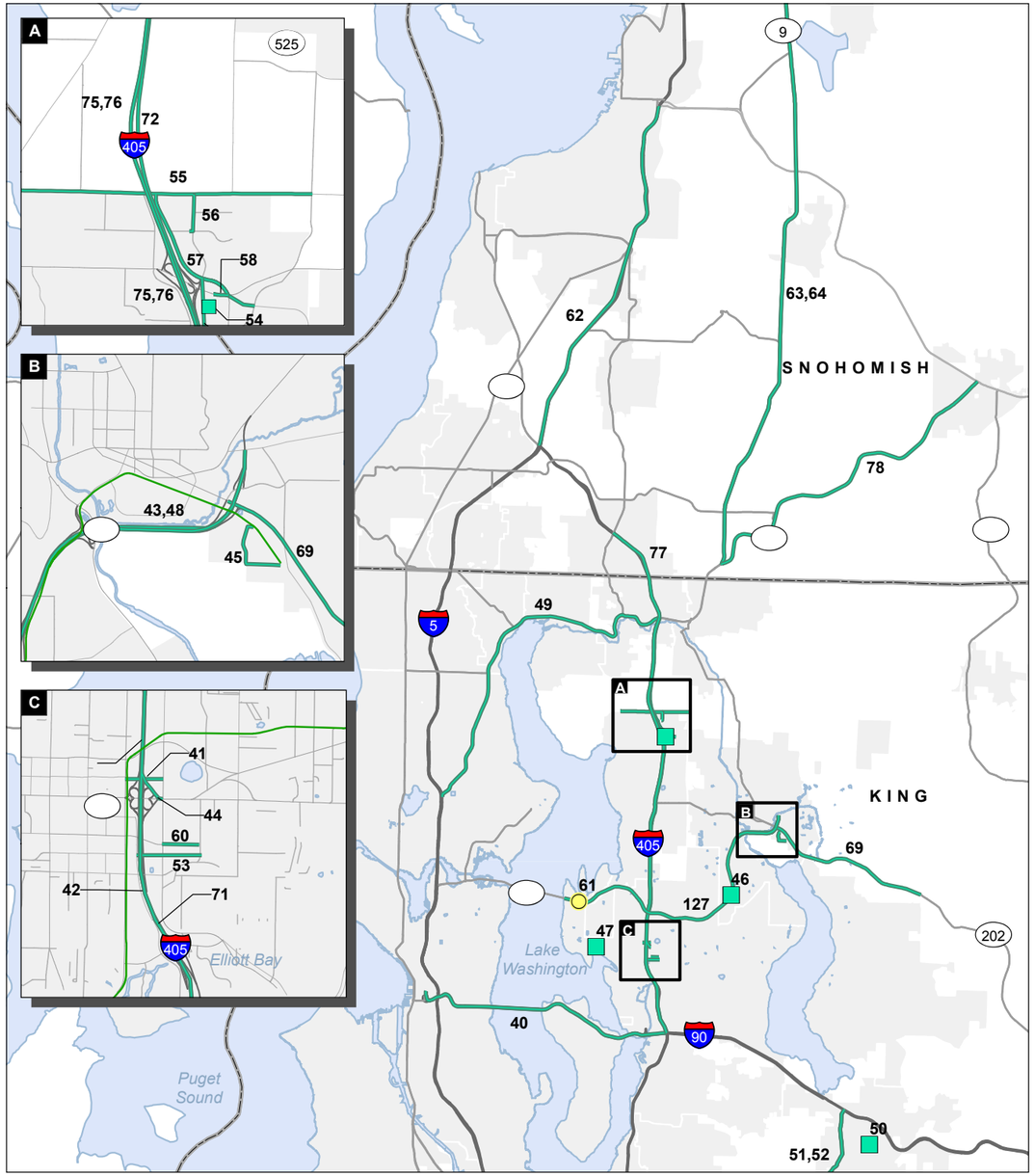
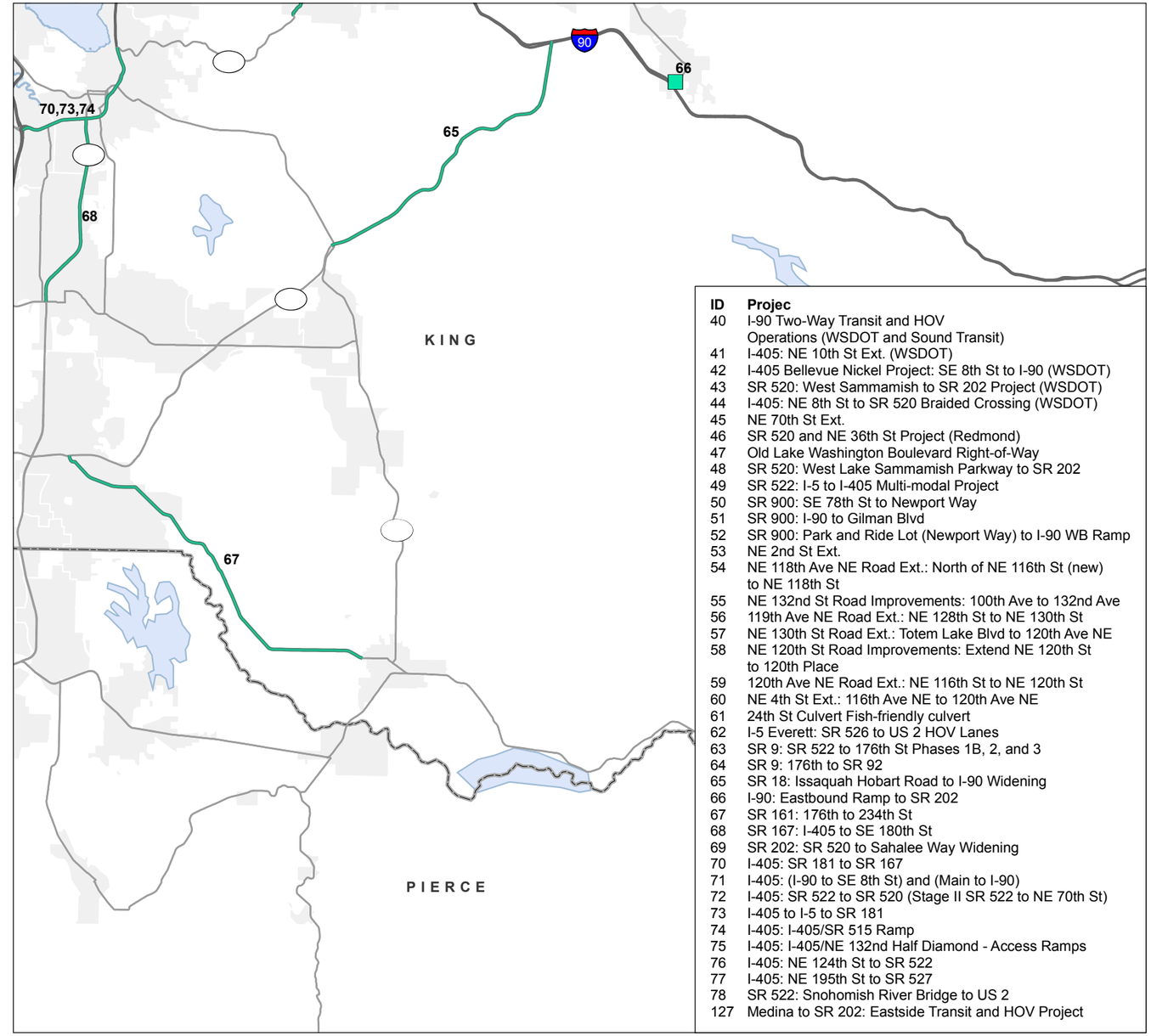
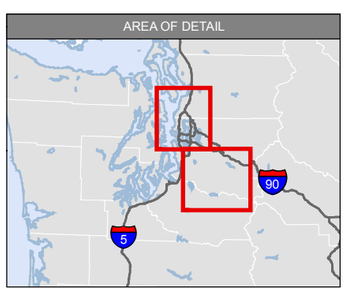



| ID | Projec |
|---|---|
| 40 | I-90 Two-Way Transit and HOV Operations (WSDOT and Sound Transit) |
| 41 | I-405: NE 10th St Ext. (WSDOT) |
| 42 | I-405 Bellevue Nickel Project: SE 8th St to I-90 (WSDOT) |
| 43 | SR 520: West Sammamish to SR 202 Project (WSDOT) |
| 44 | I-405: NE 8th St to SR 520 Braided Crossing (WSDOT) |
| 45 | NE 70th St Ext. |
| 46 | SR 520 and NE 36th St Project (Redmond) |
| 47 | Old Lake Washington Boulevard Right-of-Way |
| 48 | SR 520: West Lake Sammamish Parkway to SR 202 |
| 49 | SR 522: I-5 to I-405 Multi-modal Project |
| 50 | SR 900: SE 78th St to Newport Way |
| 51 | SR 900: I-90 to Gilman Blvd |
| 52 | SR 900: Park and Ride Lot (Newport Way) to I-90 WB Ramp |
| 53 | NE 2nd St Ext. |
| 54 | NE 118th Ave NE Road Ext.: North of NE 116th St (new) to NE 118th St |
| 55 | NE 132nd St Road Improvements: 100th Ave to 132nd Ave |
| 56 | 119th Ave NE Road Ext.: NE 128th St to NE 130th St |
| 57 | NE 130th St Road Ext.: Totem Lake Blvd to 120th Ave NE |
| 58 | NE 120th St Road Improvements: Extend NE 120th St to 120th Place |
| 59 | 120th Ave NE Road Ext.: NE 116th St to NE 120th St |
| 60 | NE 4th St Ext.: 116th Ave NE to 120th Ave NE |
| 61 | 24th St Culvert Fish-friendly culvert |
| 62 | I-5 Everett: SR 526 to US 2 HOV Lanes |
| 63 | SR 9: SR 522 to 176th St Phases 1B, 2, and 3 |
| 64 | SR 9: 176th to SR 92 |
| 65 | SR 18: Issaquah Hobart Road to I-90 Widening |
| 66 | I-90: Eastbound Ramp to SR 202 |
| 67 | SR 161: 176th to 234th St |
| 68 | SR 167: I-405 to SE 180th St |
| 69 | SR 202: SR 520 to Sahalee Way Widening |
| 70 | I-405: SR 181 to SR 167 |
| 71 | I-405: (I-90 to SE 8th St) and (Main to I-90) |
| 72 | I-405: SR 522 to SR 520 (Stage II SR 522 to NE 70th St) |
| 73 | I-405 to I-5 to SR 181 |
| 74 | I-405: I-405/SR 515 Ramp |
| 75 | I-405: I-405/NE 132nd Half Diamond - Access Ramps |
| 76 | I-405: NE 124th St to SR 522 |
| 77 | I-405: NE 195th St to SR 527 |
| 78 | SR 522: Snohomish River Bridge to US 2 |
| 127 | Medina to SR 202: Eastside Transit and HOV Project |

Source: King County (2004) GIS Data (City Limits), WSDOT (2004) GIS Data (State Routes), CH2M HILL (2008) GIS Data (Park), Ecology (2001) GIS Data (Shoreline). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.




- Utility Project
- Roadway or Arterial Project
- Roadway or Arterial Project
- City Limits
- County Boundary

N

0 2.5 5 10 Miles

Exhibit 18b. **Reasonably Foreseeable Future Actions - Transportation**

I-5 to Medina: Bridge Replacement and HOV Project

\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\INDIRECTCUMULATIVE\SDEIS_DR_ICE_TRANSIT_EAST_11X17.MXD 12/2/2009

increased pedestrian traffic across Lake Washington Boulevard. East of the floating bridge, they considered public and private developments (including recreational facilities) in Bellevue, Redmond, and Mercer Island.

Attachment 2 shows and describes the transportation-related reasonably foreseeable future actions that analysts considered for this indirect and cumulative effects analysis. The reasonably foreseeable future actions include roadway and transit projects in the region that Sound Transit; the cities of Seattle, Redmond, Clyde Hill, Kirkland, and Medina; and WSDOT may be constructing for communities, the state, and the region.

Note: Sound Transit 2 had not yet passed when the modeling was performed for the No Build Alternative. As a result, East Link was not included in that alternative, although it was included as a foreseeable project in the 6-Lane Alternative for cumulative effects. The Sound Transit 2 projects will be included in the analysis of the No Build Alternative for the Final EIS.

The Indirect and Cumulative Effects chapter provides additional detail on the existing conditions of each element of the affected environment.

# Indirect and Cumulative Effects

This chapter discusses indirect and cumulative effects that are likely to be associated with the No Build Alternative and the 6-Lane Alternative. For each discipline, the analysts first summarize the direct effects of project construction and operation identified previously, because these could lead to indirect effects and also contribute to cumulative effects. Next, they identify and briefly discuss potential indirect effects.

The analysts then discuss cumulative effects, briefly explaining the methods they used to identify them and telling the story of each resource by summarizing past actions and ongoing trends that have led to the resource's current condition. Where pertinent, the analysts note how present resource trends compare with management goals the responsible governmental agencies set. They also identify examples of other present actions and reasonably foreseeable future actions, noted previously (Exhibits 17a through 17d and 18a and 18b), that could affect the resource in coming years, with or without the project.

Having laid this groundwork, the analysts discuss the cumulative effect likely to occur under the No Build Alternative in the reasonably foreseeable future—between now and 2030, the project design year. This is the cumulative effect base case. It serves as a benchmark for comparison with the expected cumulative effect under the 6-Lane Alternative options, which they discuss next. The difference in the size of the cumulative effect with the 6-Lane Alternative compared to the base case represents the contribution of direct and indirect effects that the project would add to the cumulative effect.

Finally, the analysts suggest ways by which cumulative effects could be mitigated. WSDOT does not mitigate cumulative effects because it does not have jurisdiction over the many non-WSDOT projects that contribute to them. Even so, WSDOT is required to disclose cumulative effects and to suggest practical mitigation options that the responsible parties could take (WSDOT et al. 2008). Therefore, to close the discussion for each resource, the analysts briefly consider how cumulative effects are being or could be mitigated by public agencies, non-governmental organizations, and private entities beyond WSDOT's jurisdiction.

# Transportation

## What direct and indirect effects will the project likely have on transportation?

A highway project can directly affect elements of the local and regional transportation network such as capacity, circulation, access, safety, and level of service. The transportation analysis conducted for the I-5 to Medina project focuses on the potential effects that the project might have on traffic volumes and the flow of vehicular traffic for both freeway and local street traffic, and nonmotorized travel, transit, and parking. A travel demand model determined the direct operational effects on traffic volumes and transit usage with the magnitude of potential effects based on a comparison of the No Build Alternative with the 6-Lane Alternative options at the project design horizon (year 2030).

A major change in the corridor will be tolling on SR 520 and new westbound and eastbound HOV lanes. These changes will alter driver behavior, causing some drivers to change their travel mode (to bus or carpool), time of day for travel, or route (some drivers will avoid SR 520 and either drive around Lake Washington on SR 522 or use I-90). It is predicted that tolling will reduce single-occupancy vehicle volume by 3 percent as compared to the No Build Alternative, as some people will opt for transit, carpools, or non-motorized travel. The completion of the HOV lanes and tolling is projected to increase transit ridership by 14 percent and cut transit travel time by up to 3 minutes for westbound travel and 40 minutes for eastbound travel, depending on the time of day (see Chapter 2, Transportation Discipline Report [WSDOT 2009h]).

The project will not generate additional regional traffic, particularly as it is not increasing the capacity for single-occupancy vehicles. Thus, the different project options will have similar traffic volumes across the Evergreen Point Bridge. However, traffic circulation patterns to and from SR 520 and in the vicinity of the project will change (as well as those on SR 520 itself) because of improvements to the SR 520/I-5 interchange, the addition of HOV lanes, and improved access ramps in the Montlake area. These changes will improve traffic circulation and decrease congestion. Local traffic patterns may also shift slightly, increasing volumes at the Lakeview/I-5 northbound off-ramp and the Boylston/Lynn and East Roanoke/Harvard/SR 520 westbound off-ramps (see Chapter 6, Transportation Discipline Report [WSDOT

2009h]). In addition, widening the shoulder area of SR 520 will help prevent congestion and travel delays caused by accidents, because there will be room to move damaged vehicles off the travel lanes.

The proposed project would construct a bicycle/pedestrian path on the Evergreen Point Bridge, as well as provide bicycle/pedestrian path connections across new highway lids constructed as a part of the project to increase north-south nonmotorized travel across SR 520. This will improve mobility for non-motorized travel (see Chapter 7, Transportation Discipline Report [WSDOT 2009h]).

The project will cause some loss of parking spaces around the Montlake area at the University of Washington.

The direct effects of construction activities on transportation will be temporary in nature, generally lasting for the duration of construction (see Chapter 10, Transportation Discipline Report [WSDOT 2009h]). These include the following:

- Periodic lane closures on SR 520 and adjacent streets
- Several longer-term lane/road closures at the SR 520 Lake Washington Boulevard ramps, the Delmar Drive Bridge over SR 520, and NE Pacific Street (under Options K and L only) between the University of Washington Medical Center and Montlake Boulevard NE
- Increased truck traffic from construction vehicles
- Closure of the Montlake freeway transit station (this will require relocation of bus service and the need for additional buses)
- Modification of pedestrian and bicycle access in the Montlake area requiring detours
- Loss of parking near the University of Washington (particularly Parking Lot E-12 under Option K).

The travel demand model estimated indirect effects on transportation, which include changes in regional travel patterns in Seattle and Eastside areas outside the project limits resulting from the project. For both the Eastside and Seattle areas, the model predicts that vehicle and person trips for the 6-Lane Alternative and No Build Alternative would be similar (that is, the differences were slight). This is particularly true for north-south trips. However, the analysis indicates that there would be a slight increase in east-west person trips from these areas, which is

likely due to increased HOV capacity (see Chapter 2, Transportation Discipline Report [WSDOT 2009h]). No additional, quantifiable, indirect effects were identified for the transportation analysis.

Detailed results for direct and indirect effects are reported in the Transportation Discipline Report (WSDOT 2009h).

## What are transportation-related cumulative effects and how are they assessed?

Cumulative transportation effects are long-term trends and changes in traffic volumes, circulation patterns, congestion, access, safety, and non-motorized and transit use resulting from past, present, and reasonably foreseeable actions mostly related to land use changes from increased population and development.

Cumulative effects related to transportation are typically assessed through transportation and land use modeling. The design of the overall transportation system determines how the system functions, thus affecting traffic volumes and flow, circulation, access, safety, travel times, and so forth, which in turn affect travel behavior. PSRC is the regional Metropolitan Transportation Planning Organization tasked with modeling the future regional transportation system to ensure that this system supports anticipated growth and development. *Vision 2040* is PSRC's Regional Growth Strategy, which provides the policy structure for the related transportation plan (*Transportation 2040*) (PSRC 2008, PSRC 2009a). PSRC gathers information on future anticipated transportation projects from the state and local jurisdictions and uses this information to estimate future traffic volumes and identify potential transportation issues. Additional travel demand modeling is generally used at a smaller scale to determine a specific project's cumulative effects.

For the SR 520 project, a travel demand model was used, which incorporates a number of future planned projects as well as taking into account transportation impacts of past and present actions. Thus, the model itself yields information on direct, indirect and cumulative impacts. For example, future projects such as the Alaskan Way Viaduct, Interstate 405 (I-405), and Sound Transit's East Link, North Link (and the extension to Lynnwood), and University Link (including the Husky Stadium Station) are considered in the cumulative effects assessment (see Exhibits 18a and 18b in this report and Chapter 11, Transportation Discipline Report [WSDOT 2009h]).

## How was the cumulative effects assessment on transportation conducted?

The transportation analysis used the SR 520 travel demand model to estimate the potential cumulative effects of the project alternatives. The direct and indirect transportation effects analysis examined conditions for the year 2030, which included reasonably foreseeable future projects. Thus, the transportation cumulative effects analysis included those regional transportation improvement projects that were considered likely to be implemented by 2030 but that were not yet funded at the time of the analysis. The analysis provides an estimate of anticipated travel demand throughout the region, as well as an evaluation of cross-lake travel that specifically compares travel demand and mode choice between SR 520 and I-90 and thus captures direct, indirect, and cumulative effects.

The project travel demand model was developed with a background network assumption that matched the project description, and then the model was validated against actual data for the SR 520 corridor. The No Build and 6-Lane Alternatives were then modeled relative to the cumulative effects scenarios to obtain travel demand forecasts for each scenario at several locations on I-5, I-405, I-90, SR 522, and SR 520. The forecasts reported both daily and p.m. peak periods. The primary measures used to make the comparisons included vehicle trips and person trips. (See Chapter 4, Transportation Discipline Report [WSDOT 2009h].)

## What trends have led to the present transportation condition in the study area, and how is transportation likely to change in the reasonably foreseeable future?

Traffic volumes have increased over time due to population growth in the area, and traffic now exceeds the capacity of SR 520 during certain times of the day. The configuration of SR 520 adds to the problem because of the limited capacity of its four lanes, the incomplete HOV system, the need for traffic entering SR 520 on the westbound approaches to the Evergreen Floating Bridge to weave through the HOV traffic, and SR 520's narrow shoulders. This makes the corridor especially prone to traffic congestion during times when there are high volumes or when there are accidents on SR 520. Traffic congestion adversely affects both vehicle and transit travel times. Congestion on SR 520 also backs up traffic onto local streets such as Montlake

Boulevard and Lake Washington Boulevard, creating travel delays and circulation problems on local streets and through the Arboretum and University of Washington campus. In addition, lack of non-motorized facilities along the SR 520 corridor and especially the Evergreen Floating Bridge create a challenge for bicycles to travel between Seattle and the Eastside.

In the reasonably foreseeable future, regional population growth will add more travel demand to an already congested transportation system. Travelers will continue to face congestion in some areas, particularly during the morning and evening commutes. As described in the *Transportation 2040 Draft EIS* (PSRC 2009a), investments in the region's transportation system will be targeted to preserve the existing system, improve system efficiency, increase choices to users, and provide strategic capacity improvements to meet future travel needs.

## How is transportation likely to change in the reasonably foreseeable future without the project?

Without the project, daily traffic demand across Lake Washington would increase by 20 percent due to growth in population and employment, causing worsening congestion on SR 520 and the connecting local street system, particularly during the peak travel times. Travel times for general-purpose westbound traffic on SR 520 would increase by 20 to 30 minutes over existing levels. Travel times for eastbound traffic would increase by 60 minutes. Westbound HOV and transit travel times would improve because of completion of the Medina to SR 202 project. However, eastbound HOV and transit travel times would worsen by up to 30 minutes. Without the project, two of the 39 study intersections would experience worse level of service operation (that is, increased delay at intersections) during the morning commute, and operation of nine study intersections would worsen during the evening commute (see Chapter 2, Transportation Discipline Report [WSDOT 2009h]).

## What is the cumulative effect on transportation likely to be?

There will be cumulative effects on transportation during construction of the SR 520 improvements. This is due to the length of time required to construct the proposed improvements and the ongoing development of other projects in the area that are likely to occur at the same time. For

example, the University of Washington is making improvements to the campus and medical center in the vicinity of Portage Bay; Sound Transit is constructing University Link; there are mixed-use developments occurring on the west end of the project; and there are a number of projects underway or planned in the eastside cities of Bellevue, Mercer Island, Redmond and Kirkland (see Exhibits 17a, 17b, 17c, and 17d). Projects occurring at the same time as the SR 520 project will result in the following construction-related cumulative impacts on transportation (in addition to those described previously in the direct impacts section):

- Truck traffic traveling through the SR 520 construction zone from construction vehicles and delivery of materials
- Additional lane closures and road detours, particularly on the local street system, which would cause slowdowns and some drivers to alter their routes (this may result in more cut-through traffic in neighborhoods)
- Short-term and permanent modifications to access
- Temporary changes to transit and non-motorized facilities.

Operation of the project will benefit regional transportation. Transportation options and traffic conditions will improve as a result of the SR 520 project and other regional planned transportation improvements within the SR 520 corridor through the year 2030. A considerable increase in carpool and transit demand along SR 520 would occur with all of the 6-Lane Alternative options because the SR 520 program would complete the HOV lane system between Redmond and Seattle. This increase is also due to the assumption that transit and carpools wouldn't be required to pay a toll on SR 520.

With or without the project, there will be additional demand for transit options, including buses and light rail. It is anticipated that the overall transit demand would increase 51 percent under the No Build Alternative and 14 percent under the 6-lane Alternative by 2030 (see Chapter 2, Transportation Discipline Report [WSDOT 2009h]). Thus, there would be a need for additional buses along the SR 520 corridor and the other major routes across or around Lake Washington (that is, SR 522 and I-90) during both peak and off-peak periods. For the period between 2006 and 2016, the King County *Transit Now* program will increase the frequency of bus service for existing routes, as well as add service on new routes (there has already been an increase of 52,000 bus hours under this program). After 2016, it is assumed that there would

be an increase of one percent per year in bus service between the years 2016 and 2030.

Light rail demand on I-90 (East Link) would also increase, as would related transit connections (such as Sounder, North Link, ST Express, and Metro). Demand for light rail will enable expansion of the Sound Transit light rail to Lynnwood.

Similarly, tolling and the focus on increased transit opportunities would reduce demand for use of the SR 520 corridor by single-occupancy vehicles. There would be increased opportunities for non-motorized travel, which would also reduce some vehicle traffic.

## How could the cumulative effect on transportation be mitigated?

Cumulative construction-related effects can be mitigated by developing a comprehensive plan to control traffic during construction and a public outreach/communication plan to inform people of such things as lane closures, detours, and delays. This should include coordination of the traffic control plan with WSDOT, the City of Seattle, Sound Transit, University of Washington, and emergency service providers, as well as allowing consideration for special events. Some elements of the plan would include:

- Measures to minimize disruption of access to businesses and properties
- Details on required street and lane closures including timing
- Measures to minimize impact on transit operations
- Traffic enforcement measures, including use of police officers
- Measures to minimize the impact of traffic and parking from construction workers.

See Chapter 12, Transportation Discipline Report for additional mitigation for construction (WSDOT 2009h).

Generally, transportation improvements provide a beneficial effect by increasing roadway capacity and the efficiency of intersection operations, reducing congestion, enhancing safety, and improving access. The I-5 to Medina project would provide these benefits, as well as improving transit and non-motorized facilities and reducing transit travel times.

There are a number of planned or reasonably foreseeable transportation improvements that would provide mitigation for potential increases in traffic on SR 522 and I-90, resulting from the proposed tolling of SR 520. For I-90, these include the Sound Transit East Link light rail project and the WSDOT/Sound Transit I-90 Two-Way Transit and HOV Operations project. The WSDOT I-5 to I-405 Multi-modal project is planned for SR 522. In addition, Sound Transit 2 and the *Transit Now* programs will continue to expand and increase the regional express and local bus service.

Since there would be no adverse cumulative effects, no mitigation measures are necessary.

# Land Use

## What direct and indirect effects would the project likely have on land use?

Direct effects on land use by transportation projects often involve the acquisition of land for right-of-way, thereby converting the land from its existing use to transportation land use. As discussed more fully in the Land Use, Economics and Relocations Discipline Report (WSDOT 2009i), the 6-Lane Alternative would permanently convert between 11.1 and 15.7 acres of existing land uses to transportation use as WSDOT right-of-way, depending on the option.

Land use along the corridor is a mix of residential and park use, interspersed with civic, quasi-public, and commercial uses. Buildings, businesses, and other uses that are on affected properties would be removed or relocated. All 6-Lane Alternative options would permanently remove a residence south of the Portage Bay Bridge and the MOHAI building. In addition to this, Option A would remove two additional single-family homes and most of the buildings on NOAA's south campus for the Northwest Fisheries Science Center. During construction, several relocations of docks or moorage slips would also be required; however, these could potentially be restored after construction is complete. Option K would require relocation of the Waterfront Activities Center during construction.

Transportation projects can have indirect effects on land use if the projects bring about later changes in the rate and pattern of development. In Washington, the Growth Management Act (36.70A RCW) directs local jurisdictions to plan and regulate development

patterns and population growth. The Growth Management Act requires that state and local governments work cooperatively to identify and protect critical areas and natural resource lands, designate urban growth areas, prepare comprehensive plans, and implement them through capital investments and development regulations. Overall, the amount of land use converted from civic/quasi-public, park, and commercial and single-family residential use represents a small percentage of these types of land uses within the City of Seattle. No substantial change to the overall urbanized land use pattern in Seattle would occur, and no indirect effects on land use patterns would occur.

## How was the cumulative effects assessment on land use conducted?

To conduct the cumulative effects assessment on land use, the analyst relied primarily on two regional planning documents: *Vision 2040* and the *Transportation 2040 Draft EIS* (PSRC 2008, 2009a). *Vision 2040* is PSRC's long-range growth management, economic, and transportation strategy for the central Puget Sound region, which includes King, Kitsap, Pierce, and Snohomish counties. These documents identify trends that have affected land use in the region and provide projections of how land use is likely to change in the reasonably foreseeable future: from the present through year 2040. Reasonably foreseeable future actions, including this project, are included in the projections. More information on the present and reasonably foreseeable future actions is shown in Exhibits 17a through 17d and 18a and 18b.

*Vision 2040* contains numerous land use-related policies that emphasize concentrating growth in urban centers and connecting those centers with an efficient, transit-oriented, multimodal transportation system. The *Transportation 2040 Draft EIS* uses integrated transportation and land use modeling to examine six alternative future transportation scenarios, including a baseline alternative. Each action alternative describes a different way by which the comprehensive planning in Vision 2040 could be implemented through transportation improvements. Each alternative would improve efficiency and expand the ability of the regional transportation system to handle future demand, while at the same time supporting the goals of the region for managing urban growth and protecting the environment (PSRC 2009a).

## What trends have led to the present land use condition in the study area?

As described in Chapter 3 of this discipline report, the central Puget Sound region was first settled by non-indigenous people in the mid-nineteenth century. The region experienced accelerating population growth and industrial, commercial, and residential development in the late nineteenth and early twentieth centuries, after World War II, and through the second half of the twentieth century to the present.

According to the *Transportation 2040 Draft EIS*, the total number of housing units in the central Puget Sound region increased from approximately 683,000 in 1970 to about 1,484,000 units in 2006. During those same years, the proportion of single-family units decreased from 75 percent to 68 percent, and multi-family units increased from 25 percent to 32 percent (PSRC 2009a). Large corporations such as Boeing, Microsoft, Amazon, Starbucks, and others have established headquarters in the study area, leading to the continuing expansion of residential and commercial development, including service industries. Much of this growth has occurred on the Eastside where, since the 1970s, Bellevue and Redmond have become urban centers. Eastside urbanization has greatly increased daily vehicle trips on the SR 520 and I-90 corridors crossing Lake Washington.

## How is land use likely to change in the reasonably foreseeable future without the project?

As described above, in the *Transportation 2040 Draft EIS* PSRC analyzed and compared land use changes that could result from six transportation alternatives—a baseline alternative and five "action alternatives."

The baseline alternative forecasts population growth, land use, and transportation trends into the future to 2040 on the basis of stated assumptions, including construction of state highway projects funded under the state's Nickel gas tax and Transportation Partnership Account programs, and Sound Transit's Phase 2 plan. The baseline alternative assumes that existing ferry service and demand management programs would continue and that some improvements to King County Metro and Community Transit service would occur. The baseline alternative further assumes that the region would find sufficient additional revenue to fully maintain and preserve the existing transportation system, including the Alaskan Way Viaduct or a

replacement facility at its current capacity, and the Evergreen Point Floating Bridge and its approaches in their current configuration (PSRC 2009a).

All of the "action alternatives" considered by PSRC include the 6-Lane Alternative for SR 520 and the transit improvement projects in the region. The analysis concludes that at the regional level, the baseline alternative would not lead to future land use, population growth, or development patterns by 2040 that would be substantively different from those under the five action alternatives.

PSRC predicts that by 2040, there will be an additional 1.5 million people, an additional 1.2 million jobs, and approximately 800,000 additional housing units in the central Puget Sound region. Regional growth will be incremental, adding gradually to the present condition of over 3.5 million people and 1.5 million housing units. The *Transportation 2040 Draft EIS* concludes that much of the forecasted growth will occur as infill development within areas that are already urbanized, making their development denser than it is today (PSRC 2009a).

On the basis of the *Transportation 2040 Draft EIS* analysis, it appears that land use changes likely to occur if the SR 520 project were not built would depend largely on the cumulative effect of the other present and reasonably foreseeable actions considered in the analysis, provided the SR 520 link across Lake Washington was maintained at its present capacity.

## What is the cumulative effect on land use likely to be?

Land use planning is conducted at the regional level (*Vision 2040),* and the decisions are implemented in local comprehensive plans that must be consistent with *Vision 2040* and Washington's Growth Management Act.

The SR 520 project's contribution to the cumulative effect on land use would not be adverse or substantial in combination with other past, present, and reasonably foreseeable future actions. As described above, this finding was supported by the land use analysis in the *Transportation 2040 Draft EIS*, which incorporated reasonably foreseeable changes in central Puget Sound's future land use, population, employment, and travel patterns, including the SR 520 project.

The SR 520 project, in conjunction with other reasonably foreseeable future actions, would convert existing land uses to transportation right-of-way. Although these conversions would reduce the area of land available to a small extent, they would cumulatively convert only a small portion of the total land in the central Puget Sound region over the next 30 years. The SR 520 project's contribution of between 11.1 and 15.7 converted acres would not be substantial in a regional context.

### How could the cumulative effect on land use be mitigated?

The *Transportation 2040 Draft EIS* suggests general strategies for urban land use that would mitigate adverse effects of transportation projects on land use at the regional, or cumulative, level (PSRC 2009a). Regional and local planning organizations are the focal points for gathering public input and suggesting priorities for the future land uses.

## Economic Activity

### What direct and indirect effects would the project likely have on economic activity?

As discussed more fully in the Land Use, Economics, and Relocation Discipline Report (WSDOT 2009i), the 6-Lane Alternative would create jobs during construction and increase revenues to firms that supply materials necessary to build the project. This effect is expected to last the length of the construction period (6 to 7 years) and would be focused on King, Kitsap, Pierce, and Snohomish counties.

Operation of the completed 6-Lane Alternative would not affect the regional economy, except through beneficial effects of improved transportation efficiency along the SR 520 corridor. Because the proposed project would replace part of an existing transportation corridor through an urban area that has already been developed, it would not change land use or development patterns. For more information on the long-term effects of the project on transportation efficiency, see the Transportation Discipline Report (WSDOT 2009h).

### What would the cumulative effect on economic activity likely be?

The analyst concluded that construction-related effects of the 6-Lane Alternative on economic activity would be positive but temporary, and

that long-term operation of the proposed project would not directly or indirectly affect the economy. For these reasons, the analyst concluded that the proposed project would not contribute to lasting trends from other past, present, or reasonably foreseeable actions that would have a cumulative effect on economic activity.

# Social Elements

## What direct and indirect effects would the project likely to have on social elements, including public services and utilities?

This section briefly discusses the 6-Lane Alternative's potential to have direct, indirect, or cumulative effects on social elements such as community cohesion, emergency response services, and utilities. Other effects are discussed more fully in the Land Use, Environmental Justice, Recreation, and Cultural Resources sections of this report and in the discipline reports on those topics (WSDOT 2009i, WSDOT 2009j, WSDOT 2009k, WSDOT 2009g).

Construction effects on adjacent communities would include increases in noise, dust, traffic congestion and lane closures; partial closures of sidewalks and bicycle routes/pedestrian trails; and visual clutter in residential, business, and park areas adjacent to construction zones. These effects could temporarily affect community cohesion and limit connections to community resources, patronage at neighborhood businesses, or use of recreational amenities. Detour routes for public service providers (especially police and fire) would be developed in advance and in coordination with the providers to minimize negative effects to response times of emergency response vehicles. In addition, construction activities could result in intermittent short-term utility outages (for example, to reroute utilities).

After construction, the operational project would result in several long-term benefits to community cohesion. All of the 6-Lane Alternative's design options include landscaped lids with pedestrian and bicycle pathways in the vicinity of the I-5 and Montlake interchanges. The lids would reconnect neighborhoods originally bisected by SR 520 and improve views towards the highway. The regional bicycle/pedestrian trail would link Montlake to the Eastside across the Evergreen Point Bridge as well as provide linkages to local trails in the parks adjacent to the corridor. Travel times for transit, carpools, and vanpools across

SR 520 would decrease, and access between urban centers east and west of Lake Washington would improve. Increased shoulder width across the Evergreen Point Bridge could reduce delays for public service providers crossing the bridge.

Construction and operation of the 6-Lane Alternative would not change demographics or existing land use patterns, or increase demand for public services or utility infrastructure within the project area, as the project would not induce growth (see the Land Use, Economics, and Relocations Discipline Report [WSDOT 2009i]). Therefore, no indirect effects on public services and utilities would result from the project.

## What are social related cumulative effects and how are they assessed?

### How was the cumulative effects assessment on social elements conducted?

Because the proposed project would have no long-term adverse direct or indirect effect on social elements, including public services and utilities, the analyst did not conduct a cumulative effects assessment (WSDOT et al. 2008).

## What trends have led to the present social elements condition in the study area?

Neighborhoods adjacent to the SR 520 corridor between I-5 and Lake Washington are primarily residential and are well-established, with many residential properties that were developed in the first part of the 20th century, prior to construction of the SR 520 roadway in the 1960s. Many of the buildings on the University of Washington campus were constructed in the early 1900s to 1950s; the medical school opened in 1946. Construction of SR 520 in the 1960s bisected the neighborhoods along the corridor into areas north and south of the roadway.

## How are social elements likely to change in the reasonably foreseeable future without the project?

Without the project, neighborhoods along the corridor would retain their current characteristics and would not benefit from lids across SR 520 or a regional trail connecting areas east and west of Lake Washington. Public service providers would continue to use the existing roadway and cope with increasing congestion on SR 520.

### What would the cumulative effect on social elements likely be?

The proposed project would benefit community cohesion as previously noted, but would also provide a social benefit through greater access to transit and improved transit service. In particular, transit services are often the main mode of transportation for low-income persons and are an important element in many neighborhoods and communities.

The project would not result in any long-term adverse effect on public service providers. All negative effects would be temporary, involving the typical disruptions experienced during roadway construction activities. Therefore, the project would not contribute to a cumulative effect on social elements.

## Environmental Justice

This section summarizes potential direct effects from the SR 520 project and evaluates the potential for indirect and cumulative effects to low-income and minority populations, including Native Americans. The Environmental Justice Discipline Report (WSDOT 2009j) includes a discussion of the methodology used for the analysis.

### What direct and indirect effects would the project likely have on low income, minority or limited-English proficient (LEP) populations?

#### Native American Populations

The environmental justice analysis concluded that long-term operation of the SR 520 project would result in disproportionately high and adverse effects on low-income populations, and that all such effects would be related to tolling. Project operation would have no disproportionately high and adverse effects on minority populations. Potential project effects relating to environmental justice are summarized below and discussed more fully in the Environmental Justice Discipline Report (WSDOT 2009j).

Foster Island retains significance as an important place to the people of Duwamish descent. Although there are no known cultural resources there, its past use means that the potential exists for archaeological deposits to be uncovered during new excavations. If project construction were to encounter important cultural resources of

significance to Native American tribes on Foster Island, Native American tribes may experience disproportionately high and adverse effects. WSDOT would consult with the Washington State Department of Archaeology and Historic Preservation and the tribes to create and implement a mitigation plan.

Another potential area of effect to Native American tribes relates to tribal fishing and access to areas where fishing occurs. Construction of the 6-Lane Alternative would take place within the open waters of Lake Washington and Portage Bay and the shoreline areas of Union Bay, which are within the usual and accustomed fishing area of the Muckleshoot Indian Tribe. During demolition of the Evergreen Point Bridge and installation of the transition spans, periodic closures of several days would be required at the east and west navigation channels; these closures would limit or prevent access to usual and accustomed tribal fishing areas. Construction from barges would also have the potential to conflict with tribal fishing in Portage Bay, Union Bay, and Lake Washington. Therefore, Native American tribes are expected to experience disproportionately high and adverse effects as a result of construction effects on fishing. WSDOT is coordinating with the Muckleshoot Tribe to identify important access points to usual and accustomed fishing areas in areas where proposed structures would be built. There would be additional coordination to avoid construction conflicts with tribal fishers harvesting salmon in Portage Bay, Union Bay, and Lake Washington.

In addition, several construction effects could create negative conditions for fish populations in usual and accustomed tribal fishing areas. These include in-water construction activities such as pile-driving; unintentional discharge of sediment, debris, or hazardous materials; and increased shading from construction work bridges. Construction activities occurring within, or directly adjacent to, the study area water bodies could increase turbidity and total suspended solids levels, which could result in indirect effects to fish related to changes in their migration, rearing, or feeding behavior (see the Ecosystems section of this report). The 6-Lane Alternative's stormwater treatment may have a slight benefit to fish habitat.

During construction, contractors would be required to use best management practices (BMPs) to minimize the potential adverse effects of pile drivers, falling debris, unintentional discharge of sediment, and other construction effects that could harm fish habitat. WSDOT would also coordinate closely with the Muckleshoot to minimize construction

activities that would have adverse effects on fish habitat or access to usual and accustomed tribal fishing areas during fishing season.

The new bridge structures would have a wider footprint than the existing Evergreen Point Bridge, reducing access to usual and accustomed tribal fishing areas for the Muckleshoot Tribe. WSDOT will continue to coordinate closely with the Muckleshoot Tribe to understand the extent to which the wider bridges would affect access to their usual and accustomed fishing areas. WSDOT will also work with the Muckleshoot Tribe to develop a plan for mitigating adverse effects to access.

### Low-Income Populations

The environmental justice analysis concluded that low-income populations would experience disproportionately high and adverse effects as a result of tolling. Tolls on SR 520 would be appreciably more severe for low-income users because they would have to spend a greater proportion of their income on tolls than the general population. Mitigation measures, which are discussed in detail in the Environmental Justice Discipline Report (WSDOT 2009j) would mitigate some of the burden electronic tolling would place on low-income and LEP drivers. However, even with mitigation measures, some low-income populations—especially car-dependent populations or populations living in areas without adequate transit service—would experience a disproportionately high and adverse effect as a result of tolling.

According to the demographic analysis conducted for this environmental justice analysis, some of the neighborhoods surrounding un-tolled alternate routes SR 522 and I-90 have moderate to high proportions of low-income, minority, and LEP populations. Residents of these neighborhoods have raised concerns about the effect of traffic diverting from the tolled SR 520 Bridge to SR 522 and I-90 and the potential for additional congestion and noise, which could be perceived as an indirect effect from the SR 520 project.

According to the Transportation Discipline Report (WSDOT 2009h), there would only be a modest increase in traffic volumes on non-tolled routes as a result of the project (about 3 percent greater than the No Build Alternative on SR 522 and about 1.5 percent greater than the No Build Alternative on the I-90 Bridge). Recent improvements to SR 522 have added sidewalks and medians, and improved traffic movements

through intersections which will benefit all residents, including low-income populations. Improvements in transit service described below under Mitigation would also reduce potential effects from any increases in traffic volumes on these routes.

## How were cumulative effects to low-income and minority populations assessed?

The cumulative effects analysis follows the *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) which outlines a process to assess how past and present actions, in combination with reasonably foreseeable actions, may contribute to a cumulative effect on a resource. The environmental justice analysis evaluated potential cumulative effects within two primary study areas: an area of census block groups within an approximately half-mile radius of the 6-Lane Alternative construction limits and the Evergreen Point Bridge "travelshed," which is the geographic area where bridge traffic originates.

The SR 520 Travelshed

After defining the study areas, analysts evaluated the current circumstances for low-income, minority, and LEP populations living in the study areas. Analysts identified potential direct effects of the SR 520 project that may contribute to a cumulative effect on low-income, minority, and LEP populations. Analysts also reviewed PSRC's regional planning documents including *Vision 2040* (2008) and the *Transportation 2040 Draft EIS* (2009) and reasonable and foreseeable actions in the study areas (refer to Exhibits 17a through 17d and 18a and 18b) that may also contribute to a cumulative effect on low-income, minority, or LEP populations over the long term.

## What trends have led to the present circumstances for low income and minority populations in the study area?

### Native American Populations

Long before the first European explorers sailed into the Puget Sound area, native peoples inhabited the lands and waters of the Lake Washington basin. The Duwamish people were the Native Americans most closely associated with the SR 520 project area. Euro-American

settlers first arrived in Seattle in the mid-1850s. Since then, the region has experienced accelerating population growth and industrial, commercial, and residential development. Over the course of history, Native American tribes have yielded much of land and water where they lived, hunted, and fished to this development.

Past actions have altered the fish and aquatic habitat in usual and accustomed tribal fishing areas and set trends leading to degraded present conditions. Land use activities associated with logging, road construction, urban development, mining, agriculture, shipping, and recreation have significantly altered fish habitat quantity and quality in usual and accustomed tribal fishing areas. See the Ecosystems section of this discipline report for an expanded discussion of trends for habitat and fisheries potentially affected by the SR 520 project.

### Low-Income Populations

The Land Use section of this report summarizes the past actions that have resulted in today's residential pattern. According to outreach conducted for the *Transportation 2040 Draft EIS*, many low-income populations live outside of urban areas. This is because affordable housing in urban areas is increasingly scarce. Low-income populations living outside urban areas have less access to jobs, transit, and the goods and services that make it possible to manage daily life (such as grocery stores and health care). Current socio/economic conditions highlight the importance of affordable mobility throughout the region.

## How are the circumstances for low income, minority, and LEP populations likely to change in the reasonably foreseeable future without the project?

### Native American Populations

Recent and current trends and stressors (such as continued regional population growth, urbanization and global climate change) indicate that the condition of fish and aquatic habitat would most likely continue to degrade into the reasonably foreseeable future. Compensatory mitigation, regulatory and voluntary efforts to improve habitat will continue with or without the project.

Large-scale restoration plans and activities are currently being implemented throughout Puget Sound area (see the Ecosystems section). These activities could slow, or even halt, the existing

downward trends in fish populations. Goals for recovery and restoration efforts in Lake Washington include improvements to fish access/passage; stream restoration projects; improvements in water quantity and quality; and protection/ preservation of existing high-quality habitat.

## Low-Income Populations

The regional growth strategy outlined in *Vision 2040* focuses the majority of job, housing, and transit facility growth in urban and employment centers. *Vision 2040* also encourages the construction and preservation of housing for low-income households. If these plans become a regional trend, circumstances may improve for the region's low-income populations, as they will have much better access to jobs and services. In 2008, voters approved a new sales tax that will pay for 100,000 hours of additional Sound Transit Express Bus service starting in 2009, including some additional service hours on SR 520. In addition, as part of King County Metro's *Transit Now*, voters approved a sales tax that will create a bus rapid transit line on the Eastside. This will connect the SR 520 corridor with high-frequency transit service between Bellevue and Redmond. This service is projected to begin in 2011.

The Sound Transit 2 program includes a number of improvements including the East Link project, which would expand light rail across I-90; the North Link project providing access to the University District and University of Washington campus; and extension of North Link to Lynnwood (see Attachment 2 for a complete list of Sound Transit projects). These improvements would benefit transit riders, including low-income riders, who cross Lake Washington.

The Washington state legislature, WSDOT, PSRC, and other governmental entities are exploring opportunities to introduce tolling as a sustainable source of transportation funding or a congestion management tool. At the time of publication of this document, PSRC is evaluating several alternatives for implementing tolling in the Puget Sound region (*Transportation 2040 Draft EIS* [PSRC 2009a]). It is likely that even without the SR 520 project, tolling will be implemented on the transportation network in the future.

## What would the cumulative effect on low income and minority populations likely be?

### Native American Populations

The 6-Lane Alternative is expected to contribute slight benefit to water quality and fish habitat; however, the effects on long-term fisheries trends or stressors would not be measurable.

The amount of affected fish habitat within the study area represents an extremely small fraction of the habitat available within the area watersheds overall, and only a small portion of that fraction is regularly used by anadromous species (primarily the nearshore and shallow water habitat areas) during their life cycles. In summary, the SR 520 project's contribution to the overall condition of fish and aquatic resources within the study area would not measurably influence the overall cumulative effect on these resources. See the Ecosystems section of this report for an expanded discussion of potential cumulative effects on fish and fish habitat.

### Low-Income Populations

As discussed above, the Washington legislature is exploring opportunities to introduce tolling as a sustainable source of transportation funding; the SR 520 project is a part of this funding strategy for infrastructure planning.

While tolling SR 520 could provide benefits to all drivers and transit riders in the form of a faster, more reliable trip and a sustainable source of funding for transportation improvements, it could also increase transportation costs for low-income households and social service agencies that serve low-income populations. The contribution of the SR 520 project, in conjunction with planned transit and light rail projects and the SR 520 Variable Tolling project, would help promote affordable mobility for low-income populations in some ways by increasing the efficiency of the transportation system and providing HOV lanes along the corridor to accommodate increases in transit service.

## How could the cumulative effect on low-income populations be mitigated?

### Low-Income Populations

Cumulative effects on low-income populations from tolling could be minimized by regional planning efforts to improve transit service and

implement light-rail across the region. In addition, mitigation measures that are being considered for the SR 520 Variable Tolling Project could help reduce the burden that electronic tolling would place on low-income drivers through offering transit-accessible service centers, establishing transponder retail outlets in convenient locations, and allowing several different types of payment methods (see the Environmental Justice Discipline Report [WSDOT 2009h]).

To mitigate cumulative effects on the neighborhoods surrounding non-tolled alternative routes SR 522 and the I-90 Bridge—including the low-income, minority, and LEP populations living within those neighborhoods—local, regional, and state jurisdictions could coordinate to identify mobility improvements that could be made along both corridors.

Ultimately, providing affordable housing in urban centers so that people could live closer to work would mitigate the adverse effects of expenses, potentially including tolling, that are associated with the daily commute.

# Recreation

## What direct and indirect effects would the project likely have on recreation?

The SR 520 project would affect access and use of parks and trails along the corridor during construction and would require acquisition of parkland under all options of the 6-Lane Alternative. Bagley Viewpoint and McCurdy Park would be acquired prior to construction and would be closed to park visitors. Parks and trails proximate to construction activities, including Roanoke Park, the Montlake Playfield, East Montlake Park, the Washington Park Arboretum (Arboretum), the University of Washington Open Space, and Fairweather Park in Medina would experience increases in noise, dust, and traffic during the construction period. Trails under SR 520 (for example, Bill Dawson Trail) and adjacent to construction (for example, Ship Canal Waterside Trail, Arboretum Waterfront Trail, and Points Loop Trail) would be closed during construction for varying time periods. Detour routes for bicycle routes would be established. Recreational boating and canoe use in the vicinity of the SR 520 roadway and Evergreen Point Bridge would also be limited during construction.

Between 5.0 and 7.6 acres of parkland would be permanently converted from recreation use to WSDOT right-of-way, depending on the 6-Lane Alternative option. The general alignment of the corridor would be the same; however, depending on the option, changes to the design of the Montlake interchange would result in some negative effects to park users. Options K and L would result in the greatest effects by moving the existing interchange east into McCurdy and East Montlake parks, which are primarily used for passive recreation activities such as walking, kayaking, canoeing, and bird watching. Option L would introduce a visual intrusion from a new bascule bridge across the Montlake Cut (a bascule bridge is a moveable bridge with a counter weight that continuously balances the span as each side is raised, somewhat similar to a drawbridge). All options include new stormwater facilities in McCurdy Park.

Indirect effects to recreational resources can occur when there are changes in access, surrounding land use, noise levels, or visual intrusion that affect the value and integrity of the resource for park users. The effects described above to McCurdy and East Montlake parks would affect the "integrity" of these parks; however, connections in these parks to the Arboretum Waterfront Trail and Ship Canal Waterside Trail would be restored after construction, reducing the overall effect.

All options would displace MOHAI, a resource that serves the region's population and tourists that visit Seattle. However, the museum has plans to relocate its facilities from its current location in McCurdy Park and East Montlake Park. Because MOHAI is somewhat isolated and access is limited (primarily via 24th Avenue East), relocation to an area with more accessibility and visibility could directly and indirectly benefit this resource over time. The Arboretum Master Plan (City of Seattle, University of Washington, and The Arboretum Foundation, 2001) envisioned that MOHAI would vacate its current building in the near future, and that the structure would be used by the Seattle Parks Department and Arboretum and University of Washington staff for purposes related to the Arboretum.

The Waterfront Activity Center is located at the east end of the Montlake Cut on the north shore across from the Arboretum. Many visitors and residents rent canoes here to explore the shoreline areas in the Arboretum north and south of the roadway. Options A and L have a higher profile than Option K, meaning that, comparatively, the structure height above the water is greater and there are fewer columns

that would be needed to support the roadway through the Arboretum. These higher profiles would help to minimize negative indirect effects on canoeing in the Arboretum. The very low profile of Option K would require the most number of columns, and the structure height above water through the Arboretum in places would be approximately 5 feet. For many visitors, this could create a permanent perceived barrier and reduce the appeal to explore areas south of the roadway in the Arboretum.

Option K includes a lid across Foster Island, which would require substantial fill on either side of the lid to connect the lid to ground level. This would change the setting of Foster Island to more of a manicured urban park, which could affect the "integrity" of Foster Island for park users that prefer a more natural experience.

Many of the direct and indirect effects to park and recreational resources would be positive by encouraging greater use of recreational resources, improving connectivity and linkages between parks, and improving noise levels and visual quality in certain locations.

Replacement properties developed as part of the mitigation of direct effects on parklands would provide recreational land available to park users. The regional bicycle/pedestrian trail and lids would encourage pedestrian and bicycle use over the long-term. In the Arboretum, removal of the Lake Washington Boulevard ramps and R.H. Thomson ramps ("ramps to nowhere") would remove visual clutter and improve views to and from the park over the long-term. Inclusion of sound walls (as approved by affected neighborhoods) would also achieve long-term benefits for park users.

Park areas are protected under both federal and local regulations; mitigation in the form of replacement property, enhancement of existing park and recreational facilities, and/or replacement of lost functionality would be implemented. Additional detail on effects to recreational resources is contained in the Recreation Discipline Report (WSDOT 2009k) and the Supplemental Draft Section 4(f) Evaluation (WSDOT 2009l).

## How was the cumulative effects assessment for recreation conducted?

The cumulative effects analysis follows the *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) which outlines a process to assess how past and present actions, in combination with

reasonably foreseeable future actions, could contribute to a cumulative effect on a resource. The study area for indirect and cumulative effects on recreation was the central Puget Sound region as defined and discussed in the Transportation 2040 Draft EIS (PSRC 2009a).

Reasonably foreseeable actions considered in the cumulative effects analysis include the Pontoon Construction Project, the Eastside Transit and HOV project, and Sound Transit's East Link and North Link light rail projects. In addition, park and recreation plans, including the *Seattle Parks and Recreation 2006-2011 Development Plan* (2006), the *University of Washington Master Plan – Seattle Campus* (2003), the *Washington Park Arboretum Master Plan* (2001), and the *City of Medina's Comprehensive Plan* (1994, amended in 1999 and 2005) were reviewed to identify other present and reasonably foreseeable actions related to parks and recreation.

## What trends have led to the present recreation condition in the study area?

Seattle's park and recreation resources are interspersed across Seattle and are a key element in defining the development pattern of residential, business, civic, and recreational land uses across the city. Recreational resources are diverse and include open space, parks, boulevards and trails, beaches, lakes and creeks, as well as recreational, cultural, environmental, and educational facilities (City of Seattle 2006).

The vision and guiding principles for the City of Seattle park system that are still in use today date back to 1903 when the Olmsted Brothers were hired by the City to prepare a comprehensive plan for Seattle's park system. The dominant feature of the plan was a 20-mile landscaped boulevard linking most of the existing and planned parks and greenbelts within the city limits. The plan included numerous playgrounds and playfields in support of a new concept in this time period of "public recreation."

Over the next 30 years, planning and development of Seattle's park system continued. In 1936, John Olmsted made his last visit to the city to plan the Washington Park Arboretum. These early planning efforts serve as the framework for today's park system and distribution of recreational facilities throughout the city.

Park and recreational resources are valued highly by Seattle residents. In addition to park areas on land, hundreds of boats participate in the

Seattle Yacht Club's annual Opening Day activities in May, a tradition since the 1920s.

Seattle's growth, a long-term trend that accelerated during the second half of the twentieth century, has placed increasing pressure on the city's parklands. For example, traffic increased substantially on Lake Washington Boulevard, part of the 20-mile greenway originally envisioned by the Olmsted Brothers, following the construction of SR 520 in the 1960s, affecting the recreational setting of the Washington Park Arboretum.

In 2000, voters approved a $198.2 million Pro Parks Levy for property acquisition; development of new park, community, and recreational facilities; and for programming, operations and maintenance of parks in neighborhoods across Seattle (City of Seattle 2004).

## How is recreation likely to change in the reasonably foreseeable future without the project?

Without the project, conversion of 5.0 to 7.6 acres of parkland (adjacent to the roadway) to transportation right-of-way would not occur. However, the benefits to park users from improved connectivity, trail linkages, lower noise levels, and elimination of the ramps in the Arboretum as described above would also not occur.

Overall, Seattle has 6,100 acres of parkland and plans for continued property acquisition and park development, as supported by Pro Parks Levy (City of Seattle 2004) and outlined in its Development Plan (City of Seattle 2006). The SR 520 project would not affect new parks, park improvements, or recreational facilities included in this plan. As part of the 2006 Plan, a "gap analysis" was conducted to identify neighborhood areas in Seattle that were deficient in open space. No neighborhoods along the SR 520 corridor were identified, largely due to the presence of the Arboretum, University of Washington, and existing neighborhood parks within the adjacent well-established neighborhoods.

## What would the cumulative effect on recreation likely be?

The direct effect of converting 5.0 to 7.6 acres of parkland adjacent to the SR 520 corridor to transportation right-of-way, considered in the context of other past, present, and reasonably foreseeable future actions, would contribute a small physical change to the long-term

cumulative effect of development on Seattle's recreational lands. Unlike the experience of past years, however, today's transportation improvement projects include mitigation in the form of replacement parkland. No permanent loss in total park area would result from the proposed 6-Lane Alternative in combination with the Medina to SR 202 project, Sound Transit's North Link and East Link light rail projects, and other planned transportation improvement and land development or redevelopment projects. In all cases, adverse effects on recreational lands would be mitigated as consistent with applicable requirements.

The conversion of parks to other uses is rare, and when conversion is necessary, there is typically a replacement of the land and function. As a consequence, state and local jurisdictions are actively increasing the amount of parks and open space within the central Puget Sound region. Cumulatively, there is likely to be a net gain over time in the total area of park land in the study area.

## How could the cumulative effect on recreation be mitigated?

Parklands along the corridor are protected under Section 4(f) of the U.S. Department of Transportation Act and/or Section 6(f) of the Land and Water Conservation Fund Act (LWCFA). In part, Section 4(f) requires "all possible planning" to minimize harm to affected properties. Section 6(f) stipulates that replacement property be provided, with agreement by agencies with jurisdiction. See the Supplemental Draft Section 4(f) Evaluation (WSDOT 2009l) for a detailed description and evaluation of specific properties that these regulations cover. Parklands in Seattle are further protected under Ordinance 118477, which specifies that all lands and facilities held now or in the future by the City of Seattle for parks and recreational purposes must be preserved or mitigated by providing replacement "land or a facility of equivalent or better size, value, location and usefulness in the vicinity, serving the same community and the same park purposes."

In compliance with the regulatory requirements discussed above, WSDOT and FHWA are working with the City of Seattle, the University of Washington, the State's Recreation and Conservation Office, and the National Park Service to identify appropriate mitigation measures to ensure that no long-term adverse effect on parkland and recreational resources would result from construction of the proposed project.

# Visual Quality and Aesthetics

## What direct and indirect effects would the project likely have on visual quality and aesthetics?

As discussed more fully in the Visual Quality and Aesthetics Discipline Report (WSDOT 2009m), the 6-Lane Alternative would produce direct effects on visual quality during construction and operation. During construction, there would be many visible activities that would temporarily change the local visual environment.

During construction, visible changes would temporarily result from the demolition of existing bridges and roadways, excavation and tree removal along the SR 520 corridor, and temporary structures and traffic detour bridges. Construction of the new Evergreen Point and Portage Bay bridges, roadways, and retaining walls would continue these short-term effects, which would vary among the design options. Before and during replacement of the Evergreen Point Bridge, pontoons towed from Grays Harbor and from moorage locations in Puget Sound would be visible at many points along the Puget Sound coast, the Ship Canal, Lake Union, and Lake Washington.

Under any design option, the new interchange at Montlake Boulevard would permanently change the local visual environment with wider roadways, a new Portage Bay Bridge with a different appearance from the one there now, noise walls, and large stormwater treatment ponds with landscaped surroundings. Landscaped lids at Roanoke Street, 10th Avenue East, and Montlake Boulevard would have positive visual effects because they would hide the roadway and provide landscaped connections between the communities.

Options K and L would change the visual character of the southeast part of the University of Washington campus with a depressed Pacific Street/Montlake Boulevard intersection and partial lid. Under Options A and L, the addition of a new bascule bridge over the Montlake Cut would change the visual setting of the existing Montlake Bridge. With regard to Foster Island, Option K would have the greatest effect on visual quality and aesthetics from the removal of nearby forest and the addition of fill soil to create the land bridge. The bridges proposed under Options A and L would be similar to the existing bridge passing over Foster Island.

The proposed project would not produce indirect effects on visual quality and aesthetics because all changes to structures, landforms, and vegetation would be confined to the project area along the SR 520 corridor.

## What are visual quality-related cumulative effects and how are they assessed?

Cumulative effects on visual quality and aesthetics result from permanent changes to landforms, vegetation, and structural features introduced from past and present transportation and land development projects. Over time, the visible changes introduced by individual projects add together to change the visual environment. New projects planned for the reasonably foreseeable future, defined here as between now and 2040, would continue the trend of gradual change to the visual environment. To assess this cumulative effect, the analyst identifies the study area that the proposed project would visibly change. This study area consists of viewsheds within which the project features can be seen. The analyst then briefly describes lasting trends that have changed the visual quality of the study area from its pre-development character to its present condition. Next, the analyst reviews regional comprehensive plans, in this case *Vision 2040* and the *Transportation 2040 Draft EIS* (PSRC 2008, PSRC 2009a), to determine how planners expect the study area to change as new projects are built. Finally, the analyst considers permanent changes to landforms and structures that the proposed project would make and in what ways these would add to the long-term cumulative effect on visual quality and aesthetics.

### How was the cumulative effects assessment for visual quality and aesthetics conducted?

The cumulative effects assessment for visual quality and aesthetics was based on two procedures. First, the analyst relied on the results of the visual quality assessment for direct effects, which followed FHWA guidance. The Visual Quality and Aesthetics Discipline Report (WSDOT 2009m) provides details of the assessment. The FHWA-based visual quality assessment evaluated the present visual character, quality, and context of the study area and how the proposed project would directly affect these features.

In addition, the analyst followed *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008). This procedure, described in detail in the guidance document, allowed the analyst to identify visual quality

trends from past and present development projects, especially how fast, and in what ways, the visual environment of the study area has been changing in recent years. To determine how the visual quality of the study area is likely to change in the future, the analyst relied on *Vision 2040* and the *Transportation 2040 Draft EIS* (PSRC 2008, PSRC 2009a) for regional forecasts, and also considered the likely visual quality effects of present and reasonably foreseeable future actions as shown in Exhibit 6. The analyst made these assumptions:

- The time frame for this cumulative effects assessment is from the time when Euro-Americans began to settle in the Puget Sound Region to the regional planning horizon of roughly 2040. This time frame is consistent with the PSRC's *Transportation 2040 Draft EIS* (2009a). In addition, jurisdictions and communities typically develop strategic plans for 10-, 20-, and 30-year windows. Strategic plans provide value-based goals that indicate the intended direction of growth and development and the role that aesthetic values and civic character should play in development.
- The study area for the visual quality cumulative effects assessment consists of the viewsheds within which changes to the SR 520 corridor would be visible from ground level or from buildings, as described in the Visual Quality and Aesthetics Discipline Report (WSDOT 2009m). This study area is considered within the broader visual quality context of the central Puget Sound region, which includes portions of Pierce, King, Kitsap, and Snohomish counties (PSRC 2006b).

### What trends have led to the present visual quality and aesthetics of the study area?

Transformation of the landscape character began with the arrival of the Euro-Americans in the 1850s. They logged, mined, moved hills and rivers, deposited fill, and developed the Seattle and Lake Washington areas on a scale faster and larger than previous actions by the indigenous peoples. Over the century-and-a-half of growth, harvesting the forests and building transportation routes to reach undeveloped resources steadily developed the central Puget Sound region. Development followed the roads, railroads, and shipping routes.

Because of the region's steady population growth, traffic volumes have increased, and the regional transportation infrastructure has expanded to accommodate the increasing traffic. During the 1960s, construction of

the SR 520, I-5, and I-90 bridges and state and interstate highways opened more distant, sparsely developed areas to development. Today, the SR 520 corridor crosses Lake Washington to connect downtown Seattle with major Eastside urban centers such as Bellevue and Redmond, as well as smaller suburban communities.

### How would visual quality and aesthetics likely change in the reasonably foreseeable future without the project?

With or without the proposed project, the visual character of the central Puget Sound region would remain a complex mixture of forested and open-water areas with urban and suburban centers much like today. Because accelerating population growth and development are expected to continue into the reasonably foreseeable future, however, it is likely that the proportion of developed areas relative to forest cover would gradually increase, and that the urban visual character of the region would also increase (PSRC 2009a).

### What would the cumulative effect on visual quality and aesthetics likely be?

The long-term presence of the proposed new Evergreen Point Bridge would not make much difference to the cumulative effect of past, present, and reasonably foreseeable future actions on visual quality and aesthetics, because it would replace a similar bridge that exists in approximately the same location today. On the other hand, the wider roadway, retaining walls, sound walls, and other structural features introduced by the 6-Lane Alternative would create a more urban visual character. The more urban visual character would add to the cumulative effect of other present and planned development projects contributing to the increasingly urban visual quality of the study area. In particular, a new interchange at Montlake Boulevard under Option A, K, or L would change the appearance of that immediate area enough to contribute visibly to the cumulative effect.

As discussed in the Visual Quality and Aesthetics Discipline Report (WSDOT 2009m), the proposed project's direct effects on visual quality would be a mixture of beneficial and detrimental changes. For example, an increase in paved surfaces and concrete structures could be considered detrimental, whereas the introduction of vegetated roadway lids would add visual continuity and soften the harder effect of the solid surfaces. On balance, the cumulative effect on visual quality and aesthetics within the SR 520 study area and surrounding central Puget

Sound region would be an increasingly urban visual character, to which the proposed project would make a small contribution with both beneficial and detrimental visual elements.

### How could the cumulative effect on visual quality and aesthetics be mitigated?

In general, an adverse cumulative effect on visual quality and aesthetics can be minimized by community planning efforts that establish context-sensitive architectural and design standards, preserve visually significant stands of vegetation, and preserve important views and community-gathering places. In the central Puget Sound region, comprehensive planning by the Puget Sound Regional Council, which is composed of jurisdictions at many different levels, takes visual quality into account as a shared community value contributing to the quality of life throughout the region (PSRC 2008, PSRC 2009a). Continuing efforts to enhance visual quality through regional and community planning and in the design of individual development projects will help to mitigate the cumulative visual effect of increasing urbanization.

## Cultural Resources

This section summarizes direct effects to cultural resources from the SR 520 project and evaluates the potential for indirect and cumulative effects to occur. A detailed study of the direct effects of the project is documented in the Cultural Resources Discipline Report (WSDOT 2009g). Effects to Native American tribes are discussed further in the Environmental Justice section of this report and in the Environmental Justice Discipline Report (WSDOT 2009j).

### What direct and indirect effects would the project likely have on cultural resources?

The proximity of the project to a number of historic properties would affect their settings in positive and negative ways. The project would directly affect several historic properties eligible for listing on the National Register of Historic Places (NHRP). The Evergreen Point Bridge is an NRHP-eligible property that the project would remove and replace. Under the National Historic Preservation Act, replacement of the floating bridge would be considered a construction effect and would not be adverse. Bridges that have achieved historic significance are usually on roadways that have evolved over the years into

components of a modern transportation system. When a bridge can no longer perform safely or efficiently, it must be refurbished or replaced to assure public safety and to maintain continuity within the transportation system (FHWA 2009).

Construction-related effects on historic properties in the project vicinity could include increased noise, fugitive dust, vibration, and visual quality effects. Temporary street closures would cause traffic detours that could increase traffic in and around identified historic properties. These effects would be minimized through mitigation measures that protect building facades, comply with local noise regulations, and maintain access.

The 6-Lane Alternative design options would affect a number of historic properties, some of which are also designated as Seattle Landmarks; see the Cultural Resources Discipline Report (WSDOT 2009g) for a list of which properties would be affected. Positive effects would generally result from quieter conditions where noise walls are proposed, and from the green space and better neighborhood connectivity associated with proposed lids. Negative effects would result from the removal of land or buildings or from visual intrusion caused by more prominent roadway and bridge structures. Mitigation could include documentation of historic structures prior to demolition (for example, photographs, measured drawings, and written history), salvage of architectural elements for re-use, and development of an educational presentation.

All 6-Lane Alternative options would require placement of permanent structures on Foster Island. Ethnographic work with affected tribes is ongoing to assess the significance of the site.

The Evergreen Point Bridge occurs within the "usual and accustomed" fishing area of the Muckleshoot Tribe. WSDOT is coordinating with Muckleshoot staff because the project could affect fish habitat and access to treaty fishing areas (see the Environmental Justice section).

The effects described above are direct effects; the analyst did not identify any indirect effects to cultural resources from the SR 520 project.

# What are cultural resource related cumulative effects and how are they assessed?

## How was the cumulative effects assessment on cultural resources conducted?

The cumulative effects assessment was conducted using the *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) as the basis for assessing the cumulative effect of the project, in combination with other past, present, and reasonably foreseeable future actions, on cultural resources (Exhibits 17a through 17d and 18a and 18b).

Cumulative effects on cultural resources occur from the piecemeal removal, disturbance, or permanent alteration of archaeological sites and historic built properties. To assess the cumulative effect on cultural resources, the analyst characterizes the present status of cultural resources, how it is being affected by trends from past and ongoing actions, and how it is likely to continue, increase, or decrease in the reasonably foreseeable future without the influence of the proposed project. Finally, the analyst considers how long-term direct or indirect effects of the project could affect the cumulative trend in coming years—by either increasing or decreasing the rate at which cultural resources would continue to be removed, disturbed, or altered over time.

## What trends have led to the present condition of cultural resources in the study area?

Past and present development has removed or altered the character of many cultural resources in the central Puget Sound region during the past 150 years. This follows the national trend that led to federal and state regulations to protect these resources. By the mid-twentieth century, it had become apparent that piecemeal losses of individual cultural resource sites were accumulating to a significant level. In 1966, Congress passed the National Historic Preservation Act to slow this trend. The Act requires federal actions (for example, development projects that have federal funding or require federal permits) to evaluate the effects of a project on cultural and historic resources such as archaeological sites, traditional use areas, and historic built properties. State legislatures and regional and local jurisdictions have passed additional statutes and ordinances intended to slow the cumulative loss of cultural sites. Although many of these resources have already been lost, the rate of attrition is slowing as a result of

federal, state, and local protections and an increasing public interest in preserving the nation's cultural heritage for future generations.

Cultural resources of the central Puget Sound region have been affected similarly to those responsible for the national trend, as described above.

### How are cultural resources likely to change in the reasonably foreseeable future without the project?

The *Transportation 2040 Draft EIS* (PSRC 2009a) provides an overview of expected cumulative losses of cultural resource sites between now and 2040, noting that increasing urbanization to accommodate population and employment growth in the central Puget Sound region could have both good and bad consequences for cultural resources. Reasonably foreseeable future actions could place additional pressure on cultural resources by removing or altering them, or by compromising their settings. The *Transportation 2040 Draft EIS* concludes that without oversight and protection, high density redevelopment in the region could perpetuate the continuing loss of cultural properties and artifacts. It also notes, however, that development and growth can provide opportunities for the appropriate redevelopment and reuse of historic or culturally significant structures (PSRC 2009a).

### What is the cumulative effect on cultural resources likely to be?

The proposed project would make a minor contribution to the cumulative effect on cultural resources of the central Puget Sound region. Properties that would be removed by the project are in most cases considered contributing elements to the Montlake Historic District. It is not anticipated that there would be sufficient loss of property from this or other reasonably foreseeable future projects to reduce the significance of any historic district enough to affect its status for NRHP eligibility. The project is not likely to add to the cumulative effect on archeological resources or traditional cultural properties.

### How could the cumulative effect on cultural resources be mitigated?

The primary federal law regulating effects on cultural resources is Section 106 of the National Historic Preservation Act. Section 106 protects resources that are listed on, or eligible for listing on, the NRHP. Under Section 106, federally sponsored or funded projects are required to avoid, minimize, or mitigate adverse effects if project activities would directly or indirectly cause harmful effects to recognized historic

properties or sites. In Washington, the Department of Archaeological and Historic Preservation (DAHP), King County, and the City of Seattle also require consideration of effects to properties that have local or statewide significance, are listed or eligible for listing on the Washington Historic Register, or are designated as a King County or Seattle landmark. These agencies work together to guide and coordinate the administration of historic preservation laws and regulations in order to protect cultural resources.

# Noise

## What direct and indirect effects will the project likely have on noise?

As documented in the Noise Discipline Report (WSDOT 2009b), construction of the 6-Lane Alternative would produce noise and vibration, especially from major construction activities such as pile driving, demolishing existing structures, hauling, and concrete pumping. During heavy construction periods, noise levels could reach very high levels (85 to 105 A-weighted decibels [dBA]) at 50 to 100 feet from the activities, and these effects would be above the traffic sound levels normally experienced within 500 feet of the right-of-way. Noise effects would also result from trucks hauling materials to and from the project area and from activities at laydown yards and construction staging areas. All construction activities, including noise from staging, laydown, and storage areas, would be required to meet applicable local noise regulations or to obtain a noise variance from the appropriate agency.

Once completed, noise effects from vehicle traffic within the project area would be similar to or slightly less than those of the No Build Alternative (or current conditions). At specific locations, noise levels would be substantially reduced in comparison with the No Build Alternative and current conditions because of noise walls and lids that would be associated with the design alternatives. There are currently an estimated 289 residences in the SR 520 project area that have noise levels meeting or exceeding the Washington state traffic noise abatement criteria (NAC). Compared with current and projected 2030 No Build Alternative noise levels, the proposed 6-Lane Alternative would reduce noise levels to below the NAC at about 11 to 19 percent of these residences, depending on the design option (WSDOT 2009b).

No indirect noise effects were identified from construction or operation.

## What are noise-related cumulative effects and how are they assessed?

### How was the cumulative effects assessment on noise conducted?

The analysts identified cumulative effects on noise for the Build Alternative by following *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) and by reviewing plans and policies developed by PSRC, including *Vision 2040* (PSRC 2008), the *Transportation 2040 Draft EIS* (PSRC 2009a), and the *2010 to 2013 Transportation Improvement Program* projects. First, the analysts reviewed trends from past and present actions, including the original construction of the SR 520 corridor, and then considered potential future traffic levels for SR 520 and other nearby roadways as modeled and presented in the Transportation Discipline Report (WSDOT 2009h). To assess the Build Alternative's contribution to a cumulative effect, the analysts factored in the changes in noise levels anticipated to result from the 6-Lane Alternative, as modeled and documented in the Noise Discipline Report (WSDOT 2009b).

### What trends have led to the present noise condition in the study area, and how is noise likely to change in the reasonably foreseeable future without the project?

When the Roanoke Park, Montlake, and other neighborhoods west of Lake Washington in the vicinity of the SR 520 corridor were settled and developed during the opening decades of the twentieth century, they were quieter in comparison to present conditions. After World War II, population growth in the central Puget Sound region accelerated, leading to increased commercial development and roadway traffic. In the 1960s, I-5 and SR-520 were built, and traffic noise from these major highways and from arterial roads such as East Roanoke Street, 10th Avenue East, Lake Washington Boulevard, and Montlake Boulevard NE had increased ambient noise levels substantially in comparison to the prewar years. Noise from local streets, air traffic, water-related traffic, and industry has also increased and contributed to this trend. As the number of daily trips has increased on SR 520, so has the road noise. In addition, in-filling has occurred with more residences close to the highway than when it was built. In part because SR 520 was not constructed with today's sound dampening features, such as noise

walls, the noise level is higher than on similar roadways in other parts of the state.

Without the project, six of the ten roadway segments would have an increased number of residences negatively affected by traffic noise. The expected local reductions in noise adjacent to the roadway would not be achieved if the project and its proposed noise walls were not constructed. Even with noise walls present, however, relative noise levels would still increase between now and 2030, because traffic volumes would increase over time. For a detailed discussion of these effects, see the Noise Discipline Report (WSDOT 2009b).

### What is the cumulative effect on noise likely to be?

The 6-Lane Alternative would have noise contributions equal to or slightly less than current levels and projected future levels without the project. The project would contribute minimally to the noise effects of other present and future actions. Each of the 6-Lane Alternative design options, compared with the 2030 No Build Alternative, would substantially decrease the number of residences exceeding the NAC noise levels.

### How could the cumulative effect on noise be mitigated?

The cumulative effect of transportation-related noise is gradually being mitigated as many new transportation improvement projects incorporate modern noise attenuation features, such as lids and noise walls, that were not present in the facility being replaced. As motor vehicles become more efficient and incorporate new ways to generate power, such as electric or hydrogen propulsion, the proportion of quieter vehicles will increase over time. In addition, the *Transportation 2040 Draft EIS* (PSRC 2009a) notes that policies encouraging vehicle trip reductions through transit improvements, HOV lanes, and non-motorized modes of travel where practicable would further reduce the cumulative noise effect. More broadly, *Vision 2040* (PSRC 2008) includes many policies that emphasize concentrating growth in urban centers within the central Puget Sound region and connecting those centers with an efficient, transit-oriented, multimodal transportation system.

# Air Quality

## What direct and indirect effects will the project likely have on air quality?

As discussed more fully in the Air Quality Discipline Report (WSDOT 2009n), the SR 520 project would produce direct effects on air quality through exhaust gas and particulate emissions during construction from excavation, heavy equipment, and haul trucks, and during long-term operation from the exhaust of vehicles using the roadway. Air emissions from construction activities are not expected to cause a change from the baseline condition or a violation of National Ambient Air Quality Standards (NAAQS). During project operation, vehicle emissions would occur over the long-term, but the improved highway infrastructure resulting from the project, including expanded transit facilities and the provision of HOV lanes, would help to offset increases in vehicle emissions from higher traffic volumes. The project is not anticipated to introduce any NAAQS violations (WSDOT 2009n). Potential direct, indirect, and cumulative effects on greenhouse gases are discussed in the Energy Consumption and Greenhouse Gas Emissions section of this report.

The project would produce indirect effects on air quality primarily from trucks hauling construction materials to and from the SR 520 corridor and from particulate release as a result of excavation of fill materials at borrow sites distant from the construction zone. There is also a potential for tolling of SR 520 to result higher traffic volumes on I-405, I-90, and SR-522, thereby producing indirect effects on air quality. The project has the potential to provide indirect benefits to air quality in the form of reduced single-occupancy vehicle use resulting from expanded transit service on SR 520.

WSDOT would minimize potential direct effects from project construction consistent with the procedures outlined in the Memorandum of Agreement between WSDOT and the Puget Sound Clean Air Agency (PSCAA) for controlling fugitive dust. In addition, federal regulations have been adopted that require the use of ultra-low-sulfur diesel fuel in on-road trucks, and regulations will require the use of these fuels for construction equipment by 2010.

## How were cumulative effects on air quality assessed?

Emissions from many sources accumulate in the atmosphere and together contribute to regional air quality. When transportation and land development projects are built and then are used over the long-term, emissions are released into the air by heavy equipment and haul trucks during construction, by the vehicles traveling on the completed roadway or other transportation facility, by the heating systems of buildings and houses, and by other sources. The following sections explain how past trends, present actions, and regionally planned transportation and land development projects are expected to contribute to the future cumulative effect on air quality in the central Puget Sound region, with and without the proposed project.

The analyst based the air quality cumulative effects assessment on applicable federal regulations and standards. The federal Clean Air Act, last amended in 1990, requires the U.S. Environmental Protection Agency (EPA) to set NAAQS (40 CFR 50) for pollutants considered harmful to public health and the environment. EPA has set federal standards for six principal air pollutants, which are called "criteria" pollutants: fine and coarse particulate matter, ozone, carbon monoxide, sulfur dioxide, and lead. In addition, EPA regulates nearly 200 chemical compounds known as hazardous air pollutants, or air toxics, under Section 112 of the Clean Air Act. Air toxics can be emitted into the air directly and can also be formed in the atmosphere by chemical reactions (Seigneur 2005). Federal, state, and regional agencies operate ambient air monitors in the vicinity of the project sites to assure the region meets national air quality standards. Areas where air pollution levels persistently exceed the NAAQS may be designated as "nonattainment" areas and are subject to stricter regulations regarding air emissions from new industrial sources and transportation projects. An area may be considered a "maintenance" area if it was formerly nonattainment but currently is meeting the NAAQS. Maintenance areas are also subject to stricter regulations to ensure continued attainment of the NAAQS. The analyst used the NAAQS as the benchmark to characterize present air quality and expected air quality trends in the reasonably foreseeable future with and without the project.

The analyst made the following assumptions:

- Once a region is designated as a maintenance area (a former nonattainment area where a maintenance plan is in effect), it is no

longer in nonattainment and meets the NAAQS. Therefore, there is no longer an adverse cumulative effect of pollutant emissions.

- All present and reasonably foreseeable future actions, including transportation and land development projects, are and will be subject to regulatory limits on their pollutant emissions.

The analyst used recent ambient air monitoring data for monitors near the SR 520 corridor as presented in the Air Quality Discipline Report (WSDOT 2009n).

## What trends have led to the present air quality condition in the central Puget Sound region?

PSRC's *Transportation 2040 Draft EIS* provides an overview of air quality conditions and trends in the Puget Sound Region, concluding that "Regional air pollution trends have generally followed national patterns over the last 20 years, with the level of criteria air pollutants decreasing over the last decade to levels below the federal standards" (PSRC 2009a). The *Transportation 2040 Draft EIS* points out that carbon monoxide (CO) levels have decreased substantially in the region, in large part because of federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles. It notes that "oxygenated fuels programs, inspection and maintenance programs, and traffic control measures have also played a role in the declining CO emissions trend" (PSRC 2009a).

The central Puget Sound region has designated maintenance areas for CO and particulate matter and is in attainment for all other criteria pollutants. Federal, state, and regional agencies cooperate to coordinate jurisdictional responsibilities for air quality throughout the region. In addition to the EPA Office of Air Quality Planning and Standards, which establishes the NAAQS, the Washington State Department of Ecology (Ecology), PSRC, and PSCAA have all established compatible air quality management goals and exercise jurisdiction at the state and regional levels. County and municipal air quality statutes contribute further to air quality regulation and management at local levels.

In general, air quality trends and projections in the central Puget Sound region conform with Ecology, PSRC, and PSCAA management goals to maintain air quality criteria pollutant levels below the NAAQS and to achieve steady improvement, although there have been recent localized exceptions with respect to ozone and particulate matter (PSRC 2009a). Recent ambient air monitoring data for monitors near the SR 520

corridor indicate that concentrations have been below the NAAQS for each of the six criteria pollutants for the past five years (WSDOT 2009n). Although 5 years may be too short a period to establish a reliable trend, the data do suggest that ambient air quality may be improving in the project vicinity, a trend reflected nationally. Cleaner cars, industries, and consumer products have contributed to cleaner air throughout much of the United States. EPA expects air quality to continue to improve as recent regulations are fully implemented and states work to meet national standards. Among these regulations are the Locomotive Engines and Marine Compression-Ignition Engines Rule, the Tier II Vehicle and Gasoline Sulfur Rule, the Heavy-Duty Highway Diesel Rule, the Clean Air Non-Road Diesel Rule, and the Mobile Source Air Toxics Rule (EPA 2008).

## How is air quality likely to change in the reasonably foreseeable future without the project?

Without the project, regional air quality would still likely improve between the present and 2040 based on trends towards cleaner vehicles and industries. There are a number of transportation infrastructure projects planned for the reasonably foreseeable future, including the provision of HOV lanes from Medina to SR 202 (Eastside Transit and HOV Project) and Sound Transit's North Link and East Link light rail projects. These projects would increase transit and multiple-occupancy vehicle use on the SR 520 corridor beyond present levels, increase the overall efficiency of the transportation system, and help to reduce the overall number of vehicle miles traveled.

## What would the cumulative effect on air quality likely be?

Because the Build Alternative would be a major transportation project located in a maintenance area for CO, it would be subject to transportation conformity requirements. The intent of transportation conformity is to ensure that new projects, programs, and plans do not impede an area from meeting and maintaining air quality standards. Conformity with the State Implementation Plan (SIP) means that transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

The project is not anticipated to create any new violations, nor increase the frequency of an existing violation of the CO standard; it would

conform with the purpose of the current SIP and the requirements of the federal Clean Air Act and the Washington Clean Air Act. As a "regionally significant" project, the proposed project is included in the current regional transportation plan (RTP), *Destination 2030* (PSRC 2007a), and in *Central Puget Sound Regional 2007-2010 Transportation Improvement Program* (TIP), which lists all current transportation projects (PSRC 2009b). The RTP and the TIP meet the conformity requirements identified by federal and state regulations for CO. The proposed project is also included in all of the action alternatives in the *Transportation 2040 Draft EIS* (PSRC 2009a).

### How could the cumulative effect on air quality be mitigated?

Cumulative effects on air quality are being minimized by continuing advancements in automobile technology, fuel content regulations, and the increased availability of alternative fuels. Major efforts are underway to reduce vehicle miles traveled and to improve the overall efficiency of the transportation system. Washington's Commute Trip Reduction program continues to be the primary transportation demand management strategy in the central Puget Sound region. The program targets commutes in high-traffic areas, including strategies such as employee parking management and incentives for commuting by means other than driving alone (PSRC 2009b).

## Greenhouse Gas Energy Consumption and Greenhouse Gas Emissions

The SR 520 project would consume energy over the 5- to 7-year construction period and during the long-term operation of the roadway. Much of this energy consumption would result from the use of petroleum, a fossil fuel. Any process that burns fossil fuel emits carbon dioxide ($CO_2$), which makes up the majority of greenhouse gas (GHG) emissions from transportation. GHG emissions have been found to contribute to worldwide climate change (also referred to as "global warming"). Federal, state, and local agencies are considering ways to regulate GHG levels to minimize future effects on climate change related to GHG levels. This section describes the expected direct, indirect, and cumulative effects of the project on energy consumption and greenhouse gas emissions and discusses them in relation to relevant goals and policies (U.S. Department of State 2007).

## What direct and indirect effects would the project likely have on energy consumption and greenhouse gas emissions?

Energy use during construction over the short term and from vehicles using the completed SR 520 during long-term operation would be the main source of GHG emissions from this project. The global warming impact of greenhouse gases is measured in terms of equivalency to the global warming potential of $CO_2$, the reference gas against which the other greenhouse gases are measured. GHG emissions are reported in terms of metric tons of carbon dioxide equivalent ($MtCO_2e$), which is proportional to the amount of energy used.

Considering the most likely construction approach based on currently available information, the analyst assumed that construction energy needs would be met with diesel fuel only. The amount of energy consumed was calculated as proportional to the project cost. The GHG emission analysis is based on the results of the energy consumption analysis and thus also reflects project cost. Of the 6-Lane Alternative design options, Option K would have the highest level of construction energy consumption (at about 45,000 million British thermal units [MBtu] as compared to Option A (about 25,755 Mbtu) and Option L (29,530 MBtu). As a point of comparison, in 2007, the most recent year for which data are available, Washington state's transportation sector consumed approximately 338 trillion Btus (338,000,000 MBtus) of gasoline and approximately 143 trillion Btus of distillate fuel, a total of about 481 trillion Btus (EIA 2009a, EIA 2009b). Therefore, construction of the project, in total, would consume a negligible amount of energy (from about 0.005 percent to 0.009 percent) relative to the state's annual transportation-related energy consumption.

GHG emissions for constructing Option K would be roughly 30 and 40 percent higher than for building Options A and L, respectively, as proportional to the e higher construction cost associated with Option K. $MtCO_2e$ emissions, spread over the multi-year construction period, are estimated at about 3,323,000 for Option K, about 1,900,000 for Option A, and about 2,180,000 for Option L.

Operation of Option A, K, or L would consume from 5 to 10 percent less energy than the No Build Alternative in 2030.

Annual energy consumption during operation would be similar among all of the design options at about 5 trillion Btus, or about 1 percent of

the Washington transportation sector's total annual energy consumption of 481 trillion Btus, as previously noted.

The proposed 6-Lane Alternative would reduce vehicle miles traveled (VMT) by about 6 to 8 percent below VMT estimated for the No Build Alternative. This reduction is attributable to tolling, which is anticipated to encourage a greater proportion of drivers to use transit and carpooling, and to the addition of HOV lanes, which would improve traffic flow and reduce idling and stop-and-go conditions. Operational GHG emissions would be produced by the vehicles that use the roadway once it is complete. These emissions would depend on the number of vehicles, vehicle speed, distance traveled, and vehicle fuel efficiency. Federal legislation on fuel economy is anticipated to result in higher fuel efficiencies in the future. Current conditions produce about 327 $MtCO_2e$ each weekday from 5:30 a.m. to 10:15 a.m. and again from 3 p.m. to 7:45 p.m., the daily peak traffic periods. In 2030, the No Build Alternative would produce about 407 $MtCO_2e$ during the same time periods, because future traffic volumes would be higher than at present. All of the 6-Lane Alternative design options would produce between 366 and 369 $MtCO_2e$ during the same peak periods in 2030, roughly 9 to 10 percent lower GHG emissions than under the No Build Alternative. All of the 6-Lane Alternative design options should be considered equal with respect to their operational GHG emissions.

Indirect effects related to energy consumption would occur if construction and operation of the project were to cause measurable effects on other sectors of the economy, such as utilities, or affect the ability of Washington state to meet the energy demands for this project, requiring expansion of existing resources. There is no indication that this would be the case, in part because Washington state relies heavily on hydropower to generate electricity. The project's operational contribution of about 1 percent of the state's total annual transportation energy consumption, previously noted, would be too small to have a consequential indirect effect.

Approximately 90 percent of Washington's current supply of crude oil comes from the Alaska North Slope. Five refineries in the Puget Sound area distribute refined petroleum products to Washington and adjacent states (CRC Draft EIS, 2008). Energy supplies are sufficient to build and operate the project without placing undue demands on energy sources and would not affect other sectors of the economy.

In general, operation of the project would improve energy consumption and GHG emissions over the No Build Alternative. The addition of HOV lanes as part of the corridor system and a regional bike path would be consistent with the Governor's Executive Order 09-05, which includes direction to WSDOT to continue developing GHG reduction strategies for the transportation sector. No negative indirect effects would occur.

## How were cumulative effects on energy consumption and greenhouse gas emissions assessed?

The cumulative effects analysis follows the *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) which outlines a process to assess how past and present actions, in combination with reasonably foreseeable actions, may contribute to a cumulative effect on a resource.

Major reasonably foreseeable transportation projects that would affect the corridor and are considered in the cumulative effects discussion include the Pontoon Construction Project, the Eastside Transit and HOV project, the Variable Tolling Project, and Sound Transit's East Link and North Link light rail projects.

## What trends have led to present energy consumption and greenhouse has emissions in Washington?

At the national level, industrial uses had the highest share of energy demand in 2005. However, the transportation sector's energy demand is expected to grow by 1.4 percent annually—to a 29.9 percent share by 2030—and will exceed the industrial sector's demand (CRC Draft EIS, 2008). Energy-related activities, primarily burning of fossil fuels, accounted for the majority of $CO_2$ emissions from 1990 through 2004, when approximately 86 percent of the energy consumed in the United States was produced through the combustion of fossil fuels. GHG emissions rose by about 15 percent during the same period (U.S. Department of State 2007).

Consistent with the national trend, transportation is a major consumer of energy in Washington state. This trend started locally in the 1920s when the Eastside was connected to the Seattle area by ferries and roadways. Growth in the region accelerated after completion of the

Interstate Highway System and the I-90 and SR 520 floating bridges across Lake Washington in the 1950s and 1960s. With the addition of I-405 and other connecting highways, mobility in the region continued to improve, along with the reliance on cars and other vehicles that use petroleum.

The total demand for all energy sources in Washington state has grown steadily since the early 1970s. Washington is the leading hydroelectric power producer in the nation; however, as of 2004, energy derived from petroleum products accounted for the largest single share (42.0 percent) of energy consumed in Washington (CRC Draft EIS, 2008).

While transportation makes up a larger percentage of Washington's greenhouse gas emissions—again, in large part as a result of the state's abundant hydroelectricity—on a per capita basis, Washington consumes about the same amount of gasoline per capita as the US average. Per capita diesel fuel consumption in Washington is slightly lower than the national average. Emissions associated with transportation are projected to be the largest contributor to future emissions growth from 2005 to 2020; transportation growth could add just over 12 million metric tons of carbon dioxide ($MmtCO_2e$) to Washington's emissions by 2020 (Ecology 2007).

In recent years, the fuel efficiency of new vehicles has declined because of the popularity of larger engine vehicles, such as pickups, vans, and sport utility vehicles (SUVs). Revised federal fuel efficiency standards have been mandated, and increasing fuel efficiency will help reduce effects on energy and GHG levels. The Energy Independence and Security Act of 2007 mandated that, by 2020, the fuel economy of all new cars, trucks, and SUVs would be 35 miles per gallon (mpg). On May 19, 2009, however, President Obama established a new national policy aimed at both increasing fuel economy and reducing greenhouse gas pollution for all new cars and trucks sold in the United States. The new standards, covering model years 2012-2016, and ultimately requiring an average fuel economy standard of 35.5 mpg in 2016, are projected to save 1.8 billion barrels of oil over the life of the program with a fuel economy gain averaging more than 5 percent per year and a reduction of approximately 900 million metric tons in greenhouse gas emissions. This would surpass the Energy Independence and Security Act of 2007 mandate, which required an average fuel economy of 35 mpg in 2020 (The White House 2009a, The White House 2009b).

## How are energy consumption and greenhouse gas emissions likely to change in the reasonably foreseeable future without the project?

The Puget Sound region experienced accelerating population growth and industrial, commercial, and residential development, particularly during the second half of the twentieth century. Population growth and economic development is projected to continue (PSRC 2009a). Similarly, traffic volumes have increased with population, leading to increased automotive emissions; this trend is likely to continue in the reasonably foreseeable future.

Policies at the federal, state, and local levels support energy conservation and are intended to reduce energy use, including petroleum, as well as GHG levels over the long-term. As described above, fuel efficiency is largely regulated though requirements on vehicle manufacturers. The trend toward more fuel-efficient vehicles is expected to continue. At the same time, investment in transit and transit service are helping to reduce emissions (PSRC 2009a).

In 2007, Governor Gregoire and the legislature set the following GHG reduction goals for Washington state:

- 1990 GHG levels by 2020
- 20 percent reduction below 1990 levels by 2035
- 50 percent reduction below 1990 levels by 2050

The Washington legislature passed House Bill 2815 in the spring of 2008. This bill includes, among other elements, statewide per capita VMT reduction goals as part of the state's GHG emission reduction strategy.

## What would the cumulative effect on energy consumption and greenhouse gas emissions likely be?

With any of the design options, construction and operation of the proposed 6-Lane Alternative, along with the other present and reasonably foreseeable future transportation improvement projects shown in Exhibits 18a and 18b, would make a very small contribution to statewide GHG emissions. At the same time, the 6-Lane Alternative's long-term operation would reduce VMT below present conditions and below future conditions projected for the No Build Alternative.

Operation of the I-5 to Medina project in conjunction with the Medina to SR 202 project would consume energy and emit GHGs into the atmosphere over the long-term. However, the build alternatives for these two projects would together generate a smaller cumulative effect in comparison with their No Build alternatives, because the build alternatives would reduce VMT and improve mobility on the roadway.

HOV lanes would encourage people to carpool, vanpool, or take transit, assisting in reducing GHG emissions. Tolling of the corridor is also anticipated to encourage transit use and reduce VMT on the corridor. Over the long-term, improvements proposed for the SR 520 corridor in conjunction with Sound Transit's light rail projects would contribute to meeting GHG reduction goals outlined by the legislature and the governor.

## How could cumulative effects on energy consumption and greenhouse gas emissions be mitigated?

Energy consumption produces GHG emissions, which are known to contribute to global climate change. Global climate change is being addressed at local, regional, national, and international levels.

As discussed above, state policies are in place to reduce GHG levels substantially between now and 2050. Examples of strategies being implemented to reduce GHG levels include providing alternatives to driving alone (such as carpooling, vanpooling, and transit); developing transportation facilities that encourage transit, HOV, bike, and pedestrian modes; supporting land use planning and development that encourage such travel modes (such as concentrating growth within urban growth areas); and optimizing system efficiency through variable speeds and tolling.

The cumulative effect on GHG emissions would be further reduced by continuing advancements in automobile technology, fuel content regulations, and the increased availability of lower-carbon fuels. Furthermore, the region's dedication to providing alternative transportation options, such as public transit and bicycle trail networks, could help reduce the number of single-occupancy vehicles on the roads (PSRC 2009a).

# Water Resources

## What direct and indirect effects would the project likely have on water resources?

As documented in the Water Resources Discipline Report (WSDOT 2009o), the 6-Lane Alternative would not have an adverse direct or indirect effect on water resources because stormwater runoff and waterborne contaminants would be appropriately mitigated.

During project construction, WSDOT would prepare and follow a Temporary Erosion and Sediment Control Plan and collect and treat stormwater runoff from the project footprint in compliance with National Pollutant Discharge Elimination System requirements and WSDOT BMPs. Consequently, stormwater discharged during construction activities would not cause a change from the baseline condition of receiving waters or violate Washington State Water Quality Standards.

WSDOT expects that the project would not violate state Water Quality Standards during its long-term operation. The improved highway infrastructure, including improved stormwater treatment facilities, would reduce pollutant amounts in stormwater runoff relative to the paved surfaces that exist on SR 520 now. The improved stormwater treatment associated with the project could have slight direct or indirect beneficial effects on water quality. There would be no adverse indirect effects associated with the operation of stormwater quality treatment facilities as part of the project action.

## What are water resource related cumulative effects and how are they assessed?

For this analysis, cumulative effects related to water resources are considered to be long-term trends affecting water quality as a result of contaminants entering surface water or ground water from many sources over time. Transportation improvement projects frequently add to the total area of a roadway's paved surface. The additional paved surface area produces additional stormwater runoff relative to the pre-project surface area. As a consequence, stormwater runoff from the larger paved surface area can carry a greater load of contaminants from vehicle engines, tires, and exhaust relative to the pre-project condition. Unless the stormwater is treated to remove or reduce the contaminant load before it enters receiving waters, the contaminants can accumulate

in surface water and potentially migrate to groundwater. Water flow can distribute the contaminants widely, potentially affecting human health and ecosystems.

The cumulative effects assessment first evaluates the current condition of water resources in the study area with respect to accumulated contaminants and examines long-term trends that have led to the present condition. Next, it surveys other present and planned development and land improvement projects to determine the extent to which the regional paved roadway surface is likely to increase in the reasonably foreseeable future—for this proposed project, between now and 2030, the design year. The assessment takes into account the fact that present and future development and transportation improvement projects are and will be required to treat stormwater runoff to reduce contaminant loads to at least pre-project levels. Finally, the analyst determines the extent to which stormwater runoff from the proposed project's added roadway surface would contribute to the cumulative contaminant load of the study area's receiving waters.

## How was the cumulative effects assessment of water resources conducted?

The study area for the cumulative effects assessment on water resources is shown in Exhibit 11. For this analysis, the time frame has an assumed start date of 1941, when water quality began to measurably decline in Lake Washington from sewage discharge, and an endpoint of 2030, the design year for the project.

The baseline condition of water resources in the study area was determined by consulting the scientific literature and a variety of relevant technical reports (King County 2009a, King County 2009b). Information was mapped using geographic information system technology to aid the assessment. The analysts obtained discharge data for stormwater evaluations from WSDOT.

The analysis compared potential future conditions against the present condition for stormwater and for surface water. The approaches described in this section comply with the WSDOT *Environmental Procedures Manual* (WSDOT 2009d) and *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008).

## What trends have led to the present water resources condition in the study area?

Over the last several decades, urban development and the discharge of untreated stormwater have created poor water quality in the study area. Surface water bodies in the study area receive urban runoff from residential areas and roads, including the current SR 520 roadway and sources within the greater Seattle area. Lake Washington received increasing amounts of secondary treated sewage between 1941 and 1963, causing over-enrichment of the water with nutrients and decreasing the water quality of the lake.

The present water quality condition of the study area is largely the consequence of efforts to remove secondary treated sewage from Lake Washington (King County 2009a). Since the construction of a substantial sewage infrastructure beginning in 1958 (for example, trunk lines and interceptors to carry sewage to treatment plants built at West Point and Renton), Lake Washington's water quality has dramatically improved (King County 2009a). Data collected from 1990 through 2001 indicate that the quality of Lake Washington's water supports and is consistent with the lake's beneficial uses (Tetra Tech and Parametrix 2003). Lake Washington now appears to be in a stable ecological condition with respect to water quality. Lake Washington has some of the best water quality for a large lake entirely within a major metropolitan area anywhere in the world (Tetra Tech and Parametrix 2003).

Still, problems remain. Current regulations effectively regulate point discharge (end of pipe) from new projects but do not effectively regulate non-point discharges or pre-regulation point source discharges. While Lake Washington overall water quality is improved over recent historical conditions and water quality is considered excellent for most parameters, the lake is still listed by Ecology as impaired because of bacterial contamination.

## How are water resource conditions likely to change in the reasonably foreseeable future without the project?

The likely future condition of the surface water bodies of the study area will be a gradual and steady improvement in quality. This is expected to result from an ongoing decrease in the quantities of pollutants in stormwater from the continuing development and redevelopment of

public and private lands in the study area. These newly developed and redeveloped properties and facilities, including roads and highways, will be required to provide appropriate and effective stormwater treatment following Ecology's regulations, which will contribute to these gradual improvements.

Under the No Build Alternative, other new construction, redevelopment projects, and upgrades to existing stormwater and wastewater treatment and discharge systems would improve water resources in the study area. On the east side of Lake Washington, the Medina to SR 202 project (WSDOT 2009o) would provide new stormwater treatment facilities across its project length, which would improve water resources in Lake Washington and other receiving waters along the route. New land development actions in the study area would also require new or improved stormwater treatment facilities, all of which would improve water quality conditions in Lake Washington and other receiving waters.

## What would the cumulative effects on water resources likely be?

The proposed project would add to the positive trend of improved surface water quality. The Build Alternative stormwater treatment would reduce pollution

Stormwater runoff during construction of the proposed 6-Lane Alternative would be mitigated to minimize the entry of waterborne contaminants into surface waters, and the project's improved stormwater treatment facilities would reduce pollutant runoff from SR 520 paved surfaces relative to present conditions. For these reasons the analyst concluded that the proposed project would slightly offset negative trends from other past and present, and slightly add to the gradual improvement of water quality expected in the study area between now and 2030.

## How could the cumulative effect on water resources be mitigated?

The cumulative effect of land development and transportation improvement projects on water quality could be minimized by continuing application of stormwater treatment technologies as projects are built and operated. To address existing sources of untreated runoff,

regional water quality investments may be needed. These could include systematic retrofitting of local streets and parking lots.

# Ecosystems

Ecosystems can be divided into three components: wetlands, fish and aquatic habitat, and wildlife. Project construction will directly affect wetlands, streams, and wildlife habitat, but these effects will be mitigated as part of the project and design (WSDOT 2009f).

## Wetlands

### What direct and indirect effects would the project likely have on wetlands?

As discussed more fully in the Ecosystems Discipline Report (WSDOT 2009f), both project construction and operation of the 6-Lane Alternative would directly affect wetlands. Some of the wetlands along the I-5 to Medina project corridor would be filled, cleared, or shaded under the 6-Lane Alternative options and suboptions. All such effects are considered direct effects.

In general, Option K would have more operational effects from the project than Options A and L. Wetland fill from Option K would be three times more than from Option L and nine times more than from Option A. Option K would have the greatest shade effects from project operation, and Option A would have the least. Option K would have the most fill effects from project operation on buffers, followed by Option L, then Option A. Option L, however, would have the most effects from shading, and Option K would have slightly more shading effects than Option A.

Most of the operational effects on wetlands would be due to shading from the bridge roadway. While the shaded wetlands would continue to function, the reduced light levels underneath the bridge could limit or retard plant growth, which could alter water quality, change the type and/or quality of the habitat, and potentially reduce wildlife use of the wetlands.

The wetlands assessment did not identify any expected indirect effects of the proposed project on wetlands (WSDOT 2009f).

## What are wetlands-related cumulative effects and how are they assessed?

### How was the cumulative effects assessment of wetlands conducted?

WSDOT conducted a cumulative effects analysis because of the original direct effects and uncertainty regarding the full effectiveness of the mitigation on replacing functions. WSDOT used *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) as the basis for assessing the cumulative effects of the project on wetlands in combination with other past, present, and reasonably foreseeable future actions. The study area for indirect and cumulative effects on ecosystems, including wetlands, is Water Resource Inventory Area (WRIA) 8, shown in Exhibit 11. The time frame for the ecosystem indirect and cumulative effects assessment starts at 1850, when significant Euro-American settlement began within the Puget Sound region, and ends at 2030, the project design year.

The analysts collected existing data from relevant scientific literature describing typical potential effects of transportation and major redevelopment projects on ecological resources and compared these to the potential effects of the Build Alternative. Transportation projects were specifically reviewed because they are long, linear structures that cut across landscapes, potentially affecting ecological resources differently than a site development project. The review focused on activities that have long-term or far-reaching effects on wetland functions, such as habitat, water quality, and hydrology.

For the wetlands analysis, the analysts consulted numerous digital and paper maps to determine the location of known and potential wetlands and examined digital sources including aerial photographs, National Wetlands Inventory data, King County Soil Survey, and current wetland mapping from local governments. Data collected in the field further supplemented existing information.

In some cases, identified direct or indirect effects of the project on other resources could indirectly affect wetlands functions. Therefore, the analyst reviewed potential cross-disciplinary effects that could affect wetlands and fish and wildlife habitat. The review included other discipline reports and communication with other disciplinary specialists. The disciplines reviewed in detail were ecosystems, transportation, and water resources.

### What trends have led to the present wetlands condition in the study area?

Chapter 10 of the *Transportation 2040 Draft EIS* (PSRC 2009a), Ecosystems and Endangered Species Act Issues, provides an overview of wetlands and trends in the Puget Sound Region. Wetlands within the study area have been substantially affected by past and present actions including alteration of ecosystem processes; loss of forests and riparian habitat; loss of wetlands and habitat fragmentation; introduction of invasive species; agriculture; and increases in impervious surface area and water pollution associated with urban environments (including, but not limited to, changes in hydrologic flow regimes). Taken together, these effects have resulted in significant wetland loss in WRIA 8. Transportation systems, which are a component of the overall urban development pattern within the Central Puget Sound Region, have historically played a key part in these ecosystem changes (PSRC 2009a).

Wetlands do not function as isolated systems. The landscape and land uses that surround a wetland influence a wetland's ability to provide functions. The majority of the adverse effects to wetlands have been from past and present actions, although several reasonably foreseeable future actions could also contribute to the further decline of existing conditions.

Changes to the ecosystem typically affect many aspects of the system. For example, a change to a wetland, such as filling, may degrade water quality and reduce the quantity and quality of habitat for fish and wildlife. Substantial alterations to the natural environment in central Puget Sound have occurred with the most significant, from an ecosystem standpoint, the construction of the Ship Canal and Ballard Locks, which lowered Lake Washington by about 10 feet in 1916, and construction of SR 520 and the Evergreen Point Bridge in the 1960s. In addition, wetlands within the region have been substantially affected by logging, agriculture, industrialization, and urban development, including increasing impermeable surface areas, altering ecosystem processes, and removing or fragmenting forested and riparian habitats, including wetlands.

Local government wetland protection standards, which have been established in Washington only during the last two decades, differ from jurisdiction to jurisdiction and are not always sufficient to protect and maintain the long-term sustainability of wetland functions. Wetland mitigation has been only partially successful, and attention to ecological context and landscape-based approaches to natural resource

conservation is still lacking. This is particularly true within urban locales such as the study area where ecosystem processes have already been substantially altered (Sheldon et al. 2005).

### How is the wetland condition likely to change in the reasonably foreseeable future without the project?

Under the No Build Alternative, wetlands functions in the study area would continue to be adversely affected in the project corridor; however, restoration efforts identified in the Washington Park Arboretum and on the northern shorelines of Lake Union will offset this decline. Improvements to the stadium and other University of Washington projects planned for construction in the reasonably foreseeable future are shown in Exhibit 17a. These projects could continue a cumulative pattern of wetland declines by altering ecosystem processes, changing surface water quality, and increasing impervious surface area in an already urbanized area. These effects, in turn, could alter plant and wildlife species diversity and habitat functions within the remaining wetlands. In addition, compensatory mitigation and regulatory and voluntary efforts to improve habitat will continue with or without the project.

### What would the cumulative effect on wetlands likely be?

As discussed in the Ecosystems Discipline Report (WSDOT 2009f), WSDOT has worked to avoid and minimize impacts to ecosystems during the scoping and design of this project. WSDOT avoided many impacts to wetlands through careful identification of sensitive areas early in the design process.

Where avoidance was not possible, effects were minimized by raising bridge heights, treating stormwater, and improving water quality functions of aquatic wetlands. The project would make a beneficial contribution to wetlands resources in the Lake Washington area near the SR 520 corridor, helping to reduce the cumulative effect of development on wetlands habitat. Through BMPs, conservation measures, and the application of specific construction sequencing and timing (such as minimizing in-water work), WSDOT would ensure that short-term construction effects on wetlands would be minimized to prevent to the extent possible any effects that could lead to any decreased wetland function.

When impacts cannot be avoided or minimized, WSDOT will identify mitigation to reduce the cumulative effect of the project on wetlands. The proposed compensatory mitigation will be developed in

coordination with regulatory and resource agencies. As a result, the project's contribution to cumulative effects of wetlands within WRIA 8 is anticipated to be minor to negligible.

### How could the cumulative effect on wetlands be mitigated?

The federal wetland regulatory goal of No Net Loss and recently updated state and local regulations for protecting and managing critical areas under the Growth Management Act are intended to slow the cumulative decline of wetlands. Beyond these measures, the cumulative effect of wetland conversion and loss could be mitigated by more stringent regulations, greater regulatory consistency and coordination among jurisdictions, improved planning at both regional and local levels, and increased participation of non-governmental organizations and other stakeholders in restoration efforts. Long-term programs such as watershed-based mitigation and mitigation banking also aid in the protection of the resource. For example, Ecology has prepared two guidance documents to facilitate more effective compensatory wetland mitigation. These are *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance* (Ecology et al. 2006a), and *Wetland Mitigation in Washington State, Part 2: Developing Mitigation Plans* (Ecology et al. 2006b), both prepared as part of a collaborative effort among Ecology, the USACE, and the EPA. The City of Seattle has comprehensive plans and critical areas ordinances that guide future community development so that adverse cumulative effects on wetlands can be alleviated.

## Aquatic Resources

### What direct and indirect effects would the project likely have on fish and aquatic habitat?

As discussed in the Ecosystems Discipline Report (WSDOT 2009f), the 6-Lane Alternative would require construction activities that would temporarily affect fish, other aquatic species, and habitat in Lake Washington and the Ship Canal. Such temporary effects would result from construction activities to replace the existing overwater and nearshore bridge structures. Construction activities occurring within or directly adjacent to the study area water bodies could increase turbidity and total suspended solids (TSS) levels. This could result in immediate and direct effects (as well as in indirect effects) on fish, related to changes in their migration, rearing, or feeding behavior. Such changes could result in indirect or delayed mortality to juvenile fish occurring in the study area. However, changes in stormwater discharges to Lake

Washington would likely improve long-term water quality conditions within the study area relative to present conditions, although any changes would likely have minimal influence on the overall fish and aquatic resources in the study area. Construction would also include extensive pile-driving activities in the area, which could result in direct and indirect mortality to juvenile fish.

The increased overwater shading from the larger bridge structures could also have long-term effects on freshwater habitat conditions in the migratory corridor of adult and juvenile salmonids. These habitat changes could alter the migration rates of these fish. The changes could also enhance the habitat supporting predator species, potentially increasing the risks of predation on juvenile salmonids migrating through the study area. Changes in aquatic vegetation density or distribution in the study area due to increased shading could have long-term effects on the distribution and interactions between predators and migratory species.

In addition to the potential effects in Lake Washington and the Ship Canal, the 6-Lane Alternative could also directly affect aquatic resources in Grays Harbor and the pontoon-towing route from Grays Harbor to Lake Washington. While the potential effects of constructing and temporarily storing the pontoons in Grays Harbor are addressed as a separate independent project, pontoon towing is part of the 6-Lane Alternative for the I-5 to Medina project, as well as the construction and towing of the supplemental stability pontoons. These supplemental stability pontoons could be constructed and towed from the pontoon site in Grays Harbor or the Concrete Technology Corporation site. However, it is unlikely that these activities would substantially affect habitat conditions over the long-term.

The potential direct effects described above are fully addressed in the Ecosystems Discipline Report (WSDOT 2009f) and do not constitute indirect effects. Because of the project location, project effects on habitat would generally be limited to the lake and estuarine environments in the study area, not farther removed in distance, and would be consistent with those occurring from existing uses and activities. In addition, the analyst did not identify any potential effect of the project on fish and aquatic habitat that would occur later in time than the project activity causing the effect. Therefore, the 6-Lane Alternative is not expected to result in measurable indirect effects on fish and aquatic habitat.

## What are fish and aquatic habitat-related cumulative effects, and how are they assessed?

### How was the cumulative effects assessment of fish and aquatic habitat conducted?

Construction activities could have short-term but adverse direct effects on fish and aquatic habitat, particularly during pile driving, due to the duration and extent of the in-water work. The long-term effects from the proposed 6-Lane Alternative (including project mitigation) are likely to bring a slight improvement over present conditions, however, because of improvements in stormwater treatment and fish migration conditions resulting from the project. For example, the new Evergreen Point Bridge would provide stormwater treatment, whereas the existing bridge does not. Analyses detailed in the Water Resources Discipline Report (WSDOT 2009o) and discussed further in the Ecosystems Discipline Report (WSDOT 2009f) indicate that water quality conditions would improve slightly as a result of the stormwater treatment that the project would introduce. Therefore, long-term project effects on fish and aquatic habitat, with mitigation, are expected to be a slight improvement over present conditions, in part because of the improved quality of stormwater discharge that the project would provide (WSDOT 2009f).

To analyze cumulative effects on aquatic resources, the analyst made several assumptions:

- Because the project has the potential to affect anadromous salmonid species within the study area, and because the Pacific Coast anadromous salmonids use a large portion of the north Pacific Ocean for feeding, the assumed cumulative effects study area includes these areas (see Exhibit 10) as well as Grays Harbor (WRIA 22), the northwest Washington coast, the Strait of Juan de Fuca, the Georgia Strait, Puget Sound, and the Lake Washington watershed (WRIA 8). The study area reflects the area in which anadromous fish from within or near the study area could be affected by the project in combination with the effects of other past actions, present actions, and reasonably foreseeable future actions.
- For this analysis, the analyst assumed a start date of 1850, as defined by the presence of significant European settlement within the Pacific Northwest and Alaska (including the operation of large-scale commercial fisheries), and an end point of 2030, which represents the design year for the project.

The analyst determined the baseline condition of the fisheries and aquatic habitat in the study area, trends from past actions that led to the current baseline conditions, and existing trends that would influence the future condition of the resource by consulting the scientific literature and a variety of relevant technical reports (PSRC 2009a, Good et al. 2005, WDFW et al. 1993, WDFW 1998, WDFW 2002, WDFW 2004, Kerwin 2001, Smith and Wenger 2001, Williams et al. 1975).

To analyze the expected contribution of direct and indirect effects to the overall cumulative effect and the relative importance of any such effect, the analyst compared the fish resources within the area affected by the project to the fish resources within the study area. The comparison was made both on the basis of the number of fish potentially affected by the I-5 to Medina project and the amount of habitat the project area provides relative to habitat within the much larger study area.

### What trends have led to the present fish and aquatic habitat conditions in the study area?

The baseline (present-day) condition of fish resources within the study area is degraded, with significant degradation in both the quality and quantity of freshwater habitat within WRIA 8, marine habitat within WRIA 22, and those natural physical and biological processes that are important to the maintenance of healthy fish populations. Past and present actions have substantially affected fisheries and aquatic habitat within the study area. The past and present actions include alteration of ecosystem processes, loss of forests and riparian habitat, instream habitat loss and fragmentation, competition and predation by invasive species, overharvesting of fisheries, impervious surface area and water pollution, and changes in flow regimes (PSRC 2009a, Kerwin 2001, Smith and Wenger 2001, Williams et al. 1975). Land use activities associated with logging, road construction, urban development, mining, agriculture, shipping, and recreation have significantly altered fish habitat quantity and quality.

The overall status of fish species potentially affected by the I-5 to Medina project is depressed, with all stocks of Chinook, coho, and sockeye salmon; bull trout; and steelhead showing significant declines from historical numbers, when comparing spawning escapement. The primary factor in determining year-to-year population trends in anadromous fish stocks is ocean survival, which depends heavily on temporal ocean conditions.

Past actions have altered the fish and aquatic habitat resource and set trends that have led to its present condition. These actions include the realignment of the Cedar River and the construction and operation of the Ballard Locks and Ship Canal, thereby significantly changing the hydrology of Lake Washington. In addition, juvenile salmon outmigration and rearing have been negatively affected by reduced water quality and increased fish passage barriers that have occurred throughout WRIA 8 lakes and streams; intense development along Lake Washington's shorelines; and the introduction of invasive predator species. These, and other activities, have resulted in significant declines in runs of Pacific salmonids in WRIA 8, and in multiple fish stocks that resource management agencies consider are in declining condition or at risk (Good et al. 2005, WDF et al. 1993, WDFW 1998, WDFW 2002, WDFW 2004).

The depressed condition of WRIA 8 salmon stocks has also been evaluated in multiple watershed plans, including the WRIA 8 limiting factors analysis (Kerwin 2001). Furthermore, three fish species within WRIA 8 have been included for listing under the Endangered Species Act (ESA) as threatened species—Chinook salmon, steelhead, and bull trout. Recovery actions have been identified for multiple salmonid species within WRIA 8. These actions generally focus on improving water quality, freshwater habitat, and operational improvements at Ballard Locks (Shared Strategy for Puget Sound 2007).

The study area also includes the Grays Harbor estuary and the cities of Aberdeen and Hoquiam. These areas have a long maritime history with the only deep-water port on the Pacific Coast north of San Francisco combined with their proximity to timber harvesting operations. The salmonids in WRIAs 22 and 23 depend upon the estuary for food, rearing, and migration habitat. The estuary is currently in relatively good condition. The loss of nearshore habitat, degraded water quality, and routine ship channel dredging are the primary issues of concern (The Chehalis Basin Partnership 2008).

### How are the fish and aquatic habitat conditions likely to change in the reasonably foreseeable future without the project?

Some WRIA 8 salmonid stocks have appeared to stabilize due to improved management and recovery efforts. However, continued recent and current trends and stressors (such as continued regional population growth and global climate change) indicate that, under the No Build Alternative, the condition of fish and aquatic habitat would most likely continue along a downward trend into the reasonably

foreseeable future. These factors are directly influenced by ocean temperatures and circulation patterns, which are influenced by climate processes and might be negatively affected by global climate change associated with GHG emissions.

Large-scale restoration plans and activities are currently being implemented in the study area, and throughout the Puget Sound area. These activities might slow, or even halt, the existing downward trends in fish populations. For example, Shared Strategy for Puget Sound is a collaborative initiative to restore and protect salmon runs across Puget Sound. Shared Strategy for Puget Sound coordinates with existing recovery efforts and works with federal, tribal, state, and local governments, businesses, and conservation groups. Fifteen watersheds, including Lake Washington, are participating in the Shared Strategy process to identify actions to recover salmon and obtain the commitments needed to achieve the actions. Goals for Lake Washington include improvements to fish access/passage, riparian restoration projects, improvements in water quantity and quality, and protection/preservation of existing high-quality habitat. The Chehalis Basin Partnership is another example of watershed planning and restoration occurring in the study area.

In addition, the added protection provided to species listed as threatened or endangered under the federal ESA, as well as their designated critical habitat, would improve conditions for other species occurring in the area. This is particularly true for other salmonid species, which occupy similar habitats as the three salmonids species currently protected by the ESA.

### What would the cumulative effect on fish and aquatic resources likely be?

The analyst reviewed the present actions and reasonably foreseeable future actions from the relevant exhibits in the Ecosystems Discipline Report (WSDOT 2009f). The reasonably foreseeable future actions that have the potential to affect fisheries resources can be grouped into two basic project types—transportation and larger-scale residential/commercial development projects. Note that the Pontoon Construction Project and the Medina to SR 202 project, both transportation-related projects, were included in the analysis as present actions and reasonably foreseeable future actions. These two transportation projects could be completed or under construction while the I-5 to Medina project is being built. The identified reasonably foreseeable future actions could contribute to the continued decline of

fish stocks in WRIAs 8 and 22 through (1) continued alteration of ecosystem processes, (2) changes in flow regimes, and (3) increased impervious surface area leading to increased water pollutant loading to area waterways. However, compared to the number and magnitude of existing stressors within the study area, the analyst determined that effects from the reasonably foreseeable future actions, including the project's contribution, to existing fisheries trends or stressors would be relatively minor because:

- The study area is so large, with ecosystem-wide stressors (decreased water quality and water temperature/ocean current alterations due to global climate change).
- Individual fish from these watersheds might be negatively affected, not only within the watersheds, but in the Pacific Ocean, up to 2,000 miles from the study area.

The increase in overwater structures could result in some additional delays in juvenile salmon migration rates through the study area and could potentially provide additional habitat for predator species. Such changes could continue to affect future generations of juvenile salmonids, rearing or migrating through the project area. On the basis of recent behavioral evaluations in the study area, these effects are expected to be minor (Celedonia et al. 2008a).

The long-term effects of the larger replacement bridge on aquatic habitat could result in somewhat greater effects on migration rates through the study area, compared to the existing bridge. It is possible that the increased height of the replacement bridge, near the west highrise, could offset some of the potential shading effects of the wider structure. The west highrise area is a primary migration corridor for juvenile salmonids passing through the study area (Celedonia et al. 2008a, Celedonia et al. 2008b).

The increased width and depth of the floating pontoons could affect the wind-driven water currents in the lake, potentially affecting the mixing patterns and limnological processes in the lake. Any substantial change could affect the productivity and food availability in the lake, and in turn affect the capacity of the lake to support fish and other aquatic species. However, given the size of the lake, the relatively minor changes in the bridge design characteristics are not expected to measurably affect the capacity or productivity of the lake ecosystem.

Including the expected mitigation developed to address potential project impacts, the improvements over present conditions resulting from the project could offset the temporary adverse construction effects, and the improvements over present conditions would extend farther into the future. For example, the treatment of stormwater runoff from the bridge and upland road surfaces in the study area would be a long-term improvement relative to existing conditions in which no stormwater treatment is provided. Other long-term improvements over present conditions would include the increased height of the overwater structures in many areas and the reduced number of in-water columns.

Despite the expected improvements in water quality resulting from the treatment of stormwater and the changes in in-water structures, the contribution of the I-5 to Medina project to the cumulative effect on long-term fisheries trends and stressors would be negligible. This is true for the same reasons discussed previously for other reasonably foreseeable future actions.

Based on the estimated fish populations within the study area, I-5 to Medina project actions are expected to affect only a portion of all of the fish occurring in the watersheds. Furthermore, the amount of habitat within the study area represents only an extremely small fraction of the habitat available within the area watersheds, and only a small portion of that fraction is regularly used by anadromous species (primarily the nearshore and shallow water habitat areas). Considering the expansive marine habitat used by these species, the habitat in the study area represents only a small fraction of the total fish habitat used by these fish during their life cycles. In summary, the I-5 to Medina project's contribution to the overall condition of fish and aquatic resources within the study area would not measurably influence the overall cumulative effect on these resources.

### How could the cumulative effect on fish and aquatic resources be mitigated?

A variety of measures could mitigate the cumulative effects on fish and aquatic resources, such as the following:

- A region-wide cooperative interagency approach or public-private partnerships, with a focus on improving fish habitat conditions and water quality within WRIAs 8 and 22 and Puget Sound, would aid in the recovery of fish stocks.

More stringent land use regulations could reduce future negative effects on fish associated with stormwater runoff and human development.

## Wildlife and Wildlife Habitat

### What direct and indirect effects would the project likely have on wildlife and wildlife habitat?

The wildlife species and habitat types potentially affected by the alternatives are identified and described in the Ecosystems Discipline Report (WSDOT 2009f). As discussed in that report, the I-5 to Medina project would directly affect wildlife and wildlife habitat from both construction and operation of the 6-Lane Alternative. Construction activities that might affect wildlife and wildlife habitat include construction work bridges, finger piers that extend from the work bridges to the support piles, falsework, a detour bridge, staging areas, and construction access roads. Activities related to construction of any of the options for the 6-Lane Alternative would disturb wildlife and might cause them to leave the study area. Many of the animals that occur adjacent to the highway corridor (for example, raccoons, crows, and waterfowl) are accustomed to living in urban areas and may not be disturbed by construction-related activity and habitat alteration. Individuals that are more sensitive to disturbance would be displaced to other areas of suitable habitat. Construction and transport of pontoons could also cause short-term disturbance of marine wildlife found in the waters of the outer Washington coast, the Strait of Juan de Fuca, and Puget Sound. None of these effects would be permanent, and urbanized wildlife are generally adaptable to changing conditions.

For operation of the 6-Lane Alternative, all of the options and suboptions could affect wildlife by permanently removing or shading vegetation and other features of wildlife habitat, but also by improving stormwater treatment, decreasing noise disturbance, and reducing barriers to animal movement. Specific effects on wildlife would vary by species and throughout the I-5 to Medina project corridor. Additional indirect effects may occur if any animals move to other areas in response to habitat loss, displacing individuals already present in those areas.

These types of effects were considered direct effects in the Ecosystems Discipline Report (WSDOT 2009f). WSDOT would minimize potential

direct effects from project construction and operation, as discussed in that report.

## How was the cumulative effects assessment of wildlife and wildlife habitat conducted?

*Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008) was used to analyze potential indirect effects of the project on wildlife and wildlife habitat. The analysts reviewed relevant scientific literature on the effects of transportation projects on wildlife and wildlife habitat and compared these to the potential effects of the 6-Lane Alternative. Transportation projects were specifically reviewed because they are long, linear structures that cut across landscapes, potentially affecting ecological resources differently than site development projects. The review focused on activities that have long-term or far-reaching effects on wildlife and wildlife habitat.

In some cases, identified direct or indirect effects of the project on other resources could indirectly affect wildlife and wildlife habitat. Therefore, the analysts reviewed all potential cross-disciplinary effects that could affect wildlife and wildlife habitat. The review included other discipline reports as well as direct communication with other authors. Discipline reports reviewed included the other disciplines (wetlands and aquatic resources) in the Ecosystems Discipline Report (WSDOT 2009f) and the Transportation, Recreation, Noise, and Cultural Resources discipline reports (WSDOT 2009h, WSDOT 2009k, WSDOT 2009b, and WSDOT 2009g, respectively).

The I-5 to Medina project has the potential to affect reptiles, amphibians, mammals, and birds along the SR 520 corridor as well as marine wildlife and birds along the pontoon transportation route. For this reason, the study area also includes WRIA 8, Puget Sound, the Georgia Strait, and the Strait of Juan De Fuca.

## What trends have led to the present wildlife and wildlife habitat conditions in the study area?

Chapter 10 of the *Transportation 2040 Draft EIS* (PSRC 2009a), Ecosystems and Endangered Species Act Issues, provides an overview of ecosystems, including wildlife, and trends in the Puget Sound Region. Past actions have adversely affected wildlife habitat within the study area. Current trends in habitat quality and quantity are expected to continue in response to present actions and reasonably foreseeable future actions. These actions include alteration of ecosystem processes;

loss, alteration, and fragmentation of suitable habitat; introduction of invasive species; overharvesting; increases in impervious surface area and water pollution; and changes in natural flow regimes. Taken together, these effects have resulted in significant loss of wildlife habitat in WRIA 8. Transportation systems, which are a component of the overall urban development pattern within the Central Puget Sound Region, have historically played a key part in these ecosystem changes (PSRC 2009a).

### How are wildlife and wildlife habitat conditions likely to change in the reasonably foreseeable future without the project?

In the reasonably foreseeable future without the I-5 to Medina project, wildlife and wildlife habitat, with the exception of urban-adapted wildlife, would likely continue to decline as the factors affecting wildlife mentioned above continue. However, the ESA and other federal, state, and local regulations are designed to protect wildlife and the ecosystems upon which they depend. Regulatory and voluntary efforts to improve habitat are expected to continue with or without the project.

The coastal route for shipping the pontoons contains suitable habitat and/or sightings of six ESA-listed species—leatherback sea turtle, southern resident killer whale, humpback whale, Steller sea lion, brown pelican, and marbled murrelet—as well as designated critical habitat for the southern resident killer whale population. No species listed under the ESA occur along the SR 520 corridor, although the bald eagle receives protection under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

### What would the cumulative effect on wildlife and wildlife habitat likely be?

In general, wildlife within in the study area has been substantially affected and will continue to be affected by past actions, present actions, and reasonably foreseeable future actions. The availability of suitable habitat for many species of wildlife would likely continue to decline. In contrast, wildlife adapted to urban conditions (such as crows, sparrows, and raccoons) would likely continue to flourish.

WSDOT has made efforts to avoid and minimize negative effects to wildlife. However, there would be a permanent loss of wildlife habitat under all 6-Lane Alternative options. Adverse effects associated with

habitat loss may be offset to some degree by long-term improvements in stormwater quality, decreased noise disturbance, and reduced barriers to animal movement. Urban habitats in the SR 520 corridor are not likely to provide key habitat for the maintenance of wildlife populations that are threatened by range-wide habitat degradation and loss. Considered with the effects of past, present, and reasonably foreseeable future actions, the direct effects of the project operation would be expected to have a negligible contribution to cumulative effects on wildlife in the study area.

### How could the cumulative effect on wildlife and wildlife habitat be mitigated?

Because there are many potential contributors to cumulative effects outside of WSDOT's jurisdiction, the agency will not attempt to mitigate adverse cumulative effects. However, a variety of measures could mitigate the overall (non-project related) cumulative effects on wildlife, such as the following:

- More stringent regulations
- Improved planning on a larger scale
- Better coordination among agencies
- National or global agreements limiting the emission of GHGs that could help slow or stop the manifestations of global climate change
- Voluntary efforts by individual developers, at relatively small additional cost. These efforts could create small but, with time, cumulatively substantial new habitat areas to slow and offset cumulative habitat loss from past development. Such measures could include:
  - Using native plants in landscaping
  - Designing curved or irregular rather than straight boundaries between vegetated and non-vegetated areas
  - Leaving islands of native vegetation connected by vegetated corridors
  - Providing vegetated buffers along streams

# Geology and Soils

## What direct and indirect effects would the project likely have on geology and soils?

As discussed more fully in the Geology and Soils Discipline Report (WSDOT 2009q), building the 6-Lane Alternative could have a number of direct effects related to geology or soil conditions, including soil erosion and runoff during heavy rains, site-specific topographic changes, local slope instability and landslides, ground disturbance from vibrations during pile-driving and heavy equipment use, and soil compression. These effects are carefully considered for highway construction projects, and WSDOT would apply BMPs to avoid or minimize them. WSDOT anticipates that the effects of construction would be temporary and minor.

Direct effects during operation of the 6-Lane Alternative could include slope instability, erosion, and landslides; changes in groundwater flow; and long-term soil settlement. While the project would not cause seismic events, there is always a risk of seismic events occurring during the period of operation. The proposed project would be designed and built to withstand a major earthquake, as discussed in the Geology and Soils Discipline Report (WSDOT 2009q).

The only potential indirect effect associated with construction of this project relates to material use. Aggregate for concrete and other granular material for construction fill would be mined from borrow pits distant from the project site, reducing by a small amount the regional availability of aggregate and fill for use on other projects. Because material extraction would occur farther in distance from the SR 520 corridor than other construction effects, this is considered to be a minor indirect effect of the project.

## What are geology and soils-related cumulative effects and how are they assessed?

### How was the cumulative effects assessment on geology and soils conducted?

The analyst considered cumulative effects on geology and soils to be lasting changes to landforms, terrain, soil conditions, subsurface features, mineral material supplies, and other regional geophysical characteristics occurring as trends over long periods.

The analyst reviewed the literature on trends affecting geology and soils in the study area, the central Puget Sound region. The information sources included *Vision 2030* and the *Transportation 2040 Draft EIS* (PSRC 2008, PSRC 2009a). Next, the analyst considered other past and present actions that have already affected the geology and soils in the study area. Then, the probable effects of other projects that are planned, but not yet built, were considered. The analyst combined these past actions, present actions, and reasonably foreseeable future actions along with the expected direct and indirect effects of the proposed project to produce a comprehensive view of potential cumulative effects. This helped to provide an understanding of how the SR 520 project might contribute to trends affecting geology and soils.

### What trends have led to the present geology and soils conditions in the Puget Sound region?

Puget Sound has undergone multiple glaciations that have deposited a variety of soil types (PSRC 2009a). Supplies of aggregate, including sand and gravel, are in the many millions of tons and gravel mines are located throughout the Puget Sound region.

In the vicinity of the corridor, human activities since the late nineteenth century have substantially changed the topography by actions that include lowering Lake Washington; construction of the Montlake Cut; and substantial terrain alterations to build the I-5 and SR 520 roadways, the University of Washington campus, and other buildings and structures along the SR 520 corridor.

Past construction practices were less effective than today's standards in anticipating geologic and seismic hazards, gravel depletion, and soil erosion. As the infrastructure aged, a greater percentage of constructed projects did not meet evolving seismic design standards. As these trends became evident, roadway and bridge design codes were updated to provide better protection for the public, resulting in facilities that are more capable of resisting seismic events without damage. BMPs are standard practice in protecting against soil erosion and landslide potential. Construction debris can now be recycled into usable building materials.

### How would geology and soils likely change in the reasonably foreseeable future without the project?

Planned projects would continue to result in minor changes to topography through excavation and filling. Near the project area, for

example, the Medina to SR 202: Transit and HOV project, the East Link light rail project, the North Link Light Rail Station at Husky Stadium project, and the University of Washington Campus Master Plan would all contribute to changes in the adjacent topography. However, these and other transportation and development projects would be constructed to ever-evolving design and seismic safety standards; no negative effects to geologic and soil conditions would be likely.

Planned construction projects would likely require sand, gravel, and other mineral materials extracted from borrow sites. Over the long-term, this could result in development of new borrow sites or expansion of existing sites to maintain adequate supplies for construction.

### What would the cumulative effect on geology and soils likely be?

The SR 520 project would be constructed to current seismic standards and would decrease the risks associated with a seismic event along a major transportation corridor used by thousands of people every day.

Construction of the project would contribute towards depleting regional sources of aggregate in conjunction with other past, present, and reasonable and foreseeable projects in the central Puget Sound region. However, given the large supply of aggregate across the region, no adverse cumulative effects would be anticipated.

### How could the cumulative effect on geology and soils be mitigated?

The incremental reduction of aggregate supply cannot be avoided, but reuse of demolition debris and excavated soils could mitigate this cumulative effect. County and local governments and the state Department of Natural Resources (DNR) regulate extraction and mining in Washington state and require reclamation plans to restore gravel pits to a vegetated condition after use.

## Hazardous Materials

Hazardous materials are not themselves a resource that would be evaluated for cumulative effects. Hazardous materials can, however, enter the air and water and eventually affect human health and ecosystems. Hazardous materials can be associated with contaminated soils and groundwater, building materials encountered through demolition, accidental spills at construction sites, and leaking

underground storage tanks. Depending on the type of contamination, there can be risks to worker safety and public health as well as environmental damage.

The risk of encountering hazardous materials during the construction of this project is low, however, and safeguards would be in place to minimize temporary impacts, including the WSDOT Spill Prevention Control and Countermeasures (SPCC) Plan for construction projects. The 6-Lane Build Alternative would further contribute to the gradual reduction in existing ground and water contamination by removing hazardous materials that might be encountered during construction. See the Hazardous Materials Discipline Report (WSDOT 2009r) for additional information.

Transportation improvement projects improve hazardous materials conditions because contaminated soil or water encountered during construction must be removed and disposed of, leaving the site cleaner than it was before. The *Transportation 2040 Draft EIS* (PSRC 2009a) concludes that future projects will continue a positive, declining trend in the total amount of hazardous materials present in the central Puget Sound region.

# Navigation

## What direct and indirect effects would the project likely have on navigation?

During construction, the east and west navigation channels would be closed during certain periods (for example, for placement of the new transition spans). Construction would be staged so that the channels would not be closed on the same days and a "Local Notice to Mariners" would be distributed by the U.S. Coast Guard to inform vessel traffic ahead of any closures.

Once the project was operational, there would be no direct impacts. The new clearance would match or exceed that of the I-90 East Channel Bridge. Limiting clearance under the Evergreen Point Bridge to that of the I-90 East Channel Bridge is not anticipated to result in substantial or adverse indirect effects on navigation conditions. Currently, navigation on Lake Washington is constrained by the East Channel Bridge, which has a fixed clearance of 71 feet. Vessels that require access to both sides of the bridge include the Foss crane derrick on Lake Washington, which can be modified to clear the 70-foot clearance limit. The Seattle Fire Department's *Engine One* has an extendable

mast that can be lowered to a minimum height of 40 feet (Seattle Fire Department, Seattle, Washington. March 2009. Personal communication).

Some indirect effects could be experienced by recreational boaters and contractors that work on the lake. Recreational sailboats that exceed 70 feet and want to cross under the bridge would need to lower their masts. In addition, emergency repairs of sewer lines that cross under Lake Washington may be required in the future. Barges and cranes required for any future repairs would have to be able to accommodate the clearance limits or be launched from locations that would prevent the need to cross under the bridge.

There are currently no projects proposed by jurisdictions along the lake that would require large vessel traffic that would be indirectly affected by the 70-foot clearance limit; see the Navigable Waterways Discipline Report (WSDOT 2009s) for more information.

## How was the cumulative effects assessment of navigation conducted?

The cumulative effects analysis followed the *Guidance on Preparing Cumulative Impact Analyses* (WSDOT et al. 2008), which outlines a process to assess how past and present actions, in combination with reasonably foreseeable actions, may contribute to a cumulative effect on a resource.

Reasonably foreseeable actions that were considered in the cumulative effects discussion include the Pontoon Construction Project, the Eastside Transit and HOV project, and Sound Transit's East Link and North Link light rail projects.

## What trends have led to the present navigation condition in the study area?

Construction of the Lake Washington Ship Canal in 1917 by the USACE established a series of dredged navigation channels linking Lake Washington with the marine waters of Puget Sound. The Ballard Locks and Lake Washington Ship Canal opened Lake Washington to larger vessels and expanded recreational boater use of Lake Washington.

Subsequent construction of the I-90 and SR 520 floating bridges across Lake Washington in the 1950s and 1960s established a set of horizontal and vertical clearances. Since 1995, the annual number of Evergreen Point Bridge openings has been low. Annual openings decreased from 14 in 1995 to 0 in 2003; since 2003, annual openings have been between

0 and 6 for all years except 2006 and 2008, which had 10 openings each. In contrast, the Montlake and University Bridge openings ranged between 1,000 and 3,000 over the last 10 years. This number of openings is an indicator of the number of recreational boats that pass back and forth between Lake Washington and Lake Union or through the Lake Washington Ship Canal to Puget Sound.

## How is the navigation condition likely to change in the reasonably foreseeable future without the project?

Without the project, the existing navigation conditions would remain. The east navigation channel of the Evergreen Point Bridge rises 55 to 64 feet above the water and is 207 feet wide. The west highrise has a vertical clearance of 44 feet and is 206 feet wide. The drawbridge has no height limitation and is 200 feet wide when open. No foreseeable development actions were identified on Lake Washington that would further modify either the vertical or horizontal restrictions on vessel traffic south of the replacement floating portion of the Evergreen Point Bridge. Sound Transit's East Link light rail project would cross I-90 but would not change the navigational limits of the East Channel Bridge; the North Link light rail project would cross under the Montlake Cut in a tunnel.

## What would the cumulative effect on navigation likely be?

The closure of the mid-span drawbridge would impose a vertical height limitation on vessel traffic moving south of the floating portion of the Evergreen Point Bridge, and would impose an additional clearance limit on Lake Washington overall. Because the clearance limit would essentially match that of the I-90 lake crossing, and because there would be minimal effects to vessels that use the lake, no adverse cumulative effects to navigation were identified. In addition, there would be no permanent effects to navigation from the SR 520 project in conjunction with Pontoon Construction Project.

## How could the cumulative effect on navigation be mitigated?

The U.S. Coast Guard approves the location and clearances of bridges crossing navigable waterways by issuing a bridge permit under the authority of the General Bridge Act of 1946 and Section 9 of the Rivers

and Harbors Act of 1899. Agreements between FHWA and the U.S. Coast Guard are in place to ensure that the potential effects of bridge projects on navigable waterways be evaluated through the NEPA process.

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# Attachment 1

## Reasonably Foreseeable Future Actions—Land Use Plans or Projects

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| 26 | Car Top Boat Launch and Portage Bay Vista | University of Washington | 1409 NE Boat Street | The car-top boat launch is the result of an agreement between the City of Seattle and the University of Washington that allowed UW to vacate a portion of 15th Avenue as part of its Campus Master Plan, and relocate the renovated marina to 1401 NE Boat Street. | Due to the site location's proximity to Sound Transit's University Link alignment, the City of Seattle and UW have agreed to complete construction within 18 months of completion of the University Link Project. | Westside |
| 27 | University of Washington Medical Center Master Plan | University of Washington | City of Seattle | Construct new in-patient tower to increase bed capacity, provide additional teaching space and diagnostic imaging capacity; the new tower allows for greater NICU bed capacity which is critical for preserving the option for a joint prenatal program with Children's Regional Hospital and Medical Center. | TBD | Westside |
| 28 | Mixed Use development | Community Birth and Health LLC | 2200 24th Avenue East | This proposal is for a 3-story building with 5 residential units and 11,140 square feet of medical service, a community center and institute for advanced studies, and a restaurant along with 2,832 square feet of retail at ground floor. Parking for 43 vehicles will be located in below-grade garage. | 2006 – Present | Westside |
| 29 | Mixed Use development | Private Development | City of Seattle (4301 Roosevelt Way NE) | Construct a 6-story mixed use development with parking at-grade and below-grade for approximately 152 cars on 43rd Avenue NE between Roosevelt Way NE and 9th Avenue NE. | 2004 - Present | Westside |
| 30 | Mixed Use development | Private Development | 400 NE 45th Street, City of Seattle | Convert existing hotel to mixed use building with 84 units. | 2004 - Present | Westside |
| 31 | Mixed Use development | Private Development | 4201 15th Avenue NE, City of Seattle | The proposal is for a 6-story residential (c. 48 units) and commercial structure with accessory parking at northeast corner of NE 42nd and 15th Avenue NE. | 2005 - Present | Westside |
| 32 | Mixed Use development | Private Development | 5611 University Way NE | The proposal is for a 4-story building containing 2,100 square feet of retail at ground level with 12 apartments units on levels one through four; parking for 15 vehicles to be provided in one level below | 2005 - Present | Westside |

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| | | | | grade. The project includes future demolition of existing structures | | |
| 33 | Mixed Use development | Private Development | 4730 University Way NE | Master Use permit to establish use for future construction of a 7-story building containing 8,000 square feet of retail at ground level; 13,000 square feet of administrative offices on the second level; 125 apartment units on levels 3-7 with 88 existing units to remain; parking for 161 vehicles to be provided in four levels at and below grade. | 2005 - Present | Westside |
| 34 | University of Washington Campus Master Plan | University of Washington | City of Seattle | The Campus Master Plan has been implemented since 2001 and responds to the reporting requirements as directed by Ordinance 121193 (City of Seattle). The 2007-2009 Capital Facilities Update plans for the development of approximately 1.35 million gross square feet between 2007 and 2013 within the University Campus boundaries. | 2002 - 2013 (2007-2009 Campus Facility Update) | Westside |
| 35 | Town Center District Plan | City of Mercer Island | City of Mercer Island | To support the development of the Town Center District as the primary urban center for Mercer Island. | Currently being implemented | Westside |
| 36 | Aljoya at Mercer Island (ERA Living Senior Housing) | Private Development | City of Mercer Island | 112 independent and assisted-living units; 24,829 square feet resident amenities | Under construction | Westside |
| 37 | 7800 Plaza | Private Development | City of Mercer Island | 9,181 square feet commercial; 24 units | Under construction | Eastside |
| 38 | 7700 Central | Private Development | City of Mercer Island | 18,000 square feet retail; 189 units | In design | Westside |
| 39 | BRE | Private Development | City of Mercer Island | 14,100 square feet commercial; 165 units | In review | Westside |
| 79 | Downtown Implementation and Subarea Plan | City of Bellevue | City of Bellevue | This plan will support the development of downtown Bellevue as the primary urban center of the Eastside. | Document completed 2006, implementation ongoing | Eastside |
| 80 | Bel-Red Corridor Plan | City of Bellevue | City of Bellevue | The proposed action is the adoption of amendments to various City planning documents to designate new land uses and identify supporting transportation improvements for redevelopment of the Bel- | Document completed 2007, implementation ongoing | Eastside |

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| | | | | Red corridor. | | |
| 81 | Ashwood II | Private Development | City of Bellevue | 274 residential units | Under construction | Eastside |
| 82 | Belcarra Apartments | Private Development | City of Bellevue | 320 apartments; 11,500 square feet retail | Under construction | Eastside |
| 83 | Bellevue Place Hyatt Hotel | Private Development | City of Bellevue | 350 hotel rooms; 130,000 square feet exhibition | Under construction | Eastside |
| 84 | Bravern | Private Development | City of Bellevue | 620,000 square feet office; 240,000 square feet retail; 456 residential units | Under construction | Eastside |
| 85 | City Center East | Private Development | City of Bellevue | 700,000 square feet office and retail | Under construction | Eastside |
| 86 | Bellevue Towers | Private Development | City of Bellevue | 480 condos; 22,500 square feet retail | Under construction | Eastside |
| 87 | The Ashton | Private Development | City of Bellevue | 202 residential units; 2,000 square feet retail | Under construction | Eastside |
| 88 | Metro 112 | Private Development | City of Bellevue | 300 apartments; 25,000 square feet commercial | Under construction | Eastside |
| 89 | Meydenbauer Inn | Private Development | City of Bellevue | 68 apartments | Under construction | Eastside |
| 90 | One Main | Private Development | City of Bellevue | 62 residential units; 4,800 square feet retail | Under construction | Eastside |
| 91 | The Summit Building C | Private Development | City of Bellevue | 300,000 square feet office | Under construction | Eastside |
| 92 | Avalon at NE 10th Street | Private Development | City of Bellevue | 400 residential units; 8,000 square feet retail | In review | Eastside |
| 93 | Bellevue at Main Street | Private Development | City of Bellevue | 138 apartments; 33,000 square feet retail | In review | Eastside |
| 94 | Bellevue Plaza | Private Development | City of Bellevue | 800 residential units; 160,000 square feet retail | In review | Eastside |
| 95 | Euro Tower I | Private Development | City of Bellevue | 18 residential units | In review | Eastside |
| 96 | Hanover Bellevue Cadillac | Private Development | City of Bellevue | 312 residential units; 18,000 square feet retail | In review | Eastside |

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| 97 | Marriott Hotel | Private Development | City of Bellevue | 376 rooms | In review | Eastside |
| 98 | Legacy Apartments | Private Development | City of Bellevue | 250 apartments; 11,000 square feet retail | In review | Eastside |
| 99 | Lincoln Square II | Private Development | City of Bellevue | 120-room hotel; 200 residential units; 500,000 square feet office; 392,000 square feet retail | In review | Eastside |
| 100 | 8th Street Office Highrise | Private Development | City of Bellevue | 800,000 square feet office; 10,000 square feet retail | In review | Eastside |
| 101 | The Essex | Private Development | City of Bellevue | 40 residential units | In review | Eastside |
| 102 | Vida Condominiums | Private Development | City of Bellevue | 241 residential units; 8,000 square feet retail | In review | Eastside |
| 103 | Vantana on Main | Private Development | City of Bellevue | 68 apartments | In review | Eastside |
| 104 | Pacific Regent Phase II | Private Development | City of Bellevue | Senior housing, 168 units | In review | Eastside |
| 105 | NE 12th Substation | Private Development | City of Bellevue | Upgrade of Puget Sound Energy substation on NE 12th Street | Unknown | Eastside |
| 106 | Overlake Neighborhood Plan Update and Implementation (Redmond) | City of Redmond | City of Redmond | The updated Overlake Neighborhood Plan includes land use changes and public investments for the Overlake Neighborhood through 2030. | Plan approved in 2007, implementation ongoing | Eastside |
| 107 | Redmond Downtown Neighborhood Plan | City of Redmond | City of Redmond | The Downtown Neighborhood Plan includes land use changes and public investment for the Downtown Neighborhood through 2022. | Plan approved in 2006, implementation ongoing | Eastside |
| 108 | Microsoft Expansion (Microsoft/Redmond) | Private Development | City of Redmond | Microsoft is expanding its Redmond Campus to include an additional 3.1 million square feet of new office to accommodate an additional roughly 12,000 employees. | Under construction | Eastside |
| 109 | Group Health Property | Private Development | City of Redmond | 665,000 square feet of office; 190,000 square feet of retail; 290 room hotel; 1,445 residential units; 5,152 parking stalls | Master Planning, 2008 | Eastside |
| 110 | Redmond River Park | Private Development | City of Redmond | 316 apartments; 145 room hotel; 108,600 square feet office; 18,800 square feet retail | Under construction | Eastside |

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| 111 | Cleveland Street West | Private Development | City of Redmond | 135 condos; 6,000 square feet retail | In review | Eastside |
| 112 | Cleveland Street East | Private Development | City of Redmond | 115 condos; 6,500 square feet retail | In review | Eastside |
| 113 | Portula'ca | Private Development | City of Redmond | 24 town homes | Under construction | Eastside |
| 114 | Center Pointe | Private Development | City of Redmond | 130 condos; 15,000 square feet retail | In review | Eastside |
| 115 | Tudor Manor | Private Development | City of Redmond | 9 townhouses | 2008 | Eastside |
| 116 | Perrigo Park | Private Development | City of Redmond | 15 condos | In review | Eastside |
| 117 | White Swan | Private Development | City of Redmond | 38 condos; 12,000 square feet retail | Under construction | Eastside |
| 118 | Redmond Court | Private Development | City of Redmond | 21 townhomes | Under construction | Eastside |
| 119 | Parkside Apartments | Private Development | City of Redmond | 60 apartments | In review | Eastside |
| 120 | Bellevue/Redmond Overlake Transportation Study (BROTS) (Bellevue/Redmond) | City of Redmond/City of Bellevue | City of Redmond/City of Bellevue | The objective of BROTS is to jointly manage land use and traffic congestion in the Overlake neighborhood and Bel-Red Corridor. | Ongoing; adoption of successor agreement targeted for 2008 | Eastside |
| 121 | Redmond Transit Oriented Development | King County | City of Redmond | Three-story parking garage; 324 apartments; 15,000 square feet retail | Under construction | Eastside |
| 122 | Expressway Nature Trail | City of Clyde Hill | City of Clyde Hill | Acquire two wooded parcels of land from the State Department of Transportation to develop a simple nature trail along SR 520 from 92nd Avenue NE to 96th Avenue NE. The trail could connect to other trails in Clyde Hill, Medina, and Hunts Point. Development of the trail segment could involve the State's help in installing an earthen berm along the right-of-way to help buffer the trail and reduce traffic noise. | Complete by 2022 | Eastside |
| 123 | Fairweather Nature Preserve Long Range | City of Medina | City of Medina | The 11-acre Fairweather Park and Nature Preserve is located off Evergreen Point Road | 2020 | Eastside |

Attachment 1. **Reasonably Foreseeable Future Actions—Land Use Plans or Projects**

| Map ID | Project | Proponent | Location | Purpose | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|
| | Park Improvements | | | and is adjacent to the north side of SR 520. The City of Medina will work to continue the establishment of a long-term landscaping, maintenance, and usage plan that will maintain this site in a manner that is consistent with and enhances public use. | | |
| 124 | Overlake Hospital Master Plan | City of Bellevue | City of Bellevue | The Overlake Hospital Master Development Plan (and 2005 amendments) are intended to provide for the development of the Overlake Hospital campus over the next 25 years, and encourage comprehensive long-term master development planning for the existing campus and surrounding area. | Implementation ongoing | Eastside |

# Attachment 2

## Reasonably Foreseeable Future Actions—Transportation-Related Projects

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 1 | Mercer Corridor Improvements | City of Seattle | City of Seattle | Widen Mercer Street between I-5 and Dexter Avenue North to accommodate three lanes in each direction, parking, sidewalks, and left turn lanes to reduce congestion and improve pedestrian safety. | Roadway or Arterial | Complete by 2011 | Westside |
| 2 | Spokane Street Viaduct Project | City of Seattle | City of Seattle | Add general purpose lane in each direction to reduce congestion, build eastbound off-ramp at 4th Avenue South to improve access to downtown Seattle. | Roadway or Arterial | 2008 - 2011 | Westside |
| 3 | King County *Transit Now* – Aurora, Ballard, West Seattle, Eastside, and Pacific Highway BRT Corridor | King County Metro | City of Seattle | Provide Bus Rapid Transit (BRT) service on arterial street corridors on high ridership routes in rapidly developing neighborhoods. | Roadway or Arterial | 2007 - 2016 | Eastside |
| 4 | I-5: Pierce County Line to Tukwila Stage 4 HOV Program | WSDOT | King County | This project widens I-5 between South 320th Street and the Pierce County line by adding an HOV lane for carpools, vanpools, and buses to both directions of the freeway. This is part of WSDOT's comprehensive plan to add carpool lanes on I-5 south through the Tacoma urban area. | Roadway or Arterial | Complete by 2030 | Westside |
| 5 | I-5 Improvements: Port of Tacoma Road to the King/Pierce County Line | WSDOT | Pierce County | Widen I-5 for HOV lanes in each direction between the Port of Tacoma Road and the King/Pierce County line. Six bridges crossing Wapato Creek and Hylebos Creek will be widened. Traffic cameras will be added to monitor traffic flows and to inform drivers of traffic conditions. Metering signals will be installed on the northbound and southbound on-ramps at the 54th Avenue Interchange. The on-ramps will also be widened to allow HOV traffic to bypass the ramp metering signals. | Roadway or Arterial | Complete by 2030 | Westside |
| 6 | I-5: Pierce County Line to South 320th Street | WSDOT | King County | This project extended HOV lanes in both directions of I-5 from downtown Seattle to the Pierce County line and also improved roadway surfaces. | Roadway or Arterial | Complete by 2030 | Westside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 7 | I-5: 38th Street to Port of Tacoma Road | WSDOT | City of Tacoma | Widen I-5 for HOV lanes in each direction between South 38th Street and Port of Tacoma Road to reduce travel times for transit and HOV. | Roadway or Arterial | 2011 - 2017 | Westside |
| 8 | SR 16: Olympic Drive (Gig Harbor) to Union Avenue (Tacoma) | WSDOT | Pierce County | This project constructs HOV Lanes on SR 16 from Olympic Drive in Gig Harbor to Union Avenue in Tacoma. There are currently four travel lanes that will expand to six lanes throughout the corridor when complete, with additional lanes provided between Union Avenue and 6th Avenue interchanges. | Roadway or Arterial | Complete by 2030 | Westside |
| 9 | SR 16: I-5 to Union | WSDOT | City of Tacoma | Widen SR 16 for HOV lanes in each direction between I-5 and South Union Avenue to reduce travel times for transit and HOV. | Roadway or Arterial | Complete by 2030 | Westside |
| 10 | SR 99: South 284th Street to South 272nd Street | WSDOT | City of Federal Way | HOV lanes were built in each direction for carpools, vanpools, and buses between South 284th Street and South 272nd Street on State Route 99 north of Federal Way. | Roadway or Arterial | Complete by 2030 | Westside |
| 11 | SR 99: (Shoreline) Aurora Avenue North Corridor Transit/HOV Lanes | WSDOT | City of Shoreline | Three miles of Aurora Avenue North will be redesigned and upgraded to increase driver and pedestrian safety and help reduce congestion. These include additional lanes for business access and transit, new sidewalks and crosswalks, lighting, additional signals and left and U-turn pockets for drivers, and undergrounding of overhead power lines. | Roadway or Arterial | Complete by 2030 | Westside |
| 12 | SR 161: Jovita Boulevard to South 360th Street | WSDOT | King County | This project widened State Route 161 (Enchanted Parkway) to four lanes from Milton Way in Milton to South 360th Street in Federal Way. Also added was a two-way, left-turn lane, sidewalks, and a bike lane in the commercial area from Military Road to Milton Way. | Roadway or Arterial | Complete by 2030 | Westside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 13 | SR 304: SR 3 to Bremerton Ferry Terminal | WSDOT | City of Bremerton | Traffic congestion between SR 3 and the Bremerton ferry terminal will be reduced by reconstructing and widening the existing roadway and constructing an HOV lane. | Roadway or Arterial | Complete by 2030 | Westside |
| 14 | SR 518: SeaTac Airport to I-5 /I-405 Interchange | WSDOT | King County | Add eastbound general purpose lane on SR 518 between airport and I-5/ I-405 interchange to reduce congestion and bottlenecking at the interchange. | Roadway or Arterial | Complete by 2030 | Westside |
| 15 | Sound Transit – Light rail between SeaTac Airport and Northgate | Sound Transit | King County | Provide light rail transit service between SeaTac Airport and Northgate Transit Center. This project has been broken into three distinctive segments: Central Link (SeaTac to Downtown), University Link (Downtown to UW), and North Link (UW to Northgate). The Central Link segment was completed in December 2008. | Transit | Completed in July 2009 (Central Link, SeaTac service complete in December 2009);<br>2009 - 2015 (University Link)<br>Construction TBD (North Link) | Westside |
| 16 | Seattle Streetcar | City of Seattle | City of Seattle | Provide streetcar service between Seattle waterfront and South Lake Union neighborhood. | Roadway or Arterial | Completed in October 2007 | Westside |
| 17 | University Link Light Rail Station at Husky Stadium | Sound Transit | City of Seattle | Provide light rail service between Downtown Seattle and University of Washington. | Transit | Complete by 2016; Light rail extension to Northgate is planned for 2020 | Westside |
| 18 | Sound Transit – Sounder Commuter Rail from Everett to Seattle | Sound Transit | King/Snohomish County | As of 2000, commuter rail service has been provided between Everett and Seattle as part of Sound Move Program (1996); as of February 2009, plans for signal and track upgrades by 2010 are currently under environmental review. | Transit | TBD | Westside |
| 19 | Sound Transit – Sounder Commuter Rail from Lakewood to Seattle | Sound Transit | Pierce/King County | As of 2000, commuter rail service has been provided between Tacoma and Seattle as part of the Sound Move Program (1996). As of February 2009, alternatives for planned service between Tacoma and Lakewood are currently under evaluation and conceptual design stages with construction estimated to occur by 2012. | Transit | 2012 - TBD | Westside |

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| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 20 | WSDOT Ferries: Bainbridge – Seattle Auto Ferry, Bremerton – Kingston Auto Ferry | WSDOT | King/Kitsap County | Operate two auto-capacity vessels year round. | Transit | | Westside |
| 21 | I-5: NE 175th Street to NE 205th Street – Northbound Auxiliary Lane | WSDOT | King County | This project constructed an additional lane on I-5 between the northbound NE 175th Street on-ramp and NE 205th Street exit in Shoreline. Widened the northbound NE 175th Street on-ramp to provide another metered lane; added a Washington State Patrol enforcement area, built sound walls, and created a stormwater collection and filtering system. | Roadway or Arterial | Complete by 2030 | Westside |
| 22 | SR 167: 15th Street SW to 15th Street NW | WSDOT | City of Auburn | This project added a northbound HOV lane and metered on-ramps from the Auburn Super Mall to Interstate 405 in Renton to address safety and reduce congestion along the corridor. | Roadway or Arterial | Completed in October 2008 | Westside |
| 23 | SR 167: SR 410 to 15th Street SW | WSDOT | Pierce County | Extend HOV lanes from 15th Street SW to SR 410 to add capacity and improve safety. | Roadway or Arterial | Complete by 2030 | Westside |
| 24 | Alaskan Way Viaduct and Seawall Replacement Project (South End and Central Waterfront Projects) | WSDOT | City of Seattle | This project is intended to replace the Alaskan Way Viaduct. Options for the central waterfront segment are currently being evaluated.. | Roadway or Arterial | Complete by 2030 | Westside |
| 25 | SR 519 Intermodal Access Project, Phase 2: South Atlantic Corridor (WSDOT) | WSDOT | City of Seattle | The intent of these improvements to SR 519 is to separate car, freight, pedestrian, and rail traffic to improve traffic flow and reduce the risk of collisions. | Roadway or Arterial | 2010 | Westside |
| 40 | I-90 Two-Way Transit and HOV Operations (WSDOT and Sound Transit) | WSDOT | Interstate-90 (King County) | The project will provide full-time HOV lanes for eastbound and westbound traffic on the outer I-90 roadways and will retain the existing reversible lane operations in the center roadway (Implementation of Alternative R-8A). | Roadway or Arterial | Stage 1 (2007), Stage 2 (2012), Stage 3 (2014) | Eastside |
| 41 | I-405 NE 10th Street Extension (WSDOT) | WSDOT | City of Bellevue | Phase 2 of the NE 10th Street Extension – WSDOT will construction | Roadway or Arterial | Under construction | Eastside |

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| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| | | | | the portion of the bridge over I-405. | | | |
| 42 | I-405 Bellevue Nickel Project: SE 8th to I-90 (WSDOT) | WSDOT | City of Bellevue | Addition of one new general-purpose lane in each direction along I-405 between SE 8th Street and I-90. Extend the southbound HOV lane from I-90 to SE 8th Street. | Roadway or Arterial | Under construction | Eastside |
| 43 | SR 520 /West Lake Sammamish to SR 202 Project (WSDOT) | WSDOT | City of Redmond | Project to widen SR 520 in Redmond from two to four lanes in each direction and build a new ramp from westbound SR 202 to westbound SR 520. | Roadway or Arterial | Under construction | Eastside |
| 44 | I-405 NE 8th Street to SR 520 Braided Crossing (WSDOT) | WSDOT | City of Bellevue | Construct new structures to separate northbound traffic exiting to SR 520 from traffic entering I-405 in Bellevue. The project also adds a new eastbound collector distributor lane along SR 520 to separate the on- and off-ramps between I-405 and 124th Avenue NE traffic and a new on ramp at NE 10th Street to SR 520. | Roadway or Arterial | 2009 | Eastside |
| 45 | NE 70th Street Extension | City of Redmond | City of Redmond | Construct new NE 70th Street from Redmond Way to 180th Avenue NE. Improvements include one through lane in each direction, left turn lanes, sidewalks, street lights, and storm drainage. | Roadway or Arterial | Unknown | Eastside |
| 46 | SR 520 and NE 36th Street Project (Redmond) | City of Redmond | City of Redmond | Microsoft and the City of Redmond have partnered to construct a bridge across SR 520 connecting NE 31st Street to NE 36 Street. | Roadway or Arterial | 2008 | Eastside |
| 47 | Old Lake Washington Boulevard Right-of-Way | City of Clyde Hill | City of Clyde Hill | Work with the City of Bellevue to formalize or better maintain this area for a walking/biking trail from Bellevue Way and possibly connection to the proposed Expressway Nature Trail. | Roadway or Arterial | Complete by 2023 | Eastside |
| 48 | SR 520: West Lake Sammamish Parkway to SR 202 | WSDOT | City of Redmond | Add two lanes in each direction on SR 520 from West Lake Sammamish Parkway to SR 202 to reduce congestion and improve safety. | Roadway or Arterial | Complete by 2030 | Eastside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 49 | SR 522: I-5 to I-405 Multi-modal Project | WSDOT | City of Lake Forest Park | Installed signal, crosswalk, and transit pull-out at NE 153rd Street. Replaced two-way left-turn lanes with raised medians and designated turn pockets to improve pedestrian safety. | Roadway or Arterial | Completed in October 2007 | Eastside |
| 50 | SR 900: SE 78th Street to Newport Way | WSDOT | City of Issaquah | Add one lane in each direction on SR 900 between Newport Way to SE 78th Street to eliminate the chokepoint at Newport Way and improve traffic flow through Issaquah to I-90. | Roadway or Arterial | Complete by 2030 | Eastside |
| 51 | SR 900: I-90 to Gilman Blvd | WSDOT | City of Issaquah | Add southbound general purpose lane, southbound dedicated bus lane, and northbound HOV lane to reduce travel time for transit and reduce congestion on SR 900. | Roadway or Arterial | Complete by 2030 | Eastside |
| 52 | SR 900: Park and Ride Lot (Newport Way) to I-90 WB Ramp | WSDOT | City of Issaquah | Add HOV lane to improve access to I-90 and reduce travel time for transit. | Roadway or Arterial | Complete by 2030 | Eastside |
| 53 | NE 2nd Street Extension | WSDOT | City of Bellevue | Extend NE 2nd Street across I-405 with ramps to and from the south to improve access to downtown Bellevue. | Roadway or Arterial | Complete by 2030 | Eastside |
| 54 | 118th Avenue NE Road Extension – north of NE 116th (new) to NE 118th Street | City of Kirkland | City of Kirkland | Extend approximately 450 feet of new 28-foot-wide roadway. Project requires obtaining approximately 22,500 square feet of right-of-way. Includes construction of 650 square feet retaining wall and a new 3-leg signal at NE 116th Street. | Roadway or Arterial | 2009 - 2014 | Eastside |
| 55 | NE 132nd Street Road Improvements – 100th Avenue to 132nd Avenue | City of Kirkland | City of Kirkland | Widen NE 132nd Street to accommodate two lanes in each direction, a center turn lane, and raised sidewalks to reduce congestion and improve pedestrian safety. New lanes could be converted to HOV lanes pending transit project at Totem Lake. | Roadway or Arterial | 2009 - 2014 | Eastside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 56 | 119th Avenue NE Road Extension – NE 128th Street to NE 130th Street | City of Kirkland | City of Kirkland | Extend approximately 600 feet of new 28-foot-wide roadway. Includes obtaining approximately 55,000 square feet of right-of-way. Project will include bicycle lanes, curb, gutter, and sidewalks. | Roadway or Arterial | 2009 - 2014 | Eastside |
| 57 | NE 130th Street Road Extension – Totem Lake Boulevard to 120th Avenue NE | City of Kirkland | City of Kirkland | Extend approximately 1,100 feet of new 28-foot-wide roadway. Includes obtaining approximately 72,000 square feet of right-of-way. Project will include bicycle lanes, curb, gutter, and sidewalks. Connect to access on the north side of Evergreen Hospital. | Roadway or Arterial | 2009 - 2014 | Eastside |
| 58 | NE 120th Street Road Improvements – extend NE 120th Street to 120th Place | City of Kirkland | City of Kirkland | Install up to 44-foot (curb-to-curb) roadway with 5-foot planter strips and 5-foot sidewalks, new traffic signal at 124th Avenue NE/NE 120th Street, and signal modifications at Slater Avenue NE/NE 120th Street. | Roadway or Arterial | 2009 - 2014 | Eastside |
| 59 | 120th Avenue NE Road Extension – NE 116th Street to NE 120th Street | City of Kirkland | City of Kirkland | Install 1,450 feet of new roadway along an alignment north of the NE 116th Street/I-405 off-ramp. The project will include signal modifications. | Roadway or Arterial | 2009 - 2014 | Eastside |
| 60 | NE 4th Street Extension – 116th Avenue NE to 120th Avenue NE | City of Bellevue | City of Bellevue | Extend NE 4th Street from 116th Avenue NE to 120th Avenue NE to improve access to Downtown Bellevue. | Roadway or Arterial | Complete by 2030 | Eastside |
| 61 | 24th Street Culvert Fish-friendly culvert | City of Medina | City of Medina | Removal of fish passage barrier and replacement of open-bottom box culvert. | Roadway or Arterial | 2011 - 2012 | Eastside |
| 62 | I-5: Everett – SR 526 to US 2 HOV Lanes | WSDOT | Snohomish County | Widened the northbound and southbound freeway lanes to include an extra merging lane between 41st and US 2. This included adding 10 miles of new HOV lanes on I-5 from Boeing Freeway (SR 526) to US 2 (Hewitt Avenue Trestle), as well as making several other safety and traffic flow improvements. Crews also built a new, wider 41st Street bridge with a new, northbound I-5 exit, a new southbound | Roadway or Arterial | Complete by 2030 | Eastside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| | | | | I-5 entrance and new signals. | | | |
| 63 | SR 9: SR 522 to 176th Street Phases 1B, 2, and 3 | WSDOT | Snohomish County | Double the number of through lanes on SR 9, provide additional turn lanes at the 180th Street SE intersection, add a raised median to separate oncoming traffic, and limit access points for turning drivers. | Roadway or Arterial | 2011 - 2017 | Eastside |
| 64 | SR 9: 176th to SR92 | WSDOT | Snohomish County | Widen more than 2 miles of State Route 9 from a two-lane road to a four-lane divided highway from SR 524 north of Bothell to 176th Street SE in the community of Clearview. | Roadway or Arterial | 2011 - 2017 | Eastside |
| 65 | SR 18: Issaquah Hobart Road to I-90 Widening | WSDOT | King County | Developing plans to widen SR 18 to two lanes in each direction between Issaquah Hobart Road and I-90 and to rebuild the I-90/SR 18 interchange. | Roadway or Arterial | Complete by 2030 | Eastside |
| 66 | I-90: Eastbound Ramp to SR 202 | WSDOT | King County | Built a two-lane roundabout at the I-90/SR 202 interchange in North Bend to help improve safety and reduce congestion at this busy interchange. | Roadway or Arterial | Completed in October 2007 | Eastside |
| 67 | SR 161: 176th to 234th Street | WSDOT | King County | Added signals and modified existing signals while widening the roadway. Additionally, the project included more street lights and improved traffic flow to address safety issues in the area. | Roadway or Arterial | Completed in October 2005 | Eastside |
| 68 | SR 167: I-405 to SE 180th Street | WSDOT | King County | Construct an additional southbound auxiliary lane on SR 167 between the I-405 interchange and SE 180th Street as part of the larger I-5 to SR 169 Widening Project. | Roadway or Arterial | Complete by 2030 | Eastside |
| 69 | SR 202: 520 to Sahalee Way Widening | WSDOT | King County | Added an additional lane in both directions, improved flow at intersections with the installation of new or revised signals and left-turn lanes. | Roadway or Arterial | Completed in September 2008 | Eastside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 70 | I-405: SR 181 to SR 167 | WSDOT | King County | One northbound and one southbound lane will be added to I-405 between I-5 and SR 167. One additional southbound lane on SR 167 between I-405 and SW 41st Street will also be built, and the southbound SR 167 HOV lane from I-405 will be extended to the existing start of the HOV lane. | Roadway or Arterial | Complete by 2030 | Eastside |
| 71 | I-405 - (I-90 to SE 8th) and (Main to I-90) | WSDOT | King County | Realign existing HOV lanes to connect with HOV lanes on I-90. | Roadway or Arterial | Complete by 2030 | Eastside |
| 72 | I-405: SR-522 to SR 520 (Stage II SR522 to NE 70th Street) | WSDOT | King County | This project will add one continuous north and southbound lane between NE 70th Street in Kirkland and SR 522 in Bothell. This project will also add a northbound lane between NE 195th Street and SR 527 and build a bridge at NE 132nd Street. It also constructs a grade-separated ramp northbound between the NE 160th Street on-ramp and I-405 traffic exiting SR 522 to alleviate the existing weave. | Roadway or Arterial | Complete by 2030 | Eastside |
| 73 | I-405: I-5 to SR 181 | WSDOT | King County | Add general purpose lane in each direction as part of the Stage 1 Widening Project. | Roadway or Arterial | Complete by 2030 | Eastside |
| 74 | I-405: I-405/SR 515 Ramp | WSDOT | King County | Construct a new half-diamond interchange at SR 515 (Talbot Road) as part of the Stage 2 Widening Project. | Roadway or Arterial | Complete by 2030 | Eastside |
| 75 | I-405: I-405/NE 132nd Half Diamond – Access Ramps | WSDOT | King County | Construct a new half-diamond interchange to and from the north at NE 132nd Street in Kirkland. | Roadway or Arterial | Complete by 2030 | Eastside |
| 76 | I-405: NE 124th Street to SR 522 | WSDOT | King County | Add northbound lane on I-405 between NE 124th Street to SR 522 to eliminate weaving traffic. | Roadway or Arterial | Complete by 2030 | Eastside |
| 77 | I-405: NE 195th Street to SR 527 | WSDOT | King County | Add northbound lane on I-405 between NE 195th Street and SR 527 to increase general purpose capacity by 50 percent. | Roadway or Arterial | Complete by 2030 | Eastside |

Attachment 2. **Reasonably Foreseeable Future Actions—Transportation-Related Projects**

| Map ID | Project | Proponent | Location | Purpose | Project Type | Expected Construction Time Frame | Corridor Location |
|---|---|---|---|---|---|---|---|
| 78 | SR 522: Snohomish River Bridge to US 2 | WSDOT | King County | Widen SR 522 to two lanes in each direction to reduce travel times and built ramp from eastbound SR 522 to eastbound US 2 to improve access and reduce congestion. | Roadway or Arterial | Unknown | Eastside |
| 126 | Pontoon Construction Project | WSDOT | Grays Harbor County | WSDOT is advancing pontoon construction to restore the SR 520 floating bridge in the event of a catastrophic failure. Crews would construct and store pontoons until they were needed for a recovery effort. If the pontoons are not needed for emergency use, they would be used for the planned replacement of the SR 520 bridge. | Roadway or Arterial | 2009 – 2012 | Grays Harbor County |
| 127 | Medina to SR 202: Eastside Transit and HOV Project | WSDOT | King County | The Eastside Transit and HOV Project will respond to the needs of the rapidly growing Eastside by completing the HOV system, improving transit time and reliability, enhancing public safety, and other environmental and community benefits. | SR 20 Pontoon Construction Project | In review | Eastside |
| 128 | East Link Light Rail | Sound Transit | King County | Provide light rail between Seattle and Overlake. Stations proposed at Mercer Island, south Bellevue, downtown Bellevue, Bel-Red, Overlake connecting to Seattle via I-90. | Roadway or Arterial | 2021 | I-90/ Eastside |