Chapter 4: The Project Area's Environment

The SR 520, I-5 to Medina: Bridge Replacement and HOV Project area encompasses one of the most diverse and complex human and natural landscapes in the Puget Sound region. It includes areas in Seattle from I-5 to the Lake Washington shore, the waters of Lake Washington, and a portion of the Eastside communities and neighborhoods from the eastern shoreline of the lake to Evergreen Point Road. It also includes densely developed urban and suburban areas and some of the most critical natural areas and sensitive ecosystems that remain in the urban growth area. The project area includes the following:

- *Seattle neighborhoods—Eastlake, Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park*
- *The Lake Washington ecosystem and the bays, streams, and wetlands that are associated with it*
- *The Eastside community of Medina*
- *Usual and accustomed fishing areas of the Muckleshoot Indian Tribe, who have historically used the area's fisheries resources and has treaty rights for their protection and use*

This chapter describes what the project area is like today, setting the stage for the project's effects described in Chapters 5 and 6.

4.1 Transportation

The configuration of SR 520 today, with its inadequate shoulders and gaps in HOV lanes, makes the corridor especially prone to traffic congestion. And, as commuters on SR 520 know, the corridor is overloaded with traffic on a regular basis.

Traffic on Evergreen Point Bridge

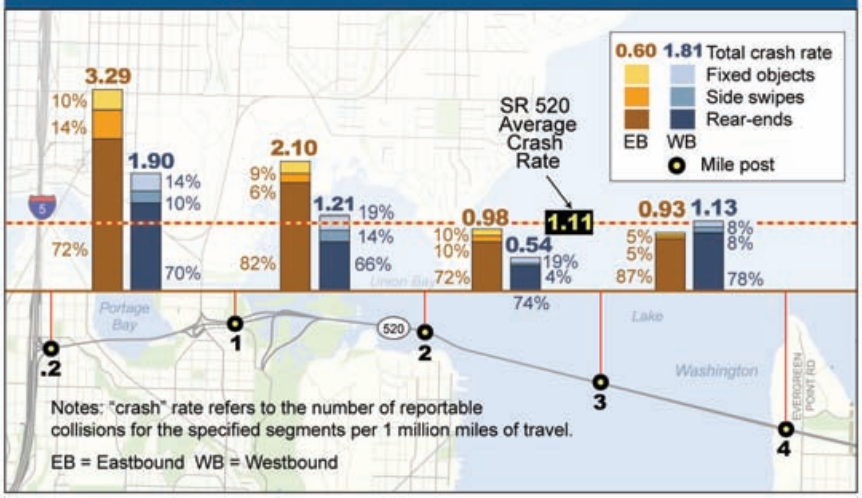
Population and employment continue to grow both on the Eastside and in Seattle, resulting in new travel patterns and a steady rise in the number of vehicles crossing the Evergreen Point Bridge. Forecasts from the Puget Sound Regional Council indicate that between years 2000 and 2010, Eastside population will have grown 14 percent and Seattle population will have grown 4 percent (PSRC 2006). Employment estimates show a similar

pattern with an 18 percent increase in employment between 2000 and 2010 on the Eastside and a 7 percent increase in Seattle. Because of this growth, traffic on the Lake Washington bridges is now heavy in both directions throughout the day. On SR 520, traffic volumes have been virtually equal in both directions since the late 1980s. In fact, since 1993, peak afternoon traffic volumes have been slightly higher westbound than eastbound.

What is traffic like on SR 520 today?

Many factors influence traffic congestion on SR 520, including traffic operations on I-5, I-405, and on- and off-ramp traffic along SR 520 itself. SR 520 often becomes congested when there are backups on I-5 through downtown Seattle and on I-405 in Bellevue at the ramps to and from SR 520. Congestion caused by unpredictable incidents such as traffic accidents or stalled vehicles can last for several hours, both in the morning and the afternoon. Exhibit 4.1-1 shows eastbound and westbound crash rates, including the nature of the accidents, along SR 520, I-5 to Medina project. The highest crash rates were between I-5 and the 24th Avenue East overpass of SR 520 (in both directions). This is likely due to the congested conditions, since 83 percent of the eastbound crashes and 86 percent of the westbound crashes are congestion-related (rear-end and sideswipe crashes) along this section.

Exhibit 4.1-1. **Distribution and Type of Eastbound and Westbound Crash Rates Along SR 520**



What is traffic like at interchanges in the study area?

The study area interchanges (SR 520/Montlake, SR 520/Roanoke, I-5/NE 45th Street, I-5/Mercer Street, and I-5/Stewart Street) are congested during the morning and evening peak commute hours. During these times, travelers on local streets encounter congestion that is related in part to freeway congestion. However, other factors not related to the freeway affect local traffic operations, including intersection configuration, signal

timing, and intersection spacing. The causes for congestion in the Montlake Boulevard interchange area are discussed in more detail below since the project would affect traffic mostly within this area. The existing areas of congestion along Montlake Boulevard are shown on Exhibit 4.1-2 and discussed below.

SR 520 Eastbound On-ramp

During the morning peak period, eastbound SR 520 in Seattle is congested, limiting how much traffic can enter from the SR 520 on-ramps. On-ramp traffic can back up beyond the ramp and onto local streets, such as Montlake Boulevard and Lake Washington Boulevard. Traffic congestion on Montlake Boulevard southbound can extend back across the Montlake Bridge. During the evening peak period, congestion on Montlake Boulevard can extend as far north as 25th Avenue NE.

U-Turn at Hamlin Street

Drivers traveling northbound on Montlake Boulevard who want to access SR 520 westbound must make a U-turn at the Montlake Boulevard/East Hamlin Street intersection. These vehicles often spill out of the U-turn pocket and block the inside northbound lane on Montlake Boulevard, constraining through traffic to a single lane. This, in turn, affects traffic exiting the eastbound off-ramp and other intersections to the south.

SR 520 Westbound Off-ramp

Some drivers use the SR 520 westbound off-ramp to travel southbound on Montlake Boulevard. These drivers stop at the end of the westbound off-ramp to wait for a gap in traffic to cross the two northbound through lanes so that they can make a U-turn at Hamlin Street. Accommodating this movement worsens northbound congestion and introduces a safety issue.

Montlake Bridge

Montlake Bridge openings also affect traffic flow in the Montlake interchange area. The bridge does not open during the morning and afternoon peak periods; however, a bridge opening at 3:30 p.m. can affect traffic operations throughout the afternoon commute. The effects of bridge openings compound whatever congestion is present on the local street network and can cause traffic on the SR 520 westbound and eastbound off-ramps to back up onto the SR 520 main line. This same congestion can extend back far enough to affect traffic on I-5.

During a typical summer weekday, the bridge opens an average of 8 times a day. Bridge openings typically last 5 minutes, but can extend up to 6 minutes. Longer bridge openings closer to the afternoon commute period can negatively affect traffic flow for a considerable portion of the commute period. In addition to slowing general-purpose traffic, these delays make it difficult for bus drivers to keep to their schedules, affecting transit system reliability.

Exhibit 4.1-2. **Montlake Boulevard Existing Areas of Congestion**

Area of congestion

1 - SR 520 eastbound on ramp

2 - U-turn at Hamlin Street

3 - SR 520 westbound off ramp

4 - Montlake Bridge

N

0 200 400 800 Feet

Montlake Bridge Openings

In 2008, nearly 50 percent of the weekday Montlake Bridge openings occurred between 10:00 a.m. and 3:30 p.m.. Weekday openings represented about 55 percent of the total bridge openings.

The bridge is closed to boat traffic during weekday peak traffic periods of 7:00-10:00 a.m. and 3:30-7:00 p.m. (September 1 – April 30) and 7:00-9:00 a.m. and 3:30-6:30 p.m. (April 30 –September 1) (33 CFR 117.1051).

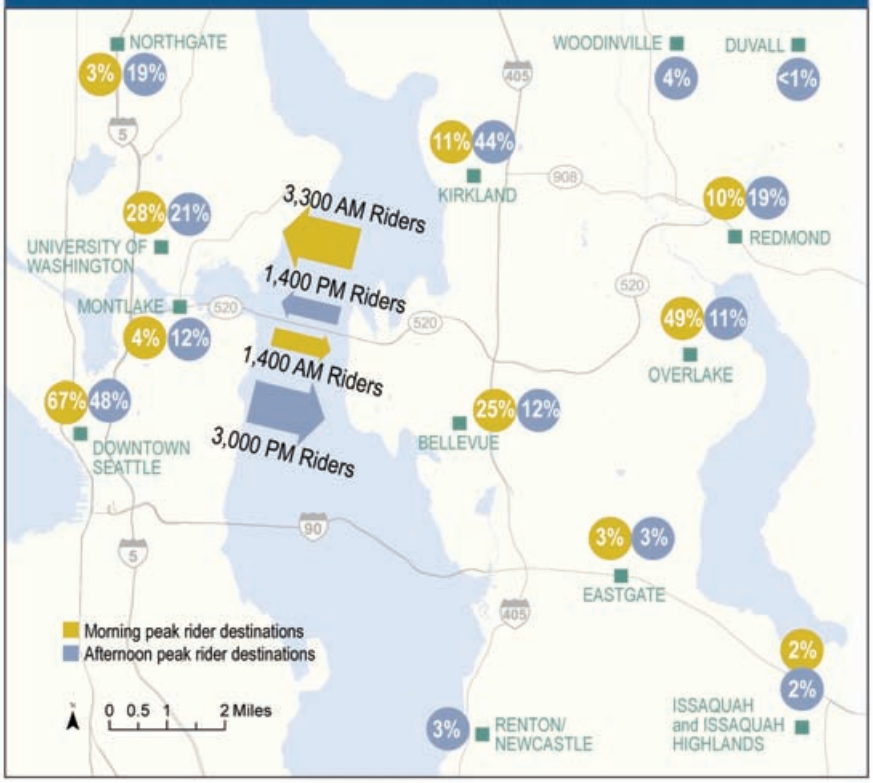
In 2008, there was an average of 6 openings per weekday, but during the peak months of June, July, and August there was an average of 8 openings per weekday.

The bridge typically remains open for about 5 minutes. Transit delays occur due to the bridge openings. 60 percent of affected routes are local and 40 percent are routes using SR 520.

How does transit operate in the corridor today?

Currently, 23 bus routes use the Evergreen Point Bridge—18 King County Metro routes, 4 Sound Transit Regional Express routes, and 1 route operated by Snohomish County Community Transit. Fourteen of these routes connect Eastside communities to downtown Seattle; five routes connect to the University District and four connect to north Seattle. Exhibit 4.1-3 shows existing Metro and Sound Transit transit ridership and destinations across the Evergreen Point Bridge. As shown, most riders are destined for downtown Seattle. Metro and Sound Transit currently provide approximately 600 bus trips across the Evergreen Point Bridge on an average weekday, serving almost 16,000 riders.

Exhibit 4.1-3. **Transit Ridership across Evergreen Point Bridge**



Traffic on Montlake Bridge

During the morning peak period (6:00-9:00 a.m.) there are approximately 122 westbound and 56 eastbound bus trips carrying 3,300 and 1,400 riders, respectively, across SR 520. Eight routes provide eastbound morning peak service across SR 520.

During the afternoon peak period, transit travel patterns reverse with more buses traveling eastbound than westbound and with passenger volumes typically spread out over longer periods. There are approximately 52 westbound and 117 eastbound bus trips carrying 1,400 and 3,000 riders, respectively, across SR 520.

Eastbound bus near Montlake Transit Station

Individual routes crossing the Evergreen Point Bridge reach a frequency of one bus every 7 minutes during peak periods, with midday service provided at 15- to 30-minute frequencies.

In addition to Metro and Sound Transit service, Microsoft uses SR 520 for its Microsoft Connector shuttle service, which provides service for Microsoft employees commuting between Microsoft and Seattle, Bothell, Mill Creek, Issaquah, Woodinville, and Sammamish.

Traffic congestion along the SR 520 corridor results in widely varying transit travel times in both directions throughout much of the day (Table 4.1-1). This high variability means that transit riders needing to keep a regular schedule must plan for the worst conditions and expect a relatively long travel time. The variability also makes transferring between routes and services difficult and adds to the cost of providing bus service.

Table 4.1-1. Range of Existing Bus Travel Times between NE 51st Street in Redmond and the Montlake Freeway Transit Station in Seattle

Direction of Travel	Mornings	Evenings
Westbound	10 to 30 minutes	10 to 55 minutes
Eastbound	10 to 30 minutes	10 to 30 minutes

What transit facilities and services are on or near SR 520 today?

Exhibit 4.1-4 shows the existing transit facilities in the Montlake area. Between I-5 and the floating bridge, there is only one freeway station on SR 520, located at the Montlake interchange in Seattle.

Montlake Freeway Transit Station

The Montlake Freeway Transit Station consists of eastbound and westbound bus platforms and shelters on the shoulders of SR 520 near the Montlake interchange. Bus riders access the eastbound platform via stairs on the Montlake overpass, while passengers using the westbound platform use a walkway from Montlake Boulevard.

The Montlake Freeway Transit Station has the second highest usage of all of the freeway stations in the SR 520 corridor, with approximately 1,600 riders per day in 2009 (King County Metro 2007). Exhibit 4.1-5 summarizes westbound and eastbound daily and peak period use of the Montlake Freeway Transit Station.

Montlake Freeway Transit Station

The Montlake Freeway Station under Montlake Boulevard allows bus riders to connect to several routes for many destinations, both at the Montlake Freeway Transit Station and at local bus stops on or near the Montlake Overpass. Bus riders also access the Montlake, University and other neighborhoods from the Montlake Freeway Transit Station.

In the morning, the eastbound station serves approximately 220 passenger boardings and 40 passenger offloadings over a 3-hour period. Approximately 90 percent of these people are traveling to work. Approximately 60 percent of these people arrive by bus while another 20 percent arrive by bicycle (EnviroIssues 2005). At the freeway transit station, they transfer to SR 520 express buses for the trip to the Overlake area or other Eastside destinations.

Exhibit 4.1-4. **Existing Transit and HOV Facilities within the Montlake Area**

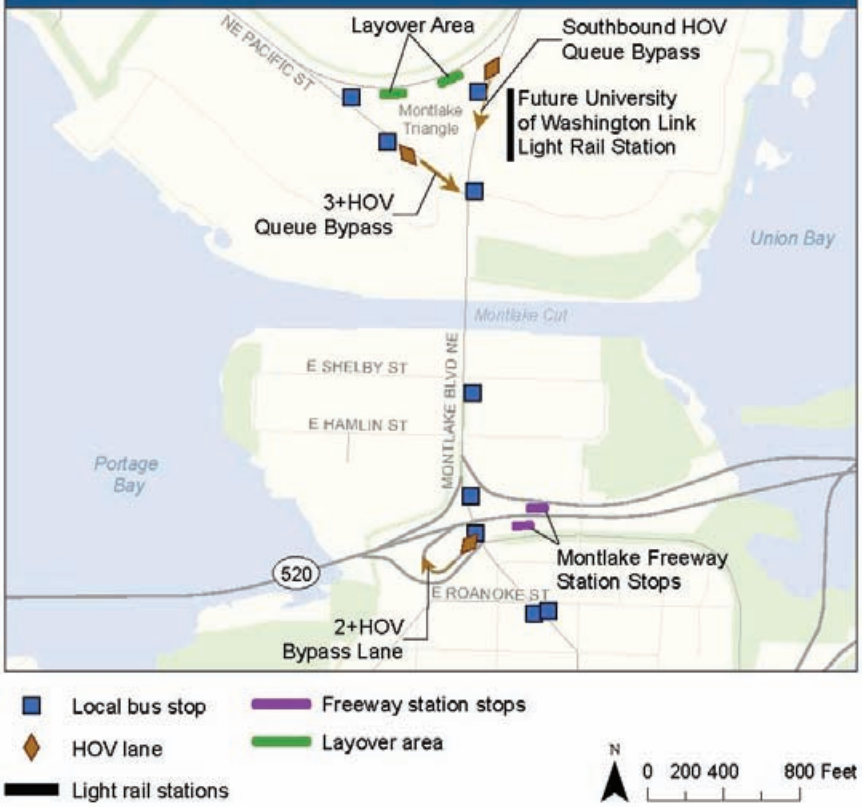
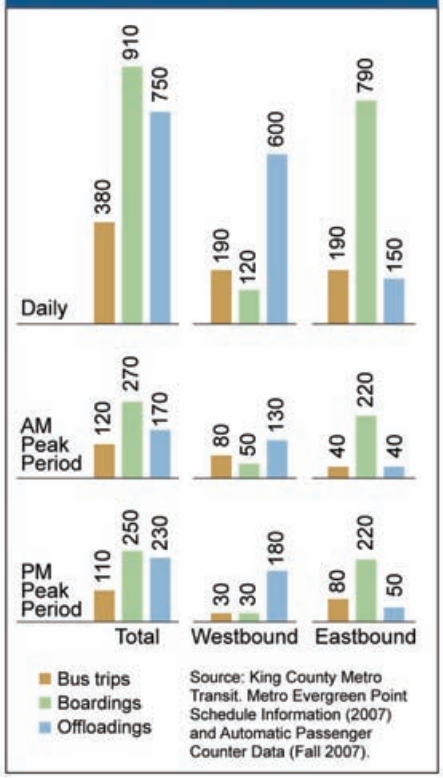


Exhibit 4.1-5. **SR 520 Montlake Freeway Transit Station Use**



Bus with a Bike Rack

Bicyclists wishing to cross the lake via SR 520 must board a bus equipped with a bicycle rack.

The westbound station serves approximately 50 passenger boardings and 130 passenger offloadings over a 3-hour period. The offloadings represent Eastside residents that either transfer to local buses, or walk/bike across the Montlake Bridge to the University of Washington campus (EnviroIssues 2005).

The Montlake Freeway Transit Station is the busiest stop in the entire transit system for loading and unloading bicycles with 300 bike rack uses daily. Bicyclists who commute three or more days per week may park their bicycles in one of 54 reserved King County Metro locker spaces at the Montlake Freeway stop on the north side of the bridge. This bicycle locker provides the largest number of spaces in the King County Metro system. There are currently 42 people on the waitlist. A King County Metro bicycle

rack capable of holding 53 bikes is also available at the Montlake Freeway stop on a first-come first-served basis. More bicycle parking information is available in the Social Elements Discipline Report (Attachment 7).

Montlake Triangle

The University transfer point is located in front of the University of Washington Medical Center on NE Pacific Street, just northwest of the Montlake Boulevard/NE Pacific Street intersection. This transfer point provides access to the University Medical Center, medical and health sciences academic buildings, the main campus, and Husky Stadium. Transit service is provided by King County Metro and Sound Transit.

Combined, the two NE Pacific Street bus stops (eastbound and westbound) have 3,800 boardings/offloadings every weekday. There is slightly more boarding and alighting at the westbound stop, with 56 percent (2,132) of the total daily activity. The westbound stop is served by 11 routes—3 local and 8 SR 520 routes. The eastbound stop is served by 13 routes—4 local and 9 SR 520 routes. SR 520 routes account for 30 percent of boarding/alighting at the westbound stop and 35 percent at the eastbound stop. On a daily basis and during the morning peak period, local buses account for 60 to 80 percent of bus trips for both stops, except at the eastbound stop during the afternoon peak period. At this stop, SR 520 buses account for 60 percent of the bus trips during the afternoon peak period.

In addition to the bus stops described above, there are transit layover spaces on the southeast curb of NE Pacific Place and a driver comfort station in the Montlake Triangle Garage. HOV lanes are provided on NE Pacific Street eastbound and Montlake Boulevard southbound lanes to facilitate bus and carpool travel. These lanes help to reduce the delays for local buses and eastbound SR 520 bus routes and carpools. Overhead electric bus wires (trolley wires) are located along NE Pacific Street, the eastbound lane of NE Pacific Place, and the southbound outside lane of Montlake Boulevard (between NE Pacific Place and NE Pacific Street). There are also trolley wires on Montlake Boulevard NE south of NE Pacific Street, across the Montlake Bridge, 24th Avenue, and 10th Avenue East (in the North Capitol Hill and Portage Bay/Roanoke neighborhoods). Trolley wire power substations are located in these areas. Several bus stops in the vicinity include covered passenger waiting areas and other enhancements for pedestrians and transit patrons, including lighting and artwork.

Montlake Overpass Bus Stops

There are two stops on the Montlake overpass that allow transit riders to transfer between regional and local transit service. The northbound stop is located just south of the SR 520 westbound off-ramp, and the southbound

stop is located at the entrance to the SR 520 eastbound on-ramp (Exhibit 4.1-4).

Evergreen Point Freeway Station (eastbound station)

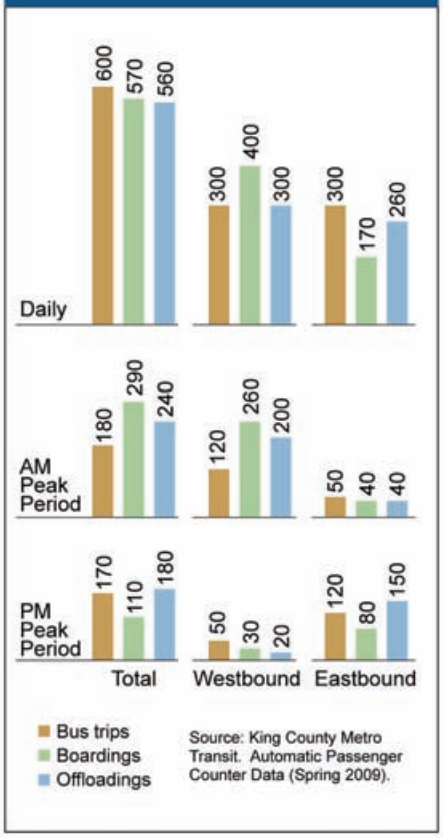
Evergreen Point Freeway Station

The Evergreen Point Freeway Station is located west of I-405 near the east end of the Evergreen Point Bridge. Both eastbound and westbound bus platforms and shelters are located on the shoulders of SR 520. On the south side of SR 520, the Evergreen Point Park-and-Ride provides 51 parking stalls just southwest of the eastbound bus platform. Approximately 20 routes serve this freeway station. Over 80 percent of the activity at the westbound station is transfer activity, primarily to University District-bound buses (EnviroIssues 2005). At the eastbound station, transfers account for 95 percent of the activity.

The majority of riders using the Evergreen Point Freeway Station transfer to and from bus routes serving the University of Washington (over 50 percent) or downtown Seattle (over 30 percent) (EnviroIssues 2005). Many of the connecting Eastside routes originate in Redmond, Kirkland, or Bellevue. Some Medina residents and students busing to private schools in Seattle also use this freeway station.

As Exhibit 4.1-6 shows, approximately 1,100 bus riders per day used this station in 2007. Many bicyclists use this stop because it is the last opportunity to put bikes on buses before crossing the SR 520 floating bridge. On a daily basis, both stops have similar levels of activity, with the westbound station being slightly busier (67 percent of total daily boardings and offloadings).

Exhibit 4.1-6. **Evergreen Point Freeway Transit Station Use**



What bicycle and pedestrian paths and facilities are in or near the project area?

Today, the Evergreen Point Bridge poses a considerable challenge for bicyclists and pedestrians traveling between Seattle and the Eastside communities. Because of the limited shoulder widths, no pedestrian or bicycle traffic is allowed on the bridge. Bicyclists wishing to cross the lake via SR 520 must board a bus equipped with a bicycle rack. Bicyclists and pedestrians can reach the SR 520 corridor in Seattle using a combination of trails and on-street bicycle lanes. The Montlake Bridge over the Montlake Cut is an important crossroads serving several transportation modes that link the Montlake and University District neighborhoods.

As shown in Exhibit 4.1-7, there is currently substantial pedestrian and bicycle activity around the Montlake interchange as people travel to, from, or through the University District and the UW.

Exhibit 4.1-7. SR 520/Montlake Interchange Area Pedestrian Volumes and Bicycle/Pedestrian Routes

This interchange area provides the following functions for pedestrians and bicyclists:

- A key stop and transfer point for local and regional bus service to and from the University District, including the UW, via the NE Pacific Street bus stops. There are 3,800 total boardings and alightings at this bus stop every weekday (King County Metro 2007).
- A link between the Burke-Gilman Trail and Seattle destinations, especially those to the south.

- Access to the UW Medical Center, the Triangle Parking Garage, UW main campus, and the UW parking areas.

Pedestrians use a traffic island at the corner of the Montlake Triangle to travel between the UW E-11 parking lot east of Montlake Boulevard and the UW Medical Center. Pedestrians also cross the Triangle to travel between the UW central campus and the UW Medical Center and Husky Stadium facilities.

There are five pedestrian bridges located north of the Montlake Triangle:

- Two across NE Pacific Street between Montlake Boulevard NE and 15th Avenue NE
- Three across Montlake Boulevard connecting the UW main campus to the athletic facilities and parking lot located east of Montlake Boulevard

Bicyclists cross the Montlake Triangle as they travel between areas south of the Montlake Bridge and the UW Medical Center or the main campus and the Burke-Gilman Trail. The sidewalks, crosswalks, and asphalt path across the Triangle are designated regional trail connections in the Seattle nonmotorized plan. Approximately 6 percent of students and staff bicycle to campus, many of whom come from the south and cross Montlake Boulevard NE, NE Pacific Street, and NE Pacific Place (University of Washington 2001).

There are currently no dedicated bicycle facilities between the Burke-Gilman Trail and the portion of the Lake Washington Bike Loop south of SR 520. However, cyclists use sidewalks and arterial streets in the project area to travel to the Montlake Freeway Transit Station and other destinations.

4.2 Land Use and Economic Activity

The land uses of a community indicate where people live, work, shop, and participate in community activities. Local governments plan for land uses according to the community's long-range vision and goals. In the Puget Sound region these goals are identified within the framework of the Washington State Growth Management Act, which requires communities to plan for future growth and the infrastructure required to serve it. SR 520 is a regionally important transportation corridor, one of only two bridges that cross Lake Washington connecting major employment and population centers. Successful implementation of state, regional, and local land use plans requires the ability to efficiently and reliably move an increasing volume of people and goods across the lake. Regional plans have identified the addition of HOV lanes in the SR 520 corridor as a key component of the area's future infrastructure needs.

What are the land uses within the project area?

The project area encompasses neighborhoods in Seattle from I-5 to the Lake Washington shore, the waters of Lake Washington, and the city of Medina on the Eastside. Within Seattle, it includes seven Seattle neighborhoods: Eastlake, Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park. Land use along the SR 520 corridor is primarily residential, with parks, playfields, and open space interwoven into the development pattern. Businesses are located near the I-5 and Montlake interchanges. Recreational, civic, and commercial establishments are located along the shorelines of Portage Bay and Lake Union and in the neighborhoods surrounding the Montlake interchange.

Aerial view of Lake Washington

The UW campus lies north of the freeway and the Montlake Cut, with Husky Stadium and the UW Medical Center prominently located at its southern end. The National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center and MOHAI are immediately north of SR 520 on either side of the Montlake interchange. The corridor extends through the north end of the Washington Park Arboretum before crossing Lake Washington. On the Eastside, Medina occupies a peninsula that extends into Lake Washington; this neighborhood is characterized by large homes on semi-wooded properties with few commercial businesses. Exhibits 4.2-1 and 4.2-2 show the land use pattern through the Seattle and Eastside portions of the project area. Neighborhoods are described in more detail in Section 4.3, Social Elements.

What are the current economic conditions in the project area?

On both sides of the lake, there are major employers that require efficient transportation systems for the movement of goods, services, and employees to and from their places of business. Seattle is the largest city in Washington and the biggest employment center in the Pacific Northwest. Between 2000 and 2030, employment in Seattle is expected to increase 31 percent from approximately 540,000 to over 708,000 jobs (PSRC 2006).

Bellevue is the financial, retail, and office center of the Eastside. The greater Eastside is expected to grow considerably in the coming decades. This is especially true for Bellevue, the second largest employment center in the Puget Sound region. Total jobs on the Eastside are expected to increase 56 percent, from approximately 240,000 in 2000 to 375,000 in 2030 (PSRC 2006). The Eastside includes many "new economy" jobs in high-tech industries, as well as retail and service jobs including financial, real estate, medical, and professional.

In recent years, the regional economy has diversified, resulting in an economy less affected by downturns in a single industry. One of the

Exhibit 4.2-1. Existing Land Use in Seattle

Existing Land Use			
Single family	Park/open space	Industrial	Unknown
Multifamily	Civic and quasi-public	Parking	Right-of-way
	Commercial	Vacant	

N 0 500 1,000 2,000 Feet

primary industries responsible for this diversification is the high-tech industry. Business growth will continue to depend on the region's transportation system to provide reliable movement of goods and services, customers, and employees to and from their business locations. SR 520 is a critical component of the region's transportation system.

What are the land use plans and implementing regulations for the project area?

Several key state and regional planning documents establish the framework for local land use plans and programs. These planning documents are the Washington State Growth Management Act (GMA); Puget Sound Regional Council's *Vision 2040* (PSRC 2008) and *Destination 2030* (PSRC 2007); and King County's Countywide Planning Policies (King County 2008a). In addition, Sound Transit's 2030 *Sound Move* plan, adopted in 1996, and the *ST2* plan, adopted in 2008, provide a multi-year regional transit planning framework.

Washington State's GMA (Chapter 36.70A Revised Code of Washington [RCW]) provides a comprehensive framework for managing growth and coordinating land use planning with infrastructure. The GMA's planning goals guide development of local comprehensive plans and development regulations, such as directing growth to urban areas, reducing sprawl, and

Exhibit 4.2-2. Existing Land Use on the Eastside

Existing Land Use	
Single family	Commercial
Park/open space	Vacant
Civic and quasi-public	Right-of-way

N 0 500 1,000 2,000 Feet

encouraging efficient transportation systems. Local, county, and regional plans are required to be consistent with the GMA.

Regional Plans

Vision 2040 (PSRC 2008) is PSRC's long-range growth management, economic, and transportation strategy for the central Puget Sound region, which encompasses King, Kitsap, Pierce, and Snohomish counties. *Vision 2040* contains numerous land use and transportation related policies that emphasize concentrating growth in urban centers and connecting those centers with an efficient, transit-oriented, multimodal transportation system. The plan supports transportation investments in major facilities and services that maximize transportation system continuity and are phased to support regional economic development and growth management options.

In particular, *Vision 2040* supports developing a transportation system that connects urban centers with frequent service, convenient connections, and easy transfers between modes. *Destination 2030* (PSRC 2007) translates the policies of *Vision 2040* into implementation strategies, providing a guide for large regional projects and important local solutions for a 30-year period. The plan is the regional transportation planning document that serves as the basis for state and federal transportation expenditures within the region.

Destination 2030 calls for coordinating transportation and land use decisions to support transit- and pedestrian-oriented land use patterns and supports priority treatment for HOVs by investing in a core HOV network on regional freeways with direct access for transit. The plan identifies a new 6-lane SR 520 (four general-purpose lanes and two HOV lanes) as a project deemed "strategic to the region." This means that a 6-lane SR 520 is assumed in PSRC's regional traffic model as a key facility needed to serve planned land uses under *Vision 2040* and local land use plans. *Destination 2030* is currently being updated, and it is anticipated that this plan update—called *Transportation 2040*—will be adopted in 2010.

Washington State Transportation Plan and Highway System Plan

The 2007-2026 Washington Transportation Plan (WTP) (WSDOT 2006) guides transportation policy and investment decisions at all levels throughout the state and meets federal and state planning requirements. The WTP addresses the state's transportation challenges by making targeted, prioritized investments to achieve the greatest benefit with limited funding.

The WTP assigns 4 of the 5 prioritized investment guidelines to the SR 520 Evergreen Point Bridge. These are:

- Preservation—Preserve and extend prior investments in existing transportation facilities and the services they provide to people and commerce.
- Safety—Target construction projects, enforcement, and education to save lives, reduce injuries, and protect property
- Economic Vitality—Improve freight movement and support economic sectors that rely on the transportation system, such as agriculture, tourism, and manufacturing.
- Mobility—Facilitate movement of people and goods to contribute to a strong economy and a better quality of life for citizens.

Countywide Planning Policies

Consistent with the provisions of the GMA and *Vision 2040*, the King County Countywide Planning Policies (King County 2008a) provide the regional vision and framework for the comprehensive plans of King County and its cities. These policies establish an urban growth area in the western one-third of King County where most growth and development is projected to occur. Policies that support the urban growth area call for a balanced transportation system that includes both high-capacity transit and an extensive HOV system.

What is high-capacity transit?

Sound Transit's enabling legislation defines high-capacity transit as a system of public transportation services within an urbanized region operating principally on exclusive rights of way, and the supporting services and facilities necessary to implement such a system, including interim express bus services and HOV lanes, which, taken as whole, provides a substantially higher level of passenger capacity, speed, and service frequency than traditional public transportation systems operating mainly on general-purpose roadways. Example HCT components include: Sounder commuter rail, Link Light Rail, and Sound Transit Express buses.

Local Plans

Seattle and Medina have comprehensive plans consistent with the GMA. These plans provide the overall policy guidance for future development at a

local level and address topics such as land use, housing, parks and open space, transportation, and the environment. Each city also has a shoreline master program that is consistent with the requirements of the Washington State Shoreline Management Act (Chapter 90.58 RCW). In addition, Seattle has transportation and neighborhood plans that pertain to the SR 520 project area. These are described below.

Comprehensive Plans

Seattle's Comprehensive Plan: Toward a Sustainable Seattle (City of Seattle 2007) sets forth land use policies geared toward creating urban centers that concentrate residential development and employment centers while maintaining the density and character of the neighborhoods. No substantial changes in land use patterns are planned for the Seattle neighborhoods along SR 520. Policies within the Comprehensive Plan state Seattle's support for completion of the HOV lane system in the Puget Sound region, and that freeway expansion should focus primarily on accommodating non-single-occupant-vehicle users.

The land uses identified in the Medina comprehensive plan do not differ from existing uses, and no substantial changes in land use patterns are planned for this community.

Shoreline Master Programs

Shorelines generally refer to lands next to rivers, larger lakes, and marine water bodies, including associated shorelands, wetlands, and floodplains. The state's Shoreline Management Act (SMA) provides the vision, goals, and policy context for each city and county in Washington to adopt a shoreline master program at a regional and local level. The shoreline master programs regulate local shoreline use and development.

The City of Seattle's Shoreline Master Program (SMP) is currently in the process of being comprehensively updated. The SMP constitutes the policies and regulations governing development and uses on and adjacent to marine and freshwater shorelines. These include the shorelines of Puget Sound, Lake Washington, Lake Union/Ship Canal, Duwamish River, and Green Lake, as well as associated wetlands and floodplains. These policies and regulations affect land uses, structure bulk and setbacks, public access requirements, bulkheads, docks, piers, and construction practices.

The state has established a December 2010 deadline for Seattle to adopt the updated SMP (City of Seattle, 2008).

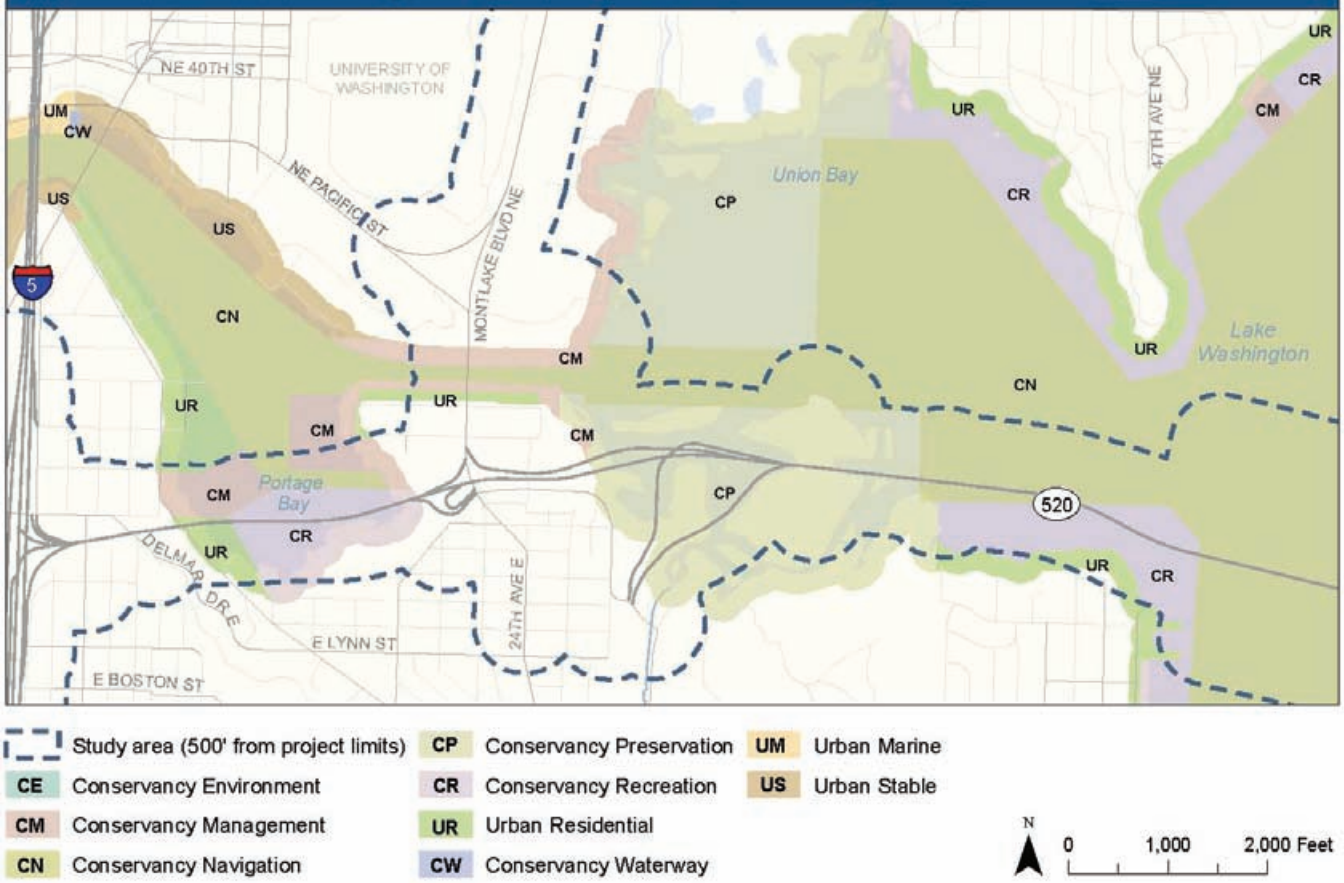
The major categories of shoreline designation within the Seattle project area are Conservancy and Urban. Each has several sub-categories. The Conservancy designation is intended to protect and manage shorelines for public, ecological, and/or navigational use, and typically is more restrictive in terms of permitted uses. The urban designation is usually applied to

The Arboretum shoreline is designated Conservancy Preservation (CP).

shorelines that are more densely developed or designated for future development. Exhibits 4.2-3 and 4.2-4 depict shoreline designations within the land use study area. Within Seattle, bridges are currently permitted as a special or conditional use under Conservancy shoreline designations; bridges and streets are permitted outright in areas designated Urban Residential (UR).

The shoreline designation within the city of Medina is urban (Exhibit 4.2-4). Utilities and government facilities are allowed within this shoreline designation.

Exhibit 4.2-3. Seattle Shoreline Designations



Seattle Neighborhood Plans

Eastlake Neighborhood Plan

The Eastlake community, adjacent to I-5 in Seattle, has adopted the *Eastlake Neighborhood Plan* (City of Seattle 1998a). The plan's policies call for reducing freeway-related noise, air, and water pollution and supporting the neighborhood's visibility and identity from I-5 through such means as landscaping and signage.

University Community Urban Center Neighborhood Plan

The University District is adjacent to Montlake Boulevard NE and the UW. Policies in its adopted *University Community Urban Center Neighborhood Plan* (City of Seattle 1998b) call for an efficient transportation system that balances different modes (including public transit, pedestrians, bicycles, and automobiles) and minimizes effects on the community. A goal of the neighborhood plan is to focus on improving circulation within existing roadway capacity.

Exhibit 4.2-4. **Eastside Shoreline Designations**

Institutional Master Plans

University of Washington Master Plan – Seattle Campus

The University of Washington's Seattle campus master plan (UW 2003) guides proposed campus development. The campus plan anticipates adding approximately 3 million square feet of new building space to support long-term growth needs. The plan identifies 68 potential sites for future development and areas of the campus that are to be preserved as open space. In addition, the plan establishes campus circulation patterns, including internal streets, transit circulation, pedestrian and bicycle pathways, and parking areas; identifies how the UW will manage its transportation needs and mitigate traffic effects; and determines how UW-related development will integrate with the University District's neighborhood plan and Sound Transit's University Link light rail system.

The campus master plan identifies major pedestrian pathways along Montlake Boulevard NE and the Union Bay shoreline within the south campus area, where 6-Lane Alternative improvements would occur. The plan also identifies areas of development and where increased parking capacity may be possible in and around the Husky Stadium. Objectives in the plan include increasing access for pedestrians and bicycles to and within campus and improving transit access to minimize vehicle trips. The plan also includes a policy to work in partnership with Seattle and regional partners to provide a high level of transit service to the campus and the adjacent community.

UW Campus in the spring

Washington Park Arboretum Master Plan

The Seattle City Council approved the *Washington Park Arboretum Master Plan* in 2001 (Seattle Parks and Recreation et al. 2001). The plan calls for the continued use of the Arboretum for education, conservation, and recreation and visitor services. It includes new trails and exhibits, revised roadways and parking, new and replacement buildings, and expanded maintenance and education programs. New structures include a south gateway education and visitor center, education and curation buildings near the Graham Visitors Center at the north end of the Arboretum, a pavilion and entry building for the Japanese garden, expanded maintenance facilities,

Arboretum Graham Visitors Center

greenhouse and bathhouse replacement, and use of part of the present MOHAI building as administrative space.

4.3 Social Elements

Transportation infrastructure influences neighborhoods and communities in many ways. Highways connect people with their homes and daily destinations, while local streets and paths provide circulation for commuters, bicyclists, and pedestrians within their neighborhoods.

What neighborhoods are in the project area?

As described in Section 4.2, Land Use and Economic Activity, the project area includes portions of seven Seattle neighborhoods–Eastlake, Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park–and a portion of Medina on the Eastside. Exhibit 4.3-1 identifies the neighborhoods and community services within the project area. (Parks are depicted in Exhibit 4.4-1 in the next section.) The following paragraphs describe key features of each neighborhood.

Eastlake

The Eastlake neighborhood is located west of I-5 and east of Lake Union and consists of single-family residences, small-scale apartment and condominium complexes, and commercial businesses. Commercial businesses consist mainly of retail stores and restaurants interspersed with office space.

Eastlake Avenue bisects the neighborhood from north to south and connects the UW to the north with downtown Seattle to the south. The Option Program at Seward—a kindergarten through 8th grade alternative school in the Seattle Public School District—is located along Boylston Avenue East, just west of the I-5/SR 520 interchange. This program, known as TOPS, is a public magnet school that serves diverse populations, including many low-income and minority students.

North Capitol Hill

North Capitol Hill, located east of I-5 and south of SR 520, is a densely populated urban neighborhood made up of single-family and multifamily residential areas and commercial businesses along the main arterials. 10th Avenue East is the major north-south arterial, providing access to I-5 and SR 520. The Bertschi School, a private elementary school, is located in the North Capitol Hill neighborhood, south of East Lynn Street. Seattle Preparatory School, a private high school, is located on 11th Avenue East, south of Delmar Drive East.

Seattle Area Community Organizations

The Seattle project area includes many active neighborhood groups that have been involved in the project since its inception. Information on these groups can be found at the following websites:

www.eastlakeseattle.org (Eastlake)

www.nchna.com (North Capitol Hill)

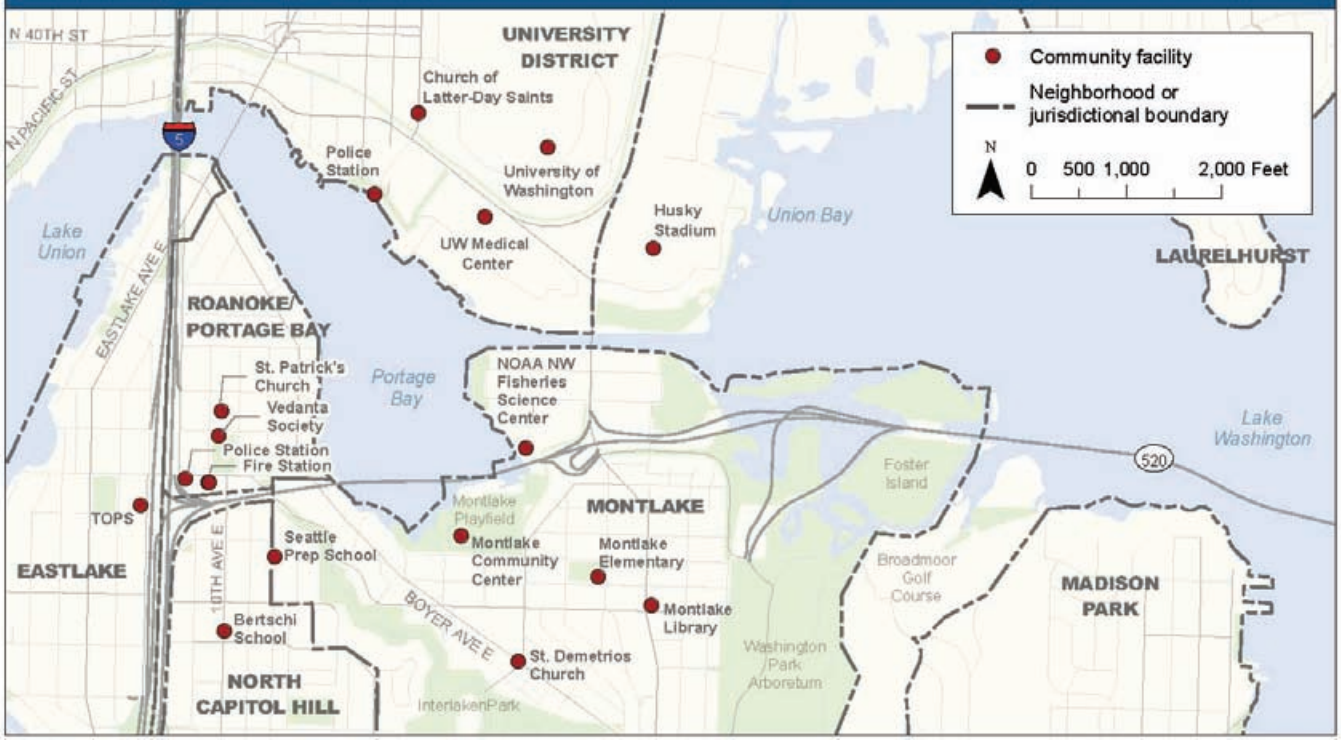
www.montlake.net (Montlake)

www.udistrictchamber.org (University District)

www.laurelhurstcc.com (Laurelhurst)

www.madisonparkcouncil.org (Madison Park)

Exhibit 4.3-1. Neighborhoods and Community Facilities



Portage Bay/Roanoke

The Portage Bay/Roanoke neighborhood, located east of I-5 and north of SR 520, is generally bordered by Portage Bay on the north and east. This neighborhood is almost completely residential with tree-lined streets. Mixed land uses along Boyer Avenue East include houseboats on Portage Bay, the Queen City Yacht Club, and the Portage Bayshore Condominiums. Roanoke Park is located just north of SR 520 on East Roanoke Street and is part of the Roanoke Park Historic District.

Neighborhood streets in the Portage Bay/Roanoke and Montlake neighborhoods

There are two churches in the neighborhood: Saint Patrick's Catholic Church at 2702 Broadway East and the Vedanta Society of Western Washington at 2716 Broadway East. Seattle Fire Department Station #22 and the Seattle North Detachment of the Washington State Patrol are located on East Roanoke Street.

Small commercial areas consisting of retail stores and restaurants are located at the north end of the neighborhood around the intersection of Eastlake Avenue East and Fuhrman Avenue. Fuhrman Avenue East and Boyer Avenue East provide access around Portage Bay on the east and connect this neighborhood to the Montlake neighborhood and SR 520.

Montlake

The Montlake neighborhood lies between the waters of Portage Bay and the Washington Park Arboretum and is generally bounded by the Lake Washington Ship Canal (Montlake Cut) on the north, the Arboretum on the south and east, and the Portage Bay/ Roanoke neighborhood on the west. Montlake Boulevard/24th Avenue East is the main north-south arterial, connecting the Montlake neighborhood to the UW, SR 520, and other neighborhoods further south in Seattle.

Seattle Yacht Club

The neighborhood is predominantly residential and characterized by homes that were built in the first two decades of the 20th century. The construction of SR 520 in the 1960s separated the neighborhood into two areas. The area north of SR 520 (often referred to as the Shelby-Hamlin neighborhood) includes the Seattle Yacht Club, MOHAI and the U.S. Department of Commerce's NOAA Northwest Fisheries Science Center. The neighborhood area south of SR 520 includes the Montlake Community Center, Montlake Elementary School, and several community services.

Interlaken Park, Montlake Playfield, McCurdy Park, East Montlake Park, and the Washington Park Arboretum encircle the neighborhood, providing a substantial amount of public open space and offering a variety of active and passive recreational opportunities. Park and recreational facilities are described in more detail in Section 4.4.

Montlake Community Center

Community services within the Montlake neighborhood include the Saint Demetrios Greek Orthodox Church at 2100 Boyer Avenue East, the Montlake Community Center (1618 East Calhoun Street) at the south end of Montlake Park, and the Seattle Public Library Montlake Branch (2401 24th Avenue East). The Seattle Parks and Recreation Department operates the Montlake Community Center, which offers an array of programs and special events for all ages, including martial arts, dancing, and senior programs.

University District

The University District and the UW are located north of Portage Bay and the Montlake Cut and west of Union Bay. This neighborhood is densely developed with campus buildings, housing, and commercial businesses to support a large student population, employees, and residents.

University of Washington – Husky Stadium

Montlake Boulevard NE and NE Pacific Street are main roadways linking the Montlake neighborhood via the Montlake Bridge to the UW campus

and Husky Stadium, the UW Medical Center, and the business district and residential areas north of the campus. The Burke-Gilman Trail, a regional bike and pedestrian path, also runs along Montlake Boulevard and NE Pacific Street.

Laurelhurst

Laurelhurst is a predominantly residential neighborhood located north of SR 520 on a peninsula that is bounded by Lake Washington on the south and east and by Union Bay on the west. Single-family homes are located along a south-facing hillside on the peninsula, and residents enjoy views of the lake, the Evergreen Point Bridge, and Mount Rainier.

Madison Park

Madison Park is a residential neighborhood located between the Arboretum and Broadmoor Golf Course on the west, and Union Bay and Lake Washington on the north and east. East Madison Street connects downtown Seattle with the lakeshore neighborhood, which is characterized by small retail shops, restaurants, and single-family and multifamily residential development. Madison Park is located along the Lake Washington shoreline south of the Evergreen Point Bridge. At the southern end of the neighborhood, East Madison Street intersects with Lake Washington Boulevard East, which runs east through the Washington Park Arboretum to provide access to SR 520.

Medina (Eastside)

The Eastside portion of the project area that would be affected by construction of the 6-Lane Alternative is within the city of Medina, a predominantly residential area on the east shore of Lake Washington. Medina is characterized by large single-family homes. SR 520 separates the north and south portions of Medina, and Evergreen Point Road provides access between these two areas. Fairweather Park borders SR 520 from Evergreen Point Road east to 80th Avenue NE. The Points Loop Trail, a bicycle and pedestrian path, also crosses SR 520 at Evergreen Point Road.

What are the existing social and demographic characteristics of the project area?

Community Cohesion

Construction of I-5 in the 1950s and SR 520 in the 1960s bisected the Seattle and Eastside neighborhoods described above, which affected community cohesion in those neighborhoods. Despite the presence of the highway, however, all the neighborhoods in the project area have a strong community identity and are well established, with many older homes, mature landscaping, and limited land for any new development. A variety of parks, open spaces, and trails are found within these neighborhoods,

DEFINITION

Community Cohesion

Community cohesion is the ability of people to communicate and interact with each other in ways that lead to a sense of community, as reflected in the neighborhood's ability to function and be recognized as a singular unit.

ranging from small street triangles and lookout points (such as Bagley Viewpoint in the Portage Bay/Roanoke neighborhood) to the woodlands at Interlaken Park, to the Washington Park Arboretum with large open spaces, pedestrian trails, and botanical gardens. Most of the neighborhoods feature walkable streets with sidewalks and crosswalks and some have traffic calming devices at intersections.

Community cohesion is further maintained by neighborhood commercial areas, which include businesses such as food markets, coffee shops, restaurants, and hair salons that cater to neighborhood residents and provide the residents opportunities to engage socially with one another. Religious institutions, community centers, and local libraries also provide services that knit these communities together.

The neighborhoods in Seattle are characterized by a variety of pedestrian and bicycle facilities and extensive transit service. This transportation network supports linkages within the neighborhoods and offers many ways to travel to other neighborhoods and districts in Seattle and the Eastside. Bicycle/pedestrian paths, including the Bill Dawson Trail (also known as the Montlake Bike Path) and the Burke-Gilman Trail, also provide opportunities for bicyclists in the study area to travel broadly through the Seattle area. To cross the Evergreen Point Bridge to the Eastside, pedestrians and bicyclists must use transit.

Demographic Characteristics

Overall, the Seattle neighborhoods are more ethnically diverse and have a higher proportion of renters than the Eastside. Median home values and household incomes are generally lower than in Eastside communities. Of the Seattle neighborhoods, the University District has the highest proportion of renter-occupied housing and lowest median household income. It is more ethnically diverse than other Seattle neighborhoods in the project area, reflecting the large number of students that reside there. Median household incomes (based on the 2000 U.S. census) range from $31,000 to $80,000 in the University District, Eastlake, Portage Bay/Roanoke, and North Capitol Hill neighborhoods, and from $75,000 to $101,000 in the Madison Park, Montlake, and Laurelhurst neighborhoods. The median household income in Medina is $158,239 based on the 2000 census.

Low-Income, Minority, and Limited English Proficiency Populations

According to the 2000 U.S. Census, just over 5 percent of the population in the project study area has household incomes at or below the federal poverty level. Parts of the University District, Portage Bay/Roanoke, North Capitol Hill, and Laurelhurst neighborhoods have concentrations of low-income residents (Exhibit 4.3-2).

DEFINITION

Low-Income

A low-income person is an individual whose household income falls below the federal poverty guidelines, as defined by the U.S. Department of Health and Human Services.

For 2009, the federal poverty guideline for a household of four in one of the 48 contiguous states and Washington DC is $22,050.

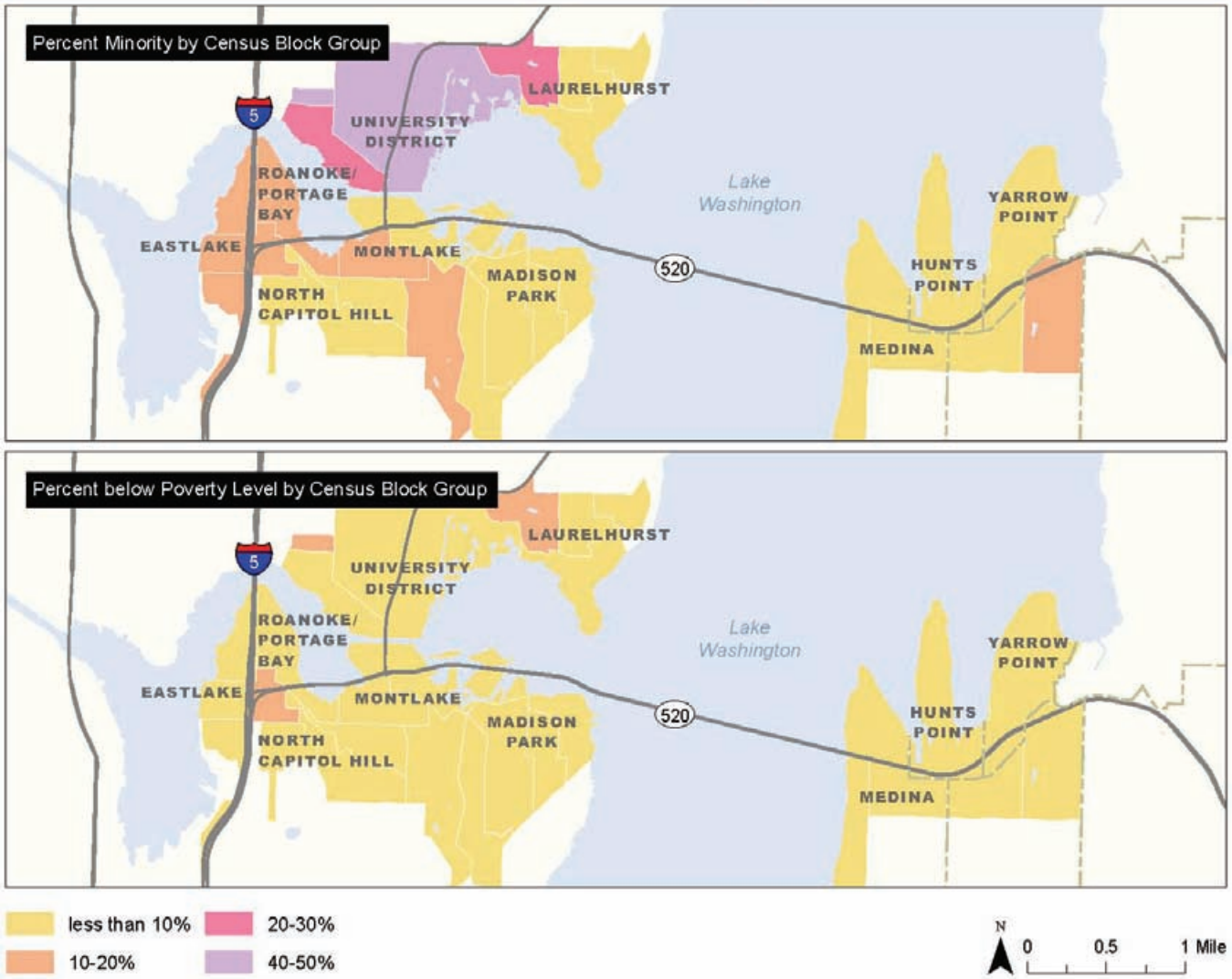
DEFINITION

Minority

A minority person is an individual who identifies himself or herself as:

- Black (a person having origins in any of the black racial groups of Africa);
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
- Asian (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);
- American Indian/Alaskan Native (a person having origins in any of the original peoples of North American and who maintains cultural identification through tribal affiliation or community recognition); or
- Some other race.

Exhibit 4.3-2. **Distribution of Low Income and Minority Populations in the Study Area**



Nearly 16 percent of residents in the project study area are identified as part of a minority population. The University District has the highest concentration of minority populations. Less than 1 percent of residents in the project study area have limited English proficiency (abbreviated as LEP).

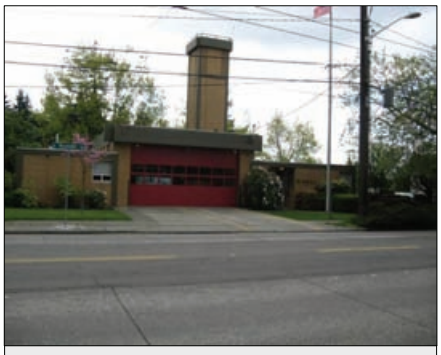
Although the project area has a small resident Native American population, Foster Island and Lake Washington are important places to people of Lakes Duwamish descent. The Lakes Duwamish were the Native Americans most closely associated with the Seattle portion of the project area. Many members of the Muckleshoot Indian Tribe, Snoqualmie Tribe, Suquamish Tribe, and Confederated Tribes and Bands of the Yakama Nation are descended from families who lived near Lake Washington, and Foster Island was used by the Lakes Duwamish as a resting place for their dead. In addition, the Muckleshoot Tribe currently uses Lake Washington for fishing as provided by treaty rights (see Section 4.11).

The effects of federal projects on low-income and minority populations are addressed by Executive Order 12898, which established the concept of "environmental justice" and required environmental documents to disclose whether a project would have disproportionately high and adverse effects on these populations. Since the Executive Order went into effect in 1996, federal agencies, including FHWA, have developed guidance on how to evaluate environmental justice effects. Chapter 5 includes information on how this analysis was done for the SR 520 project.

What fire, emergency medical, and police services are in the project area?

Fire and Emergency Medical

Seattle Fire Department Station 22 is located within the Portage Bay/Roanoke neighborhood at 901 East Roanoke Street (see Exhibit 4.3-1). The Seattle Fire Department plans to reconstruct Fire Station 22 because of its inadequate size and outdated building. Other fire stations that respond to calls in the project area include Station 17 in the University District (1050 NE 50th Street) and Station 34 in Madison Park (633 32nd Avenue East). Average response time for the Seattle Fire Department is 4.32 minutes (Seattle Fire Department 2009).



Fire Station 22

Seattle Fire Department Station 22 is located in the Portage Bay/Roanoke neighborhood at 901 East Roanoke Street.

The fireboats E1, E2, and E3 are stationed at Fishermen's Terminal in Ballard. Through mutual aid agreements with jurisdictions around Lake Washington, the fireboats can respond to boat or marina fires anywhere on the lake.

The City of Medina contracts with Bellevue Fire and Emergency Medical Services for fire and emergency response services.

The UW Medical Center (1959 NE Pacific Street) is located in the University District neighborhood. Harborview Medical Center, located on Capitol Hill (325 9th Avenue) is the Level I trauma facility for Washington and is also the headquarters for the Seattle Fire Department's Medic One Program. Other hospitals serving the project area include Swedish Medical Center (Providence and First Hill campus), Virginia Mason Medical Center, Children's Hospital and Regional Medical Center, and Overlake Hospital Medical Center (Bellevue).

Police

The Seattle Police Department provides law enforcement and responds to calls in Seattle. Seattle is divided into five precinct areas, with the East Precinct patrolling and responding to calls in the project area neighborhoods south of the Montlake Cut and the North Precinct patrolling and responding to calls in the University District and Laurelhurst neighborhoods.

Police services in Medina are provided by Medina Police Department.

There are two additional law enforcement agencies that patrol and respond to calls in the study area. The Washington State Patrol responds to accidents on project area highways and highway on-ramps, off-ramps, and interchanges. The Seattle North Detachment of the Washington State Patrol is located at 811 East Roanoke in the Portage Bay/Roanoke neighborhood. The UW Police Department serves and protects the people and property within the main campus of the university. The station is located at 1117 NE Boat Street (see Exhibit 4.3-1).

Utility Providers

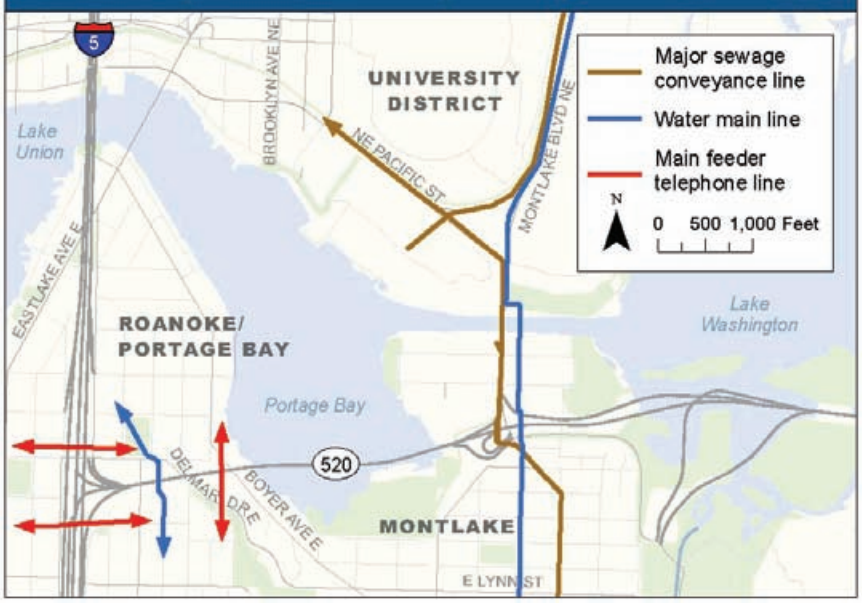
Utility providers in the project area include but are not limited to:

- AT&T Communications
- Comcast
- City of Seattle Department of Information Technology
- Seattle City Light
- Seattle Public Utilities
- King County Wastewater Treatment Division
- Puget Sound Energy
- Qwest Communications
- Sprint Nextel
- T-Mobile

What utility providers serve the project area?

A number of utility providers serve the project area. Major utility crossings of SR 520 and I-5 within the project area are identified on Exhibit 4.3-3.

Exhibit 4.3-3. Major Utilities in Seattle Project Area



Electricity

The City of Seattle-owned electric utility, Seattle City Light, provides electric power to the neighborhoods in Seattle. A number of overhead and underground distribution lines are located adjacent to SR 520 and I-5 within the project area; however, no major overhead or underground transmission lines cross SR 520 within the project area. Puget Sound Energy provides electric power on the Eastside.

Natural Gas

Puget Sound Energy provides natural gas service to the study area. There are buried gas distribution lines throughout the project area; however, no high-pressure gas mains are located near SR 520 in the project area.

Telecommunications

Qwest Communications is a principal provider of local telephone services in the study area. Qwest also provides internet service to the study area. Telephone lines are typically located within street rights-of-way, aboveground on utility poles in most areas, and underground in some areas. Main feeder telephone lines cross SR 520 at Boyer Avenue East and cross I-5 at approximately East Roanoke Street and East Miller Street.

Verizon, Sprint Nextel, and T-Mobile also provide wireless service to the area. There are a number of cellular phone providers in the study area, and a cellular tower is located at the Montlake interchange within the study area.

Cable

Comcast provides cable television and cable internet service to neighborhoods in the study area. Qwest provides cable internet service and has cable and fiber optic lines located along the Burke Gilman Trail.

Water, Wastewater, and Stormwater

Seattle Public Utilities (SPU) provides water service to the neighborhoods in Seattle. Major water mains (no smaller than 42 inches in diameter) in the study area include a 42-inch main that crosses SR 520 between 10th Avenue East and Delmar Drive East and a 54-inch main that crosses SR 520 at Montlake Boulevard NE (see Exhibit 4.3-3). The City of Bellevue Utilities Department provides water and sewer services to Medina.

SPU also manages Seattle's drainage, surface water runoff, and sewer systems. In some areas sewage and stormwater are combined and conveyed through the King County interceptor system to the West Point Treatment Plant. In other areas separate drainage-only systems convey stormwater directly to water bodies such as Lake Union, Elliott Bay, and Lake Washington.

The King County Wastewater Treatment Division provides sewage treatment services in Seattle. Wastewater from the Seattle study area flows to the West Point Treatment Plant, located on Puget Sound. Major sewer trunk lines include 108-inch and 42-inch sewers that cross SR 520 at Montlake Boulevard NE, travel south, and connect into a 90-inch main along East Montlake Place East and a 66-inch main along West Montlake Place East.

Stormwater and drainage are discussed in more detail in Section 4.10 and the Water Resources Discipline Report (Attachment 7).

Garbage and Recycling Service

SPU currently has contracts with two private firms for garbage and recycling service in Seattle: Waste Management and CleanScapes. Waste Management provides service outside the study area in south and northwest

Seattle. CleanScapes began contracting with the city in March 2009 and serves central and northeast Seattle, including the study area. There are no recycling or transfer/disposal stations located in the study area. Allied Waste Services (Rabanco) provides garbage, recycling, and yard debris collection services in Medina.

4.4 Recreation

Parks and recreation facilities are important resources, highly valued by community members. The recreational resources within the project vicinity include public parks, major waterways, popular multi-use trails, and busy UW recreational and athletic facilities. Most of the recreation facilities are owned or maintained by the parks and recreation department of Seattle, or by the UW. The City of Seattle Parks and Recreation Department manages over 6,200 acres encompassing more than 400 parks and open spaces. The UW's 630-acre campus is located north of the Montlake Cut and west and north of Union Bay and includes Husky Stadium, Hec Edmundson Pavilion, the Waterfront Activities Center (WAC), and many acres of open space used for recreational purposes.

Which Seattle recreational facilities are in the project area?

Fourteen parks and recreational facilities are located along the Seattle portion of the project corridor. These include eight City of Seattle parks (including the Washington Park Arboretum), three designated trails, two historic boulevards, and UW recreational facilities. These facilities are shown on Exhibit 4.4-1 and listed with supplemental information in Table 4.4-1. Some of these parks—in particular the Washington Park Arboretum—are of regional and even national significance.

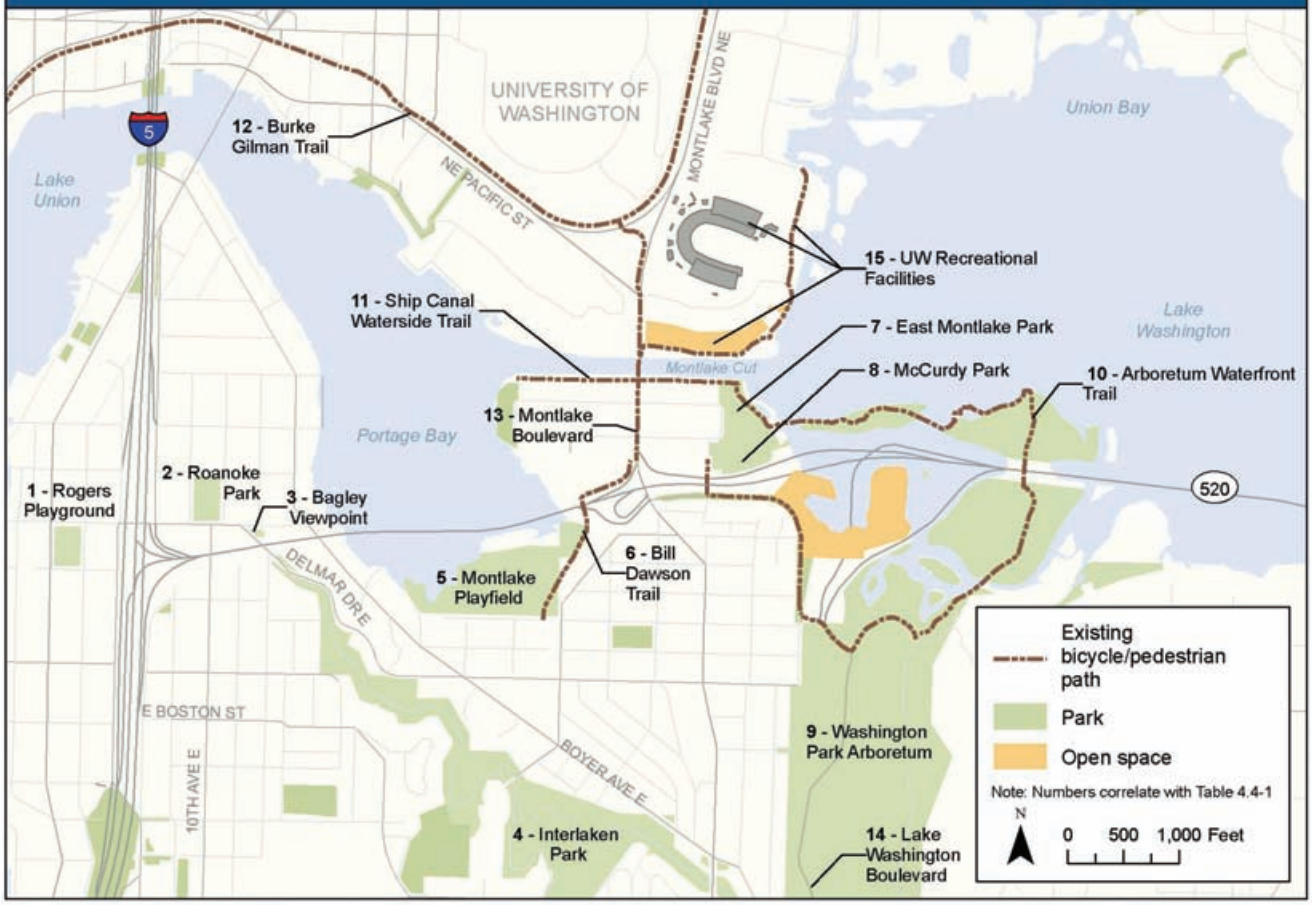
Rogers Playground

Rogers Playground is a 1.9-acre City of Seattle neighborhood park. Access is available on all sides of the playground from Eastlake Avenue, Franklin Avenue, Roanoke Street, and Louisa Street. The playground has baseball and soccer fields, restroom facilities, a children's play area, walking trails, and off-street parking.

Roanoke Park

Roanoke Park is a 2.2-acre Seattle neighborhood park. It lies within the Roanoke Park Historic District and is surrounded by stately homes (see Section 4.6, Cultural Resources, for more information). The park has many mature fruit trees as well as picnic sites, a children's play area, walking trails, and a half-basketball court. Access is available on all sides of the park from 10th Avenue East, Broadway Avenue East, East Roanoke Street, and East Edgar Street.

Exhibit 4.4-1. Parks and Recreational Facilities in Seattle Project Area



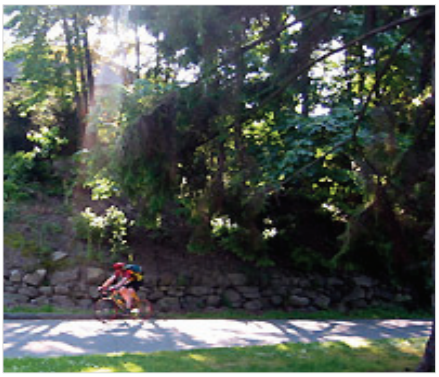
Bagley Viewpoint

Bagley Viewpoint is located adjacent to the north boundary of the Roanoke Street off-ramp from westbound SR 520. Bagley Viewpoint is a small (0.15-acre) park owned by the City of Seattle. It offers views of Portage Bay, Lake Washington, and the Cascade Mountains, although invasive vegetation has limited the extent of these views. Bagley Viewpoint is identified in the draft *Vegetation Management for Seattle Parks Viewpoints* (City of Seattle 2005), which proposes procedures for controlling erosion and removing weeds in the area. Bagley Viewpoint is also protected under the City of Seattle's SEPA ordinance as a "SEPA viewpoint." Proposed alterations to these viewpoints are subject to visual guidelines set forth in *Seattle Views: An Inventory of 86 Public View Sites Protected under SEPA* (City of Seattle 2002).

Bagley Viewpoint

Interlaken Park

Interlaken Park is a densely wooded Seattle park located at 2451 Delmar Drive East on the north end of Capitol Hill. Bikers, hikers, and joggers frequent the paths and trails throughout the park. In the 1890s, Interlaken Boulevard was the principal bike and buggy path linking Capitol Hill with



Interlaken Park

Table 4.4-1. Summary Information about Recreation Resources in the Project Vicinity

Park ID No.[a]	Name/Location	Size or length	Facility Type and/or Function[b]	Ownership and Management	Site Features and Characteristics
1	Rogers Playground	1.9 acres	Neighborhood park	City of Seattle Department of Parks and Recreation	Tennis courts, ball field, restrooms
2	Roanoke Park	2.2 acres	Neighborhood park	City of Seattle Department of Parks and Recreation	Basketball court, play area, picnic tables, trails
3	Bagley Viewpoint	0.1 acre	Viewpoint park	City of Seattle Department of Parks and Recreation	View of Portage Bay, off-street parking
4	Interlaken Park	51.7 acres	Regional park	City of Seattle Department of Parks and Recreation	Woods, trails
5	Montlake Playfield	27 acres	Neighborhood park	City of Seattle Department of Parks and Recreation	Play areas, trails, picnic tables, tennis courts, community center
6	Bill Dawson Trail	Approximately 1,750 feet	Bike and pedestrian trail	WSDOT right-of-way, City of Seattle Department of Parks and Recreation, NOAA	Multi-use pathway
7	East Montlake Park	7.1 acres	Neighborhood waterfront park	City of Seattle Department of Parks and Recreation, Washington State Department of Natural Resources	Northern half of MOHAI building, parking, benches, trails, waterfront access
8	McCurdy Park	1.5 acres	Neighborhood park	City of Seattle Department of Parks and Recreation	Southern half of MOHAI building, open space
9	Washington Park Arboretum	193 acres	Regional park	City of Seattle Department of Parks and Recreation, UW	Arboretum collection, Japanese garden, visitor center, waterfront trail and access, views
10	Arboretum Waterfront Trail	0.5 mile	Trail	City of Seattle Department of Parks and Recreation, UW	Observation platforms and views
11	Ship Canal Waterside Trail	Approximately 1,200 feet	Recreation trail	City of Seattle Department of Parks and Recreation	Trail, benches, viewpoints
12	Burke-Gilman Trail	12.5 miles	Bike and pedestrian trail	City of Seattle and UW	Multi-use pathway
13	Montlake Boulevard	0.3 acre	Historic boulevard	WSDOT right-of-way	Mature trees and landscaping
14	Lake Washington Boulevard	116 acres	Historic boulevard	City of Seattle Department of Transportation right-of-way	Mature trees and landscaping, on-street bike path
15	UW Campus[c]	630-acre campus	Campus recreational activities	UW	Boathouse, open space, benches, docks, climbing rock, trails, athletic facilities
16	Points Loop Trail	5.6 miles	Trail	Communities of Medina, Hunts Point, and Yarrow Point	Includes off-street trails, streets, and sidewalks
17	Fairweather Park	11 acres	Neighborhood nature park	City of Medina	Forested open space, tennis courts, trail

[a] ID numbers correlate with Exhibits 4.4-1 and 4.4-2.
[b] Facility designation determined by jurisdiction or use.
[c] While the entire campus is open to the public, not all areas provide publicly accessible recreational resources.

the boulevards on Lake Washington. In 1903, the Olmsted Brothers designated Interlaken as a boulevard route. Access from the north is available from Delmar Drive, through Interlaken Boulevard, but many access points are available from local roadways. A striped and designated bike path is located either on-street or adjacent to Delmar Drive for pedestrian and bicycle access.

Montlake Playfield

Located on the shore of Portage Bay, Montlake Playfield is a 27-acre Seattle regional park. The playfield is used for many recreational events, including football, baseball, soccer, and track. A project to renovate the playfields is in the design stage. The community center hosts many neighborhood meetings and events. Currently, the draft *Vegetation Management Plan for Seattle Parks Viewpoints* (City of Seattle 2005) identifies restoring intended views at Montlake Playfield as "high priority" because invasive species and overgrown vegetation obscure much of the views. Access to Montlake Playfield and community center is available from Calhoun Street, with off-street parking. Pedestrian access from the north is available from the Bill Dawson Trail.

Bill Dawson Trail (Montlake Bike Path)

The Bill Dawson Trail is a designated multi-use pathway that extends under SR 520 between the northeast corner of the Montlake Playfield and the southern edge of the NOAA Northwest Fisheries Science Center. The trail lies both on NOAA property and within the existing WSDOT SR 520 right-of-way. The trail receives considerable use because it connects to Montlake Boulevard and the larger citywide trail system. Access from the north is at Montlake Boulevard, and access from the south is at Montlake Playfield at Calhoun Street.

Bill Dawson Trail (Montlake Bike Path)

East Montlake Park and McCurdy Park

East Montlake Park and McCurdy Park are located on the shore of Union Bay adjacent to the Shelby-Hamlin portion of the Montlake neighborhood.

East Montlake Park was created from land deeded to Seattle for park purposes in the 1909 plat of the Montlake neighborhood. The 7.1-acre park is jointly owned by the Seattle Parks and Recreation Department (western one-third of the park) and the Washington State Department of National Resources (eastern two-thirds of the park). While the split in ownership of the land is still in effect, the entire area is signed and recognized by the City and the public as East Montlake Park. Today, East Montlake Park provides trail connections to the Washington Park Arboretum and the Montlake neighborhood and contains trailheads for both the Arboretum Waterfront Trail and the Ship Canal Waterside Trail.

McCurdy Park. Vegetation in the park separates SR 520 and MOHAI.

McCurdy Park is situated between the north side of SR 520 and the southern boundary of East Montlake Park. Seattle has designated the park as a SEPA viewpoint because of its views of Marsh Island and Foster Island and limited views of Lake Washington. Vehicular access to these parks and MOHAI is available from the 24th Avenue overpass, with off-street parking. Pedestrian traffic can access these parks from the Montlake neighborhood, the Arboretum Waterfront Trail, and the Ship Canal Waterside Trail.

Washington Park Arboretum

Seattle Parks and Recreation and the University of Washington cooperatively manage the Washington Park Arboretum. Seattle Parks and Recreation maintains its park functions and the University of Washington owns, maintains, and manages the plant collections and associated programs. The Arboretum Foundation manages fund raising, membership, and volunteer services. Although the City of Seattle owns most of the Washington Park Arboretum, the University of Washington owns portions of the park, and the Washington Department of Natural Resources owns most of Marsh Island and the northern half of Foster Island.

East Montlake Park and the Ship Canal Waterside Trail, looking toward Union Bay

Existing park facilities include the Japanese Garden, Graham Visitor's Center, several canoe and kayak launches to Union Bay, paved and unpaved walking paths (including the Arboretum Waterfront Trail), islands, picnic tables, parking lots, natural areas, and manicured lawns. The Washington Park Arboretum, which has a nationally and internationally recognized woody plant collection, is a significant educational resource as well as a recreation resource.

Future development of the Washington Park Arboretum is guided by the 2001 *Washington Park Arboretum Master Plan* (City of Seattle et al. 2001); see Section 4.2 and the Recreation Discipline Report (Attachment 7) for more information. Planned improvements in the project area include the addition of a 300-square-foot outdoor education building on Foster Island and a viewing platform on Marsh Island. The Master Plan also proposes to modify the unused R.H. Thomson freeway ramp at the north end to make a multi-use link to MOHAI.

Foster and Marsh Islands

Foster and Marsh islands are peat and marsh landscapes that lie near the southern shore of Union Bay. They are wetland and waterway landscape features in the Washington Park Arboretum and are located at the north end of the park (City of Seattle et al. 2001). The waterways surrounding these islands consist of marshes and open-water channels that contain native and non-native vegetation not found in other portions of the park. The park provides four designated non-motorized watercraft landings in the waterways with access to the waterfront trail system.

Annual Events

The study area hosts a number of annual events that have citywide importance.

- Opening Day of boating season is held in early May. The Montlake Bridge is raised to allow larger watercraft through the Montlake Cut. Spectators line the banks of the cut and also watch from boats moored in Union Bay.
- The Windermere Cup, a rowing competition, is held in the Montlake Cut on the Opening Day of boating season. Viewing is generally from the UW Canoe House, the trails and open space along the Montlake Cut, and the Montlake Bridge, which is closed to traffic during the event.
- The Nordstrom Beat the Bridge fundraising run uses the Husky Stadium parking lot and crosses the Montlake Bridge.

Foster Island was purchased in 1917 to be included as a part of Washington Park. The island grew considerably when the opening of the Ship Canal and the Hiram M. Chittenden Locks (also known as the Ballard Locks) lowered the water level of Lake Washington by 9 feet. The original SR 520 project in 1963 divided the island and dredged through its central portion to create the isthmus over which the highway passes. SR 520 provides a pedestrian underpass for trail connection; the underpass is approximately 8 feet high by 12 feet wide and 92 feet long. Marsh Island is located west of Foster Island and is considerably smaller. The UW manages the plant collections. The two islands are connected by the Arboretum Waterfront Trail (described below).

Arboretum Waterfront Trail and Foster Island

Arboretum Waterfront Trail

In 1967, the Arboretum Waterfront Trail was established by the UW, the Interagency Committee for Outdoor Recreation (now the Recreation and Conservation Office), the U.S. Department of Interior, and the City of Seattle. Land and Water Conservation Act grant funds were used for the original development of the trail.

The Arboretum Waterfront Trail is a 0.5-mile trail that meanders on a series of floating piers and structures through the marsh land that connects Marsh and Foster islands to the main features of the Washington Park Arboretum. Raised observation platforms provide views of the various wetlands around the islands and of Union Bay and Husky Stadium. The western trailhead is located in East Montlake Park and connects to the Ship Canal Waterside Trail and on to the UW.

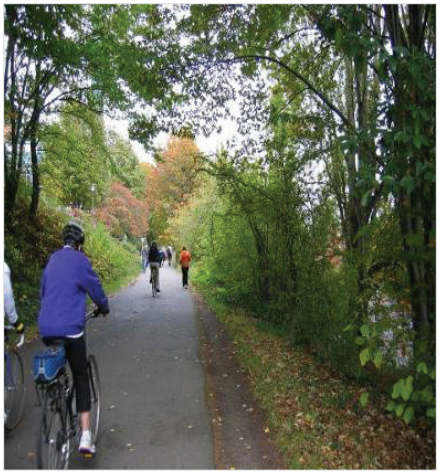
Arboretum Waterfront Trail under SR 520 on Foster Island

Ship Canal Waterside Trail

The Ship Canal Waterside Trail was constructed in 1970 and designated a National Recreation Trail in 1971. It is located east of Montlake Boulevard along the south side of the Montlake Cut. The 1,200-foot-long trail connects the Arboretum Waterfront Trail with West Montlake Park on Portage Bay. The trail was originally developed with funds from a Land and Water Conservation Act grant and is maintained by the Seattle Parks Department. Popular year-round activities along the trail include sightseeing, picnicking, fishing, and jogging. Each May, thousands of Seattle residents line the shores of the Montlake Cut to watch the parade of boats that marks the opening day of boating season. The trail can be accessed from Montlake Boulevard as well as from East Montlake Park at East Shelby Street.

Burke-Gilman Trail

The Burke-Gilman Trail is a popular recreational trail for walkers, runners, cyclists, and skaters; it is also used by non-motorized commuters. This 14-mile paved trail is located in the cities of Seattle, Lake Forest Park, and Kenmore and provides views of the city, waterways, and Lake Washington.



Burke-Gilman Trail

In the project vicinity, the trail is jointly maintained by Seattle Department of Transportation and Seattle Parks and Recreation Department.

The Burke-Gilman Trail is a regional facility built on an old railway bed, with the southern trailhead located west of the project area at 8th Avenue NW and Leary Way on the Fremont-Ballard border. The trail passes through the UW, paralleling the west side of Montlake Boulevard. The trail has become a major transportation corridor that serves thousands of commuters and recreational users.

Olmsted Boulevards

Montlake and Lake Washington boulevards were designed as part of the Olmsted plan for Seattle parks, boulevards, and playgrounds (see sidebar). The boulevards are distinguished by planting strips that contain mature trees and landscaping. The Montlake Boulevard planting strip is approximately 550 feet long and is located between the SR 520 interchange and East Shelby Street. The Lake Washington Boulevard planting strip is located between the Montlake Boulevard interchange and the western boundary of the Washington Park Arboretum. Both planting strips are located in the National Register of Historic Places (NRHP) eligible Montlake Historic District and are maintained for aesthetic value and traffic operations by the City of Seattle. (For more information, refer to Section 4.6 and the Cultural Resources Discipline Report [Attachment 7].)

The Olmsted Plan

In 1903, the Seattle City Council contracted with the Olmsted Brothers to prepare a comprehensive plan that would guide the future development of a Seattle park system. The brothers had inherited the nation's first landscape architecture firm from their father, Frederick Law Olmsted, the designer of New York's Central Park.

John C. Olmsted spent several weeks in the summer of 1903 studying the topography of Seattle and its parks. The centerpiece of his plan was a 20-mile landscaped boulevard linking most of the existing and planned parks and greenbelts within the city limits. Roanoke Park, Interlaken Park, Volunteer Park, Lake Washington Boulevard, Washington Park Boulevard, and Montlake Boulevard are all part of this Olmsted system.

Washington Park, one of Seattle's first parks, was included in the overall Olmsted plan. The Seattle Garden Club donated $3,000 in 1936 to design the first planting plan for the Washington Park Arboretum. During the Great Depression, 500 men in the Public Works Administration constructed many of the Arboretum's historical features, such as the Stone Cottage and Azalea Way.

University of Washington Campus Recreational Facilities

The UW provides several recreational sites and facilities for intercollegiate and intramural activities and for passive recreation. The intercollegiate athletic program provides organized spectator sports such as football, basketball, baseball, and track. Facilities include the Bank of America Arena at Hec Edmundson Pavilion and Husky Stadium, both located in the south campus area near the SR 520 Montlake Boulevard interchange. Montlake Boulevard provides the main arterial access to these facilities from the south campus, but many access points to the campus are possible. Other recreational areas include the Ship Canal and Union Bay waterfront, Burke-Gilman Trail, and other natural areas of the southeast campus. All recreational areas are open to the public as well as to UW students and staff.

Intercollegiate Facilities

Husky Stadium is located immediately north of the Montlake Cut and the UW Open Space. Its south parking lot has approximately 1,200 parking spaces (E-11 and E-12). Parking is at capacity and is primarily used by UW Medical Center employees and visitors. East of Husky Stadium are the Husky Softball Stadium and the Husky Soccer Field. Although these facilities are not open to the public during athletic seasons, they are also used for community events.

Husky Stadium is a resource for the community, as it is used for more than just UW athletic contests. More than 50 other events involving more than 70,000 individuals are held annually at Husky Stadium. These events include, among others, annual commencement exercises, the American Cancer Society Relay for Life, the Multiple Sclerosis Society Walk, community youth soccer practices, Washington State Patrol training, the Seattle Public School Board Walk, and high school football (UW 2008). Youth sports participation is also an important activity, with thousands of young people attending sports and band camps each year.

Aerial view of the University of Washington's Husky Stadium and southeast campus facilities

University of Washington Open Space

The UW Open Space is a large grassy area, approximately 3 acres in size, located between the Husky Stadium parking lot and the Montlake Cut. The Open Space is vegetated and includes a climbing wall and facilities for picnicking that are open for public use and other recreational activities. The Open Space also contains the Waterfront Activities Center, the Canoe House, and the connecting East Campus Bicycle Route.

Waterfront Activities Center

Water-related recreational facilities are available at the Waterfront Activities Center, which is located south of Husky Stadium on Union Bay and the Montlake Cut. The Washington Yacht Club, Sailing Team, Kayak Club (flat and white water), and Union Bay Rowing Club organize their activities at the WAC. The WAC is open 337 days a year including holiday and weekends. More than 220,000 people visit the facility each year (35 percent are the general public). The WAC also rents canoes and rowboats to the general public with discount rates for students, staff, and alumni. This facility provides a unique recreational opportunity for the general public to view the aquatic areas in and around Marsh and Foster islands. The WAC rents 15,000 to 20,000 boats each year. Storage for private non-motorized boats is also available to students, faculty, staff, and alumni association members. Most often, boaters cross the Montlake Cut, and then proceed through Union Bay and under SR 520 in order to dock, hike, or picnic in the Washington Park Arboretum.

UW Waterfront Activities Center dock and Canoe House. Canoe rentals are available at the Waterfront Activities Center.

University of Washington Canoe House

The Canoe House on the UW campus is listed in the NRHP. It is located adjacent to the WAC at the entrance to the Lake Washington Ship Canal from Union Bay. The Canoe House was built in 1928 by the U.S. Navy to serve as a hangar for the Aviation Training Corps. It was donated to the university and used as the shellhouse for the rowing team until 1949. It is currently used by the UW crew team.

Canoes exploring the Arboretum

East Campus Bicycle Route

The East Campus Bicycle Route is a gravel trail located in the southeast campus along Lake Washington and the Montlake Cut between the WAC

and Montlake Boulevard. A vegetated slope provides a buffer between the trail and the cut.

How is Lake Washington used for recreation?

There are no formally designated parks or recreational facilities on Lake Washington itself within the study area. However, recreational activities such as fishing and non-motorized boating occur in and on Lake Washington throughout the year, especially in summer. Within the project area there are multiple launch points for both motorized and non-motorized watercraft. The Washington Park Arboretum has several boat landings for non-motorized watercraft; the WAC rents canoes and kayaks.

Which Eastside recreational facilities are in the project area?

Points Loop Trail

The Points Loop Trail lies within the jurisdictions of Medina, Hunts Point, Clyde Hill, and Yarrow Point (Exhibit 4.4-2). In the project area, the trail is located in the WSDOT right-of-way and along the south side of Fairweather Park, Hunts Point Park, and Wetherill Nature Preserve.

Fairweather Park

Fairweather Park is north of SR 520 (Exhibit 4.4-2). It is managed by the City of Medina and includes tennis courts, open space, 11 acres of woods, streams, and wetlands. The park has considerable ecological diversity, with more than 53 species of plants, 6 species of mammals, and 20 species of birds. The terrain ranges from upland forest to wetland, and the park is bisected by a spring-fed stream. The park is maintained through volunteer efforts and contributions. The Points Loop Trail is located immediately adjacent to the south side of the park, within the WSDOT right-of-way.

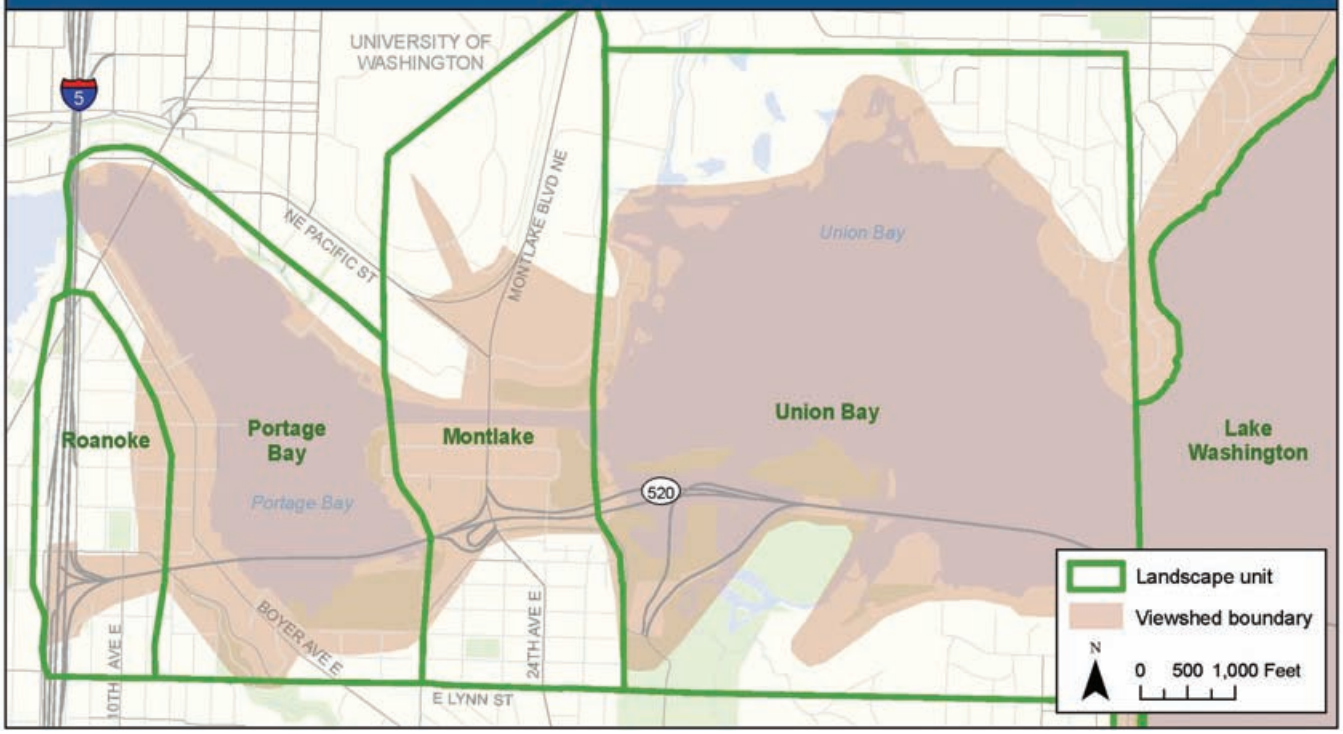
Exhibit 4.4-2. Parks and Recreational Facilities on the Eastside

Fairweather Park

4.5 Visual Quality

Study areas for this visual quality assessment are the project viewshed, which is defined as the area that can be seen from the roadway, and landscape units, which are smaller subareas within the viewshed (Exhibits 4.5-1 and 4.5-2). The viewshed is divided into subareas called landscape units, which allow a closer look at the details and character of neighborhoods or other small districts. The criteria for determining the limits of a landscape unit are that each unit has a distinctive landscape pattern or use and specific, finite geographic boundaries. The project team defined a total of six landscape units based on this criteria and field visits: Roanoke, Portage Bay, Montlake, west approach, Lake Washington, and Eastside.

Exhibit 4.5-1. **Seattle Viewshed and Landscape Units**



The Roanoke landscape unit consists of a high plateau, with steep hillsides, between Lake Union and Portage Bay. The Portage Bay landscape unit comprises the hillsides and shorelines around the Portage Bay basin including the waters of the basin. The Montlake landscape unit consists of the Montlake Boulevard corridor and neighborhoods along the corridor. The west approach segment consists of Union Bay and all of Union Bay's islands, marshes, hillsides, and shorelines. Lake Washington landscape unit includes the lake and its shorelines. The Eastside landscape unit comprises the area between Evergreen Point Road and 92nd Avenue NE in Yarrow Point.

Exhibit 4.5-2. **Eastside Viewshed and Landscape Units**

Roanoke Landscape Unit

Panoramic views are available to the public from the 10th Avenue East and Delmar Drive East overpasses. In general, however, this is a vehicle-oriented environment, and the aesthetic experience of pedestrians in most of this landscape unit is diminished by traffic. The pleasant landscape at Roanoke Park and streetscapes between 10th Avenue East and Delmar Drive East help to improve the experience. Transportation signage and signalization, street lighting, and overhead utilities create a moderate degree of visual clutter.

The visual character of the Roanoke landscape unit is defined by the highly diverse development and highways within it. SR 520 is recessed below the neighborhoods, so the experience of traveling on the highway through this area is that of traveling in a concrete channel passing under small bridges or

on elevated ramps. Few homes along SR 520 in this unit have views of the highway because of topography and dense tree screens. I-5 is generally not visible from homes north of East Roanoke Street because of recently installed noise walls.

Viewer groups are commuters traveling through the area on SR 520 and I-5, workers and visitors to businesses or activity centers in North Capitol Hill, and residents traveling between work and home or their local park. Commuters, particularly drivers, are likely to be less sensitive to visual quality because they are traveling on the roadways at high speeds and focused on traffic movements. Their passengers may be somewhat more sensitive to views and visual quality because they can look around. Workers and visitors in North Capitol Hill and Roanoke are likely to be moderately sensitive to visual quality in this area because they are familiar with the place or are engaged in social or recreation activities. Residents are likely to be very sensitive to visual quality because this is their neighborhood and they are attentive and attached to certain familiar qualities and views.

DEFINITIONS

A **viewshed** is the aggregate area that can be seen from the project and that has views of the study area from the surrounding area.

Landscape units are subareas of a viewshed that make evaluation of the study area more manageable. They are defined by visual traits and visual continuity within the unit. The "landscape units" can also be thought of as a way to organize the project by "rooms" that a viewer passes through while traveling along SR 520.

Simulations are computer-generated or hand-drawn images that illustrate probable visual changes and relative scales of the existing and proposed features as seen from a pedestrian's or commuter's viewpoint.

Roanoke landscape unit, looking northeast

Portage Bay Landscape Unit

The visual character of the Portage Bay landscape unit is defined by the bay itself and by the density and diversity of development around and in Portage Bay. Development is continuous around the shoreline except for the more natural area of shoreline and wetland vegetation at the edge of the Montlake Playfield.

The view east and southward from the Roanoke plateau hillsides is characterized by covered docks and boat slips near the Portage Bay Bridge. Most views of the bridge from the Montlake Playfield and neighborhoods are screened in summer and fall by trees along the shoreline. SR 520 is clearly visible from the north part of Portage Bay. The bridge dominates the views from the Queen City Yacht Club and homes along Boyer Avenue, while still allowing for views to north Portage Bay because of its height.

Portage Bay landscape unit, looking southwest toward Roanoke and Queen Anne

The largest viewer group is commuters traveling on the SR 520 Portage Bay Bridge. Boaters, workers, and visitors who travel to a business or activity center in the UW area and residents who travel between work and home constitute smaller groups.

Although in general commuters tend to become less sensitive over time to views of their surroundings, commuters as a whole (both drivers and passengers) on the Portage Bay Bridge are likely to appreciate the visual quality of the panoramic and memorable views in both the eastbound and westbound directions. Viewers in taller vehicles such as trucks and buses are able to see over the traffic barriers and have better lateral views of Portage Bay, the marinas to the north, and marshes to the south. Workers and visitors in the University of Washington area are likely to be moderately sensitive to visual quality because they are familiar with the place or are

engaged in social or recreation activities. Residents are likely to be very sensitive to visual quality because this is their neighborhood and they are attentive and attached to certain familiar qualities and views.

Montlake Landscape Unit

The Montlake landscape unit is a mixed-use area that includes the Montlake residential neighborhood on either side of Montlake Boulevard, the NOAA Northwest Fisheries Science Center, the MOHAI area, the Montlake Cut, and UW's southeast campus. The visual character of this landscape unit is defined by the diversity of development.

Montlake landscape unit, looking north toward Husky Stadium

The Montlake neighborhood includes residential-scale buildings and commercial establishments in a variety of architectural styles and ages. There are large, multi-story buildings at NOAA, medium-scale club facilities at the Seattle Yacht Club, and the medium-scale MOHAI building. Across the Montlake Cut, the UW area has multi-story, large-footprint buildings and structures to house the hospital, sports, and research facilities, also in a variety of styles and ages. Husky Stadium is the dominant and iconic structure and a memorable part of most views inside and outside of the area.

Panoramic, highly memorable views are available year-round from the north stands in Husky Stadium. These views contain important visual resources: Union Bay, Lake Washington, Mount Rainier, and the Cascade and Olympic mountains. The Montlake Bridge is a historic and picturesque structure when seen from other viewpoints, but also offers scenic views along the Montlake Cut, across Union and Portage bays and Lake Washington, and of the Cascade Mountains. In addition, Rainier Vista on the UW Campus offers views toward Lake Washington and Mt. Rainier.

The Montlake landscape unit is a very active area both as an important crossroads and as an urban-educational destination zone with numerous activity centers. Viewer groups are commuters traveling by bus or car through the area on SR 520 and Montlake Boulevard; employees of and visitors to the business or activity centers; and residents traveling between work and home. Commuters on SR 520 are likely to be less sensitive to visual quality because they are traveling in a concrete-lined channel at high speeds and focused on traffic movements.

West Approach Landscape Unit

The west approach landscape unit includes the bay and its diverse and complex shorelines, islands, marshes, and wetlands. The Evergreen Point Bridge and Lake Washington Boulevard ramps rise through the Arboretum wetlands and the tree canopy at Foster Island, and pass over open water north of Broadmoor Golf Course and north Madison Park. The broad oval shape of the bay connecting to the expanse of Lake Washington creates a scenic and open character.

West approach landscape unit at Arboretum looking north

The visual character of this landscape unit is defined primarily by the bay itself and secondarily by the open spaces that ring the bay. These open spaces include the islands, marshes, and wetlands along the shorelines; the Washington Park Arboretum; and the private Broadmoor Golf Course.

View of west highrise from Madison Park

The western highrise east of the Arboretum is visible from most viewpoints because of its height and the fact that it is not screened by vegetation. The western highrise is a part of the view from north-facing Madison Park residences. The structure's lines are simple and narrow, but the height of the road deck is such that from parts of Madison Park it blocks northward views of Union Bay from north Madison Park and views of Madison Park from Laurelhurst. However, Mount Rainier and the Cascade Mountains are still visible from Laurelhurst in the distance above the bridge.

Panoramic, highly memorable views are available year-round from south-facing residences in Laurelhurst, the Union Bay Bridge, and the highrise connecting to the east end of the west approach. The vista from these viewpoints includes the Cascade Mountains, Union Bay, the Arboretum, Lake Washington, the Eastside hills, and Mount Rainier. West-facing views include the Olympic Mountains and the Seattle hillsides and skyline. Picturesque and scenic views are available from most places on or around the bay.

The west approach landscape unit is a very scenic area with a high level of recreational activity. As with the other Seattle landscape units, Union Bay is important both for its connector routes and as a destination point with a number of recreational activity centers. Viewer groups are commuters traveling through the area on SR 520; boaters heading to or from Lake Washington; visitors to recreation sites; and residents traveling between work and home.

Commuters and boaters are likely to be sensitive to visual quality because of the beauty of the landscapes and stretches of open water through which they travel. Visitors engaging in recreational activities are likely to be very sensitive to visual quality in this area because they have come specifically to enjoy the natural and scenic surroundings. Residents are a small viewer group compared to the other groups discussed above, but are also likely to be very sensitive to visual quality because they are attentive and attached to certain familiar qualities and views.

Lake Washington Landscape Unit

Evergreen Point Bridge
(floating span in center)

The Evergreen Point Bridge is the only built structure in the Lake Washington landscape unit (docks are considered to be part of the Seattle or Eastside areas). A three-story control house is located midspan, with equipment for the retractable drawspan and two overhead walkways. The east and west highrises have steel-framed truss superstructures that add to

the apparent height. Overhead roadway facilities include freeway light standards and sign structures.

The road deck of the floating bridge is approximately 7 feet above water level, giving commuters the sense of being at water level. Because of the openness of the lake, especially to the north and south, Evergreen Point Bridge offers expansive, highly memorable views of the Cascade and Olympic mountains, Mount Rainier, the wooded hillside communities around the lake, and Husky Stadium.

The floating span and east and west highrises are visible from almost anywhere on Lake Washington, but these structures become less visible with distance. The dark gray of the pontoons and road deck helps to soften the visual presence of the structure when seen from distant locations.

Bridge profile near Madison Park

The bridge appears as an 8-foot-tall concrete wall when seen from the lake and near the bridge; however, this is a transitory view for most people boating on the lake. The tall columns and cross-bracing of the east approach and highrise dominate views from the homes in Medina near the east approach and from boats traveling in the boat channel.

Boaters, water skiers, and people fishing on Lake Washington are the largest group with the opportunity to have close-up views of the bridge. Residents who live on Medina's shoreline and west-facing slope near the floating bridge and east approach have a scenic view that includes them as dominant features. Boaters and residents for whom the bridge is a distant feature are also viewer groups.

Commuters are the only viewer group with views from the bridge and also represent a large group because of the high daily traffic volumes. Sensitivity is likely to be high for all viewer groups given the panoramic and memorable views from both the lake and the floating bridge.

Eastside Landscape Unit

Urban development in the Eastside study area consists primarily of single-family residences on large lots, waterfront residences with private docks in small bays and on Lake Washington, a few small commercial establishments, and the Bellevue Christian School/Three Points Elementary school complex. The Points Loop Trail that parallels SR 520 on the north is an important neighborhood recreation path for strolling and accessing other neighborhoods. The trail is screened from the freeway in many places by a dense buffer of mature trees and shrubs.

Evergreen Point Road (Eastside)

Residents with views across Lake Washington are likely to be very sensitive to the views in this area. All of these views include the Evergreen Point Bridge and are affected by the bridge to varying degrees, depending on how close the viewpoint is to the bridge.

4.6 Cultural Resources

The term "cultural resources" includes archaeological and traditional cultural resources as well as the historic built environment. Archaeological resources are places where past peoples have left physical evidence of their occupation. Archaeological sites may include deposits of debris such as artifacts, food remains (shells and bones), or the ruins of dwellings or other structures.

Foster Island Presumed Traditional Cultural Property

As part of the Washington Park Arboretum, Foster Island is already protected as a Section 4(f) resource. Because of its historic use by the Lakes Duwamish, FHWA and WSDOT are also considering Foster Island to be a presumed traditional cultural property (TCP) and are treating it as eligible for the NRHP, although formal designation of the presumed TCP's boundaries and determination of NRHP eligibility for this property are yet to be completed. FHWA and WSDOT are currently undertaking further documentation and analysis, including coordination with the interested tribes, to identify the presumed TCP's boundaries. All of the design options affect this property, and appropriate mitigation measures will be developed in consultation with WSDOT, FHWA, the SHPO, and interested tribes to mitigate any potential adverse effect.

As a presumed TCP, Foster Island is eligible for the NRHP under Criterion A because of its association with events important to history and Criterion D because of its potential to contribute information important to history. Foster Island could also be considered eligible for the NRHP as an archaeological site, but at present its archaeological status is unknown. Further archeological investigation at Foster Island could result in the discovery of below-ground resources that could warrant determination of Foster Island as eligible under Criterion D as an archaeological site. To aid in this determination, WSDOT is continuing to conduct ethnographic research, including interviews with tribal elders. Foster Island has the greatest interest to tribal members who can trace ancestry to the Montlake portage area and the Lakes Duwamish families who once lived there. Interviews with elders, along with research into existing literature, will help shed light on whether the island maintains ongoing significance to tribal members today, one of the considerations in TCP designation. The Final EIS will identify the TCP status of Foster Island. This designation would make the island eligible for the NRHP. As part of the Washington Park Arboretum, it is already protected as a Section 4(f) resource.

In recognition of the cultural sensitivity of Foster Island, WSDOT has undertaken investigations to help identify its historic shorelines. This information may help WSDOT avoid or minimize disturbance to parts of the island that are most likely to contain cultural resources. Several events

Traditional Cultural Properties

The National Park Service's Guidelines for Identifying and Documenting Traditional Cultural Properties defines a traditional cultural property (TCP) as a site "that is eligible for inclusion in the National Register [of Historic Places] because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community." These properties could include, but are not limited to, ceremonial sites, traditional homes of a particular cultural group, or locations of historic economic, artistic, or other cultural practices. Source: Parker and King (1998).

The National Register of Historic Places

The National Register of Historic Places is the official list of cultural resources worthy of preservation, authorized under the National Historic Preservation Act of 1966. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. National Register properties are distinguished by having been documented and evaluated according to uniform standards. Please see the Cultural Resources Discipline Report in Attachment 7 for additional information.

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory or history.

over the last century have changed the shape of Foster Island, which was once two islands: a larger one to the south and a smaller one to the north. The north island had low relief, and was only exposed when the water level in Lake Washington was seasonally low. In 1916, the Montlake Cut opened, dropping the elevation of Lake Washington by 9 feet. The two islands became one, surrounded by extensive mudflats. Between 1916 and 1939, landfill was placed over large areas on the south side of Union Bay, making Foster Island much larger. In the early 1960s, WSDOT dredged channels for barge access to build SR 520, creating Marsh Island and producing the hourglass shape that Foster Island has today.

The Lakes Duwamish people lived near major bodies of water in the Puget Sound area.

From maps dating back to the mid-1800s, WSDOT has identified geographic coordinates for the historic shorelines of the north and south islands. WSDOT also conducted physical study of the island in 2008 using ground-penetrating radar, a non-invasive technique that uses radar waves to collect data on subsurface characteristics. These analyses showed that the proposed alignment of SR 520 across Foster Island appears to closely match the historic gap in landform between the north and south islands (ICF Jones and Stokes 2009). To the extent that project construction takes place within the gap, the risk of encountering cultural resources is reduced, since it is likely that burials and other cultural activities would have been confined to on-land areas.

One additional type of investigation that could help determine the likelihood of cultural resources is archaeological testing by probing, shovel testing, and/or trenching. However, the sensitivity of this area makes it prudent to avoid disturbance as much as possible. At the request of the tribes, WSDOT will not perform any investigation involving subsurface disturbance until a preferred alternative is identified so as to minimize ground disturbance in this culturally sensitive area. At that time, WSDOT will work with the State Historic Properties Office (SHPO) and the tribes to develop appropriate testing methods. The results of the investigations will be presented in the Final EIS.

What is the historic setting of the project area?

With the arrival of explorers and settlers, the native cultures of the area were weakened by imported diseases, and native people were physically displaced from their land and their ways of life. The settlers, in their newly claimed territory, developed many of the project area's neighborhoods and institutions in the first half of the 20th century. One of the early results of these efforts was the Washington Park Arboretum.

Beginning of the water-level adjustment between Lake Washington and Lake Union in 1916 (printed with permission from the MOHAI, Seattle, Washington).

Washington Park Arboretum

Created as a park in 1902, the Arboretum as we now know it began to take shape in 1907 when the UW decided to expand its own arboretum in preparation for the Alaska-Yukon-Pacific Exposition. With the assistance

of local garden clubs, the University raised enough money for preparation of a master plan by the Olmsted Brothers landscape firm. In 1917, Foster Island became part of the Arboretum.

The Arboretum has changed over time, with renewed plantings, new signage and lighting, new paving, and other improvements. As a historic designed landscape meant to educate and provide public beautification, it is an icon of the Seattle parks system. Although the northern section of the Arboretum was heavily affected by the construction of SR 520 and has suffered a loss of integrity, the rest of the Arboretum remains intact. Taken as a whole, the Arboretum retains good integrity. The Washington Park Arboretum is eligible for the NRHP under Criterion A, for its association with events that have made a significant contribution to the broad patterns of our history, including the Alaska-Yukon-Pacific Exposition, the development of the University of Washington, the Works Progress Administration projects during the Depression, and the development of the parks system in Seattle, and under Criterion C, as the work of a master for its design by the noted Olmsted Brothers, as well as the many talented designers and architects who contributed to its design features.

Arboretum pavilion bridge

Roanoke Park Historic District

West of Portage Bay lies another early Seattle park surrounded by a historic neighborhood. Seattle acquired the land for Roanoke Park in 1908 and developed it in 1910. The park was originally intended for use by hikers and bicyclists headed down the popular path to the Washington Park Arboretum and Lake Washington. The surrounding neighborhood was platted in 1890, but did not see much development until the park was created. Between 1908 and 1912, growth exploded with the construction of some 60 homes in a variety of styles, including Craftsman, Mission, Classic Box, Swiss Chalet, and various revival styles. Because of their distinctive character, their association with several notable architects, and their excellent preservation, these homes also form a historic district that was listed in the NRHP in July 2009. Exhibit 4.6-1 shows the boundaries of the Roanoke Park Historic District and the location of those properties that are contributing elements. Table 4.6-1 presents the listed and individually eligible historic properties in the area of potential effects (APE).

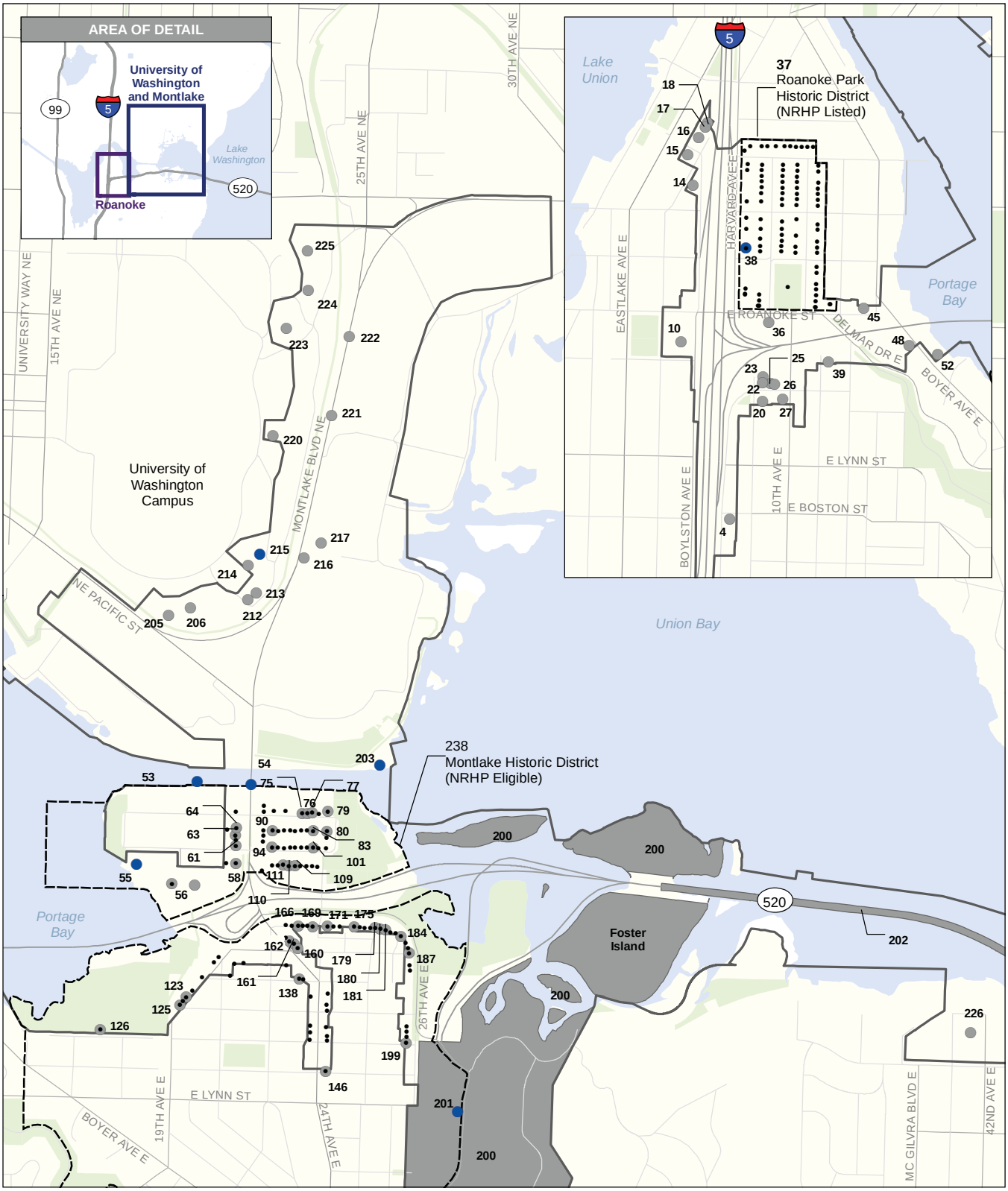
The Roanoke Park Historic District is located on the northeast side of the intersection of SR 520 and I-5. The boundaries of the historic district are roughly East Roanoke Street, Harvard Avenue East, East Shelby Street, and 10th Avenue East, and include Roanoke Park, which is located at 910 East Roanoke Street (Exhibit 4.6-1). The historic district is entirely within the APE. There are 101 properties, of which 80 are contributing resources to the district, including Roanoke Park itself and the individually listed Parsons House. The status of all listed and eligible resources is discussed in detail in the Cultural Resources Discipline Report (Attachment 7).

Area of Potential Effect

The area of potential effect (APE) is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties (36 CFR Section 800.16(d)). For this project, the APE consists of three footprints: (1) the known or anticipated construction footprint that includes staging and laydown areas, (2) a buffer area (one property deep or 200 to 300 feet from the construction footprint, as appropriate) that includes sufficient area to encompass historic structures, commercial buildings and residences, historic districts, and public facilities (including parks and bridges) that might be directly or indirectly affected by project noise, vibration, visual or other project effects, and 3) additional areas outside the construction footprint such as the entire Roanoke Park Historic District, the entire Washington Park Arboretum, and all of the navigable waters of Portage Bay. WSDOT determined the APE for the project in consultation with the SHPO, and also sought comments from the identified concerned tribes and other consulting parties. Exhibit 4.6-1 shows the APE for the project.

Home located in the Roanoke Park Historic District

Exhibit 4.6-1. Historic Properties in Seattle



NRHP Eligibility of Surveyed Resources

- Contributing
- Eligible
- Listed

Historic district boundary

Area of potential effects

Park

Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report.

N

0 500 1,000 2,000 Feet

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
4	Harvard Avenue East	1980 Chung House	1932	Eligible under Criterion C
10	Boylston Avenue E.	2515 Denny-Fuhrman (Seward) School	1893; 1899; 1905; 1917	Three buildings - Eligible under Criteria A & C Designated Seattle Landmark; 1893/99 building is also listed on the WHR
14	Boylston Avenue E.	2815 Shelby Apartments	1928	Eligible under Criterion C – Multiple Property Nomination for Seattle Apartment Buildings, 1900-1957
15	Franklin Avenue E	2847 Gilmore House	1907	Eligible under Criterion C
16	Franklin Avenue E	2901 L' Amourita Apartments	1909	Eligible under Criterion C - Multiple Property Nomination for Seattle Apartment Buildings, 1900-1957 Designated Seattle Landmark
17	Franklin Avenue E	2919 Franklin Apartments	1927	Eligible under Criterion C - Multiple Property Nomination for Seattle Apartment Buildings, 1900-1957
18	Franklin Avenue E	2923 Franklin Apartments	1927	Eligible under Criterion C - Multiple Property Nomination for Seattle Apartment Buildings, 1900-1957
20	Broadway Avenue E	2352 Talder House	1909	Eligible under Criterion C
22	East Miller Street	904 East Miller Condominium	1911	Eligible under Criterion C
23	Broadway Avenue E	2408 Sugamura House	1910	Eligible under Criterion C
25	East Miller Street	910 Wicklund-Jarr House	1905	Eligible under Criterion C
26	East Miller Street	914 Glover Homes	1910	Eligible under Criterion C
27	10th Avenue E	2351 Keuss Building	1930	Eligible under Criterion C
36	East Roanoke Street	901 Fire Station #22	1965	Two buildings on one parcel; Outside of boundaries and period of significance for Roanoke Park historic district; Fire Station #22 is eligible under Criterion C

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
37	Roughly bounded by East Roanoke Street, Harvard Avenue East, East Shelby Street, and 10th Avenue East	Roanoke Park Historic District	Period of Significance 1899-1939	Listed in the NRHP; listed in the WHR
38	Harvard Avenue East	2706 Parsons, William House	1903	Listed in the NRHP; listed in the WHR; designated Seattle Landmark
39	Federal Avenue E	2422 Boyd House	1907	Eligible under Criterion C
45	East Roanoke Street	1118 Gunby, Andrew House	1940	Eligible under Criterion C
48	Boyer Avenue E	2545 Mason, Alden House	1949	Eligible under Criterion C; Potentially eligible Seattle Landmark
52	Boyer Avenue E	2518 Kelley House	1909	Eligible under Criterion C
53	Lake Washington Ship Canal	Montlake Cut	1916	Listed in the NRHP [Chittenden Locks and Related Features of the Lake Washington Ship Canal multiple property listing]; listed in the WHR; designated Seattle Landmark
54	Montlake Boulevard NE over Lake Washington Ship Canal	Montlake Bridge	1924	Listed in the NRHP [Historic Bridges/Tunnels in Washington State]; listed in the WHR; designated Seattle Landmark
55	East Hamlin Street	1807 Seattle Yacht Club – Main Station	1919	Listed in the NRHP; listed in the WHR; designated Seattle Landmark
56	Montlake Boulevard NE	2723 NOAA Northwest Fisheries Science Center	1931; 1939; 1940; 1965; 1966	Five buildings – 1931, 1939, 1940, 1965, 1966 1931, 1965, 1966 buildings – Individually eligible for NRHP under Criteria A & C; Potentially eligible as a Seattle Landmark 1931 building also contributing element to Montlake Historic District
58	East Hamlin Street	1893	1932	Contributing to Montlake Historic District Individually eligible under Criterion C
59	East Hamlin Street	1885	1941	Contributing to Montlake Historic District
61	East Hamlin Street	1896	1925	Contributing to Montlake Historic District Individually eligible under Criterion C

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
63	Montlake Boulevard NE	2815	1914	Contributing to Montlake Historic District Individually eligible under Criterion C
64	East Shelby Street	1897	1926	Contributing to Montlake Historic District Individually eligible under Criterion C
75	East Shelby Street	2136	1931	Contributing to Montlake Historic District Individually eligible under Criterion C
76	East Shelby Street	2142	1925	Contributing to Montlake Historic District Individually eligible under Criterion C
77	East Shelby Street	2146	1921	Contributing to Montlake Historic District Individually eligible under Criterion C
78	East Shelby Street	2152	1915	Contributing to Montlake Historic District
79	East Shelby Street	2158	1925	Contributing to Montlake Historic District Individually eligible under Criterion C
80	East Shelby Street	2159 Mary Houlahan House	1914	Contributing to Montlake Historic District; Individually eligible under Criterion C
81	East Park Drive East	2817	1914; 1940	(2 buildings – 1940, 1914) Contributing to Montlake Historic District
83	East Shelby Street	2147	1926	Contributing to Montlake Historic District Individually eligible under Criterion C
90	East Shelby Street	2111	1925	Contributing to Montlake Historic District Individually eligible under Criterion C
94	East Hamlin Street	2110	1924	Contributing to Montlake Historic District Individually eligible under Criterion C
101	East Hamlin Street	2146	1920	Contributing to Montlake Historic District Individually eligible under Criterion C
109	East Hamlin Street	2133	1919	Contributing to Montlake Historic District Individually eligible under Criterion C
110	East Hamlin Street	2127	1924	Contributing to Montlake Historic District Individually eligible under Criterion C
111	East Hamlin Street	2121	1927	Contributing to Montlake Historic District Individually eligible under Criterion C
123	West Montlake Place East	2511	1931	Contributing to Montlake Historic District; Individually eligible under Criterion C
125	West Montlake Place East	2501	1931	Contributing to Montlake Historic District; Individually eligible under Criterion C

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
126	East Calhoun Street	1618 Montlake Community Center	1935	Contributing to Montlake Historic District; Individually eligible under Criteria A & C; Designated Seattle Landmark
138	East Louisa Street	2220	1930	Contributing to Montlake Historic District; Individually eligible under Criterion C
146	24th Avenue East	2402	1920	Contributing to Montlake Historic District Individually eligible under Criterion C
160	East Montlake Place East	2600	1926	Contributing to Montlake Historic District; Individually eligible under Criterion C
161	East Montlake Place East	2604	1926	Contributing to Montlake Historic District; Individually eligible under Criterion C
162	East Montlake Place East	2610	1926	Contributing to Montlake Historic District; Individually eligible under Criterion C
166	Lake Washington Blvd. E	2219	1929	Contributing to Montlake Historic District Individually eligible under Criterion C
169	Lake Washington Blvd. E	2231	1927	Contributing to Montlake Historic District Individually eligible under Criterion C
171	Lake Washington Blvd. E	2401	1930	Contributing to Montlake Historic District Individually eligible under Criterion C
175	Lake Washington Blvd. E	2425	1931	Contributing to Montlake Historic District Individually eligible under Criterion C
179	Lake Washington Blvd. E	2441	1927	Contributing to Montlake Historic District Individually eligible under Criterion C
180	Lake Washington Blvd. E	2445	1927	Contributing to Montlake Historic District Individually eligible under Criterion C
181	Lake Washington Blvd. E	2449	1928	Contributing to Montlake Historic District Individually eligible under Criterion C
184	Lake Washington Blvd. E	2465	1927	Contributing to Montlake Historic District Individually eligible under Criterion C
187	East Roanoke Street	2603	1930	Contributing to Montlake Historic District; Individually eligible under Criterion C
199	26th Avenue East	2451	1930	Contributing to Montlake Historic District Individually eligible under Criterion C

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
200	Arboretum Drive E	2300 Washington Park Arboretum	1903	Eligible under Criteria B and C; Includes Arboretum Aqueduct (1912) - Listed in the NRHP [Historic Bridges/Tunnels in Washington State], listed in the WHR, designated Seattle Landmark; and Seattle Japanese Garden (1960) - Designated Seattle Landmark
200		Foster Island		Presumed NRHP eligible under A and D as a TCP
201	Lake Washington Boulevard in the Washington Park Arboretum	Arboretum Aqueduct also known as Arboretum Sewer Trestle	1912	Listed in the NRHP [Historic Bridges/Tunnels in Washington State]; listed in the WHR; designated Seattle Landmark
203	University of Washington Campus	Naval Military Hangar – University Shell House (Canoe House)	1918	Listed in the NRHP; listed in the WHR\
205	University of Washington Campus	Bloedel Hall	1971	Eligible under Criterion C
206	University of Washington Campus	Winkenwerder Forest Lab	1963	Eligible under Criterion C
212	University of Washington Campus	Wilson Ceramics Lab	1946	Eligible under Criterion C
213	University of Washington Campus	Wilcox Hall	1963	Eligible under Criterion C
214	University of Washington Campus	More Hall	1946-48	Eligible under Criterion C
215	University of Washington Campus	More Hall Annex (former Nuclear Reactor Building)	1961	Listed in the NRHP; listed in the WHR
216	Montlake Boulevard NE University of Washington Campus	Pavilion Pedestrian Bridge	1938	Eligible under Criterion C
217	Montlake Boulevard NE University of Washington Campus	Graves Hall	1963	Eligible under Criterion C
220	University of Washington Campus	University of Washington Club	1960	Eligible under Criterion C

Table 4.6-1. Listed and Individually Eligible Historic Properties in the APE (property ID numbers correlate with Exhibits 4.6-1 and 4.6-2)

Property ID	Street Name/Location	Street Address/ Property Name	Date of Construction	Comments
221	Montlake Boulevard NE University of Washington Campus	Montlake Boulevard Pedestrian Overpass South	1958	Eligible under Criterion C
222	Montlake Boulevard NE University of Washington Campus	Montlake Boulevard Pedestrian Overpass North	1958	Eligible under Criterion C
223	University of Washington Campus	McMahon Hall	1965	Eligible under Criterion C
224	University of Washington Campus	CENPA Instrument Shop	1948	Eligible under Criterion C
225	University of Washington Campus	North Physics Laboratory	1949	Eligible under Criterion C
226	42nd Avenue E	2411 Edgewater Condominiums	1938-40	Eligible under Criterion C - Multiple Property Nomination for Seattle Apartment Buildings, 1900-1957
238	Roughly bounded by Washington Park Arboretum, Portage Bay, Montlake Cut, and Interlaken Park or Boulevard	Montlake Historic District	Period of Significance 1905 to 1952	Criterion C: significant, cohesive collection of residential architecture typical of early twentieth century Seattle, with a combination of distinctive builders' houses, high-style, architect-designed residences, and impressive non-residential structures.
				There are 145 properties from the Montlake Historic District in the APE; 109 of these are contributing elements, including 35 that are individually eligible and one that is individually listed in the NRHP, and 36 properties that are not contributing. (For a listing of all contributing, non-contributing, and individually eligible properties in the Montlake Historic District, see the Cultural Resources Discipline Report, Attachment 3).

Montlake Historic District

Home located in the Montlake Historic District

First platted in 1909, the Montlake neighborhood saw its peak of construction in the 1920s. Early developers filled the area south of the Montlake Cut with homes in the Craftsman, Tudor Revival, Colonial Revival, and California Mediterranean styles. The neighborhood's cohesiveness and integrity make it eligible for the NRHP as a historic district; residents of the community are actively working to propose the district for NRHP listing. The SHPO concurred on the NRHP eligibility of the Montlake Historic District on August 27, 2009. Exhibit 4.6-1 shows the proposed boundaries of the Montlake Historic District and the location of those properties that are eligible for the NRHP, either individually or as contributing elements.

The boundary of the Montlake area is generally considered to be from the Washington Park Arboretum to Portage Bay, with the northern boundary at the Montlake Cut and the southern boundary often listed as Interlaken Park or Interlaken Boulevard. For boundaries of the Montlake Historic District proposed by the Montlake Community Club, see Exhibit 4.6-1. The district is only partially located within the APE. There are 145 properties from the Montlake Historic District in the APE; 109 of these are contributing to the district, including 35 that are individually eligible and the individually listed Seattle Yacht Club. The status of all listed and eligible resources is discussed in detail in the Cultural Resources Discipline Report (Attachment 7).

Other Historic Properties

Exhibit 4.6-1 also shows other historic properties in the APE. They include individual historic structures on the University of Washington campus and others outside the Montlake and Roanoke Park districts, as well as engineered structures such as the Montlake Bridge and Cut and the Evergreen Point Bridge itself. The status of all listed and eligible resources is discussed in detail in the Cultural Resources Discipline Report (Attachment 7).

The Eastside transition area contains two previously identified historic built environment properties (Exhibit 4.6-2). One historic property, known as the James Arntson House, has been determined eligible for the NRHP. A property known as the Helen Pierce House has been determined not eligible for the NRHP, but eligible for the WHR. Both of these properties are located in Medina on Evergreen Point Road. DAHP concurred with these determinations of eligibility in April 2009. Nine additional properties were surveyed in the Eastside transition area. Of these, one (the Dixon House at 3267 Evergreen Point Road [property ID 227]) is eligible for the NRHP. The SHPO concurred with these determinations of eligibility on August 27, 2009.

Exhibit 4.6-2. **Historic Properties on the Eastside**

NRHP Eligibility of Surveyed Resources

- Listed
- Eligible
- Area of potential effects
- Right-of-way
- Parcel

Note: All resources are mapped and described in detail in the Cultural Resources Discipline Report.

N 0 500 1,000 Feet

4.7 Noise

Environmental noise may interfere with a broad range of human activities in a way that degrades public health and welfare. While state and local laws regulate noise from commercial, industrial, and construction activities, they do not regulate noise from traffic on public roadways. FHWA, however, has established noise abatement criteria (NAC) for new highway projects to provide guidance on acceptable noise levels. These criteria require WSDOT to consider noise abatement measures if noise levels near a highway would approach or exceed FHWA's criteria, or if the project would result in a substantial increase (10 decibels [dB] or more) over existing noise levels. For residential areas and parks, the criterion is 67 dB—about the same volume as a vacuum cleaner 10 feet from the listener. Because residential and park areas are more sensitive to noise, these were the locations where traffic noise levels were modeled to assess potential noise effects of the 6-Lane Alternative.

DEFINITION

Noise

Noise–defined as "unwanted sound"–affects most people in urban areas to some degree. It is measured in units called A-weighted decibels, which correspond to the frequencies that are audible to the human ear. For ease of reference, we refer to these A-weighted decibels simply as "decibels" (dB) in this SDEIS. The human ear perceives every 10-dB increase as a doubling of the noise level. People find a noise level increase of 3 dB or more barely perceptible, and perceive a 5-dB increase as noticeable. The loudness of highway noise is related to the volume of traffic, the distance of the listener from the highway, and whether there is a direct line of sight between the noise source and the listener.

What are the existing traffic noise levels?

High levels of traffic noise affect many neighborhoods in the project area. Sources of this noise include SR 520, I-5, and busy arterial streets. To characterize existing noise levels, WSDOT first measured noise levels at receivers in the study area, and then used the measured levels as input to a computerized noise model. The model used peak-hour traffic volumes at posted speeds to represent the worst-case noise levels that can be expected under the current roadway alignment and traffic flow conditions. To help validate the noise modeling efforts and to evaluate noise levels in the study area, noise analysts obtained actual field measurements of current noise levels. This information was compared to levels predicted by the model to verify that the model accurately calculates traffic noise exposure for existing and projected conditions.

DEFINITION

Noise Abatement Criteria (NAC)

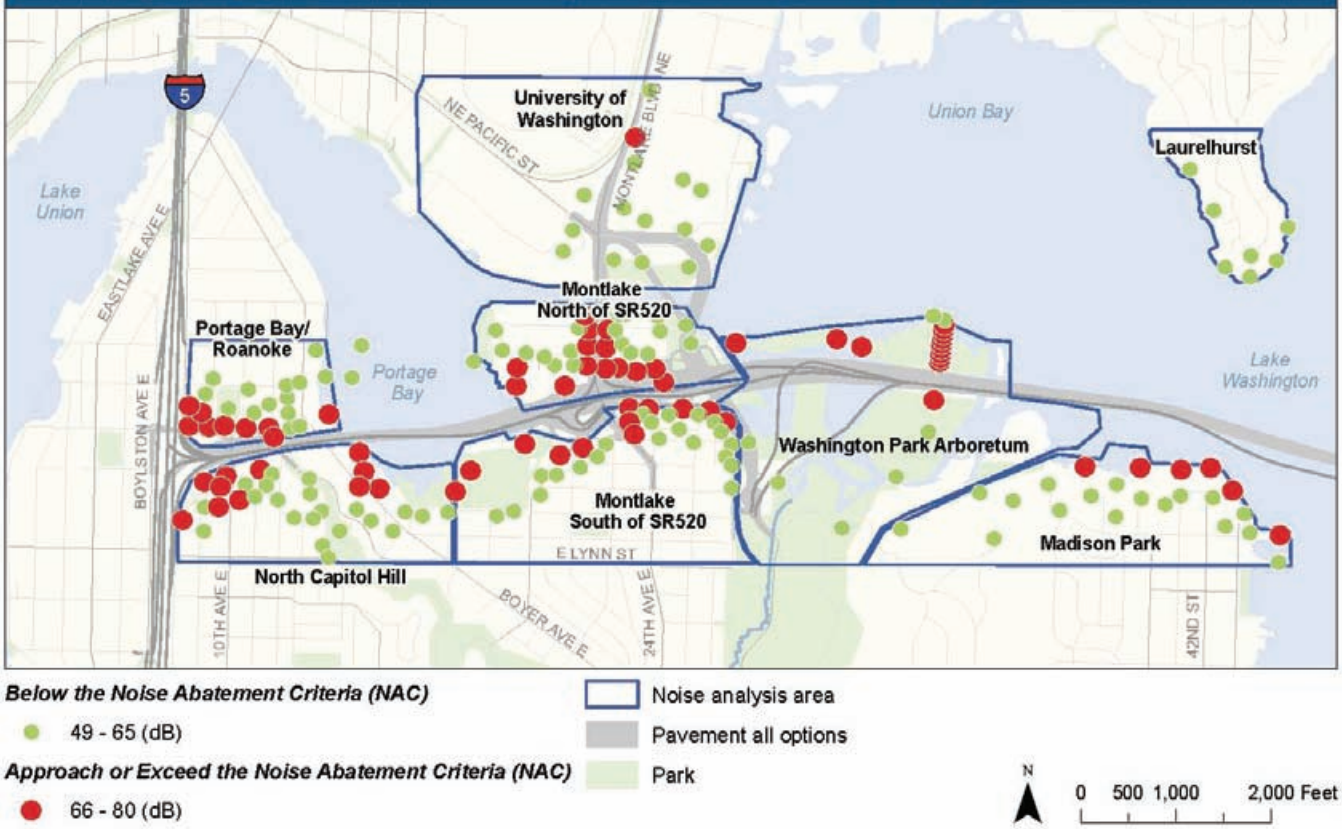
FHWA has established noise abatement criteria for new highway projects. These criteria require WSDOT to consider mitigation measures such as noise walls if noise levels near a highway would approach or exceed FHWA's noise abatement criteria, or if there is a substantial increase over existing noise levels. WSDOT defines "approach" as a level within 1 dB of the FHWA criteria and defines a substantial increase as 10 dB. For residential areas and parks, the criterion is 67 dB. FHWA considers noise levels of 66 dB or above to approach or exceed the noise abatement criteria.

Existing peak-hour traffic noise levels were modeled for 211 receivers (representing 862 residences) using posted speeds and 2004 peak-hour traffic volumes. The 2004 traffic volumes were used because the difference between 2004 and 2008 traffic volumes is so small (less than 10 percent in most cases) that there would not be any measurable difference between the predicted noise levels for each traffic data set. Exhibit 4.7-1 shows the current locations in the Seattle study area where noise levels approach or exceed the NAC. As shown, high noise levels occur in the neighborhoods of Portage Bay/Roanoke, North Capitol Hill, Montlake, and Madison Park.

Portage Bay/Roanoke

Existing peak-hour traffic noise levels were modeled for 26 receiver locations (representing 83 residences) in the Portage Bay/Roanoke neighborhood. Noise levels at residential receiver locations in this area ranged from 56 to 77 dB, with the highest noise levels at receivers along

Exhibit 4.7-1. Existing Noise Levels in the Seattle Project Area



Harvard Avenue East and East Roanoke Street. Noise levels at 9 receivers (24 residences) currently exceed the NAC in this area.

North Capitol Hill

Noise levels were modeled for 32 receiver locations (representing 219 residences) in North Capitol Hill. Current noise levels in this area are between 60 and 73 dB. Noise levels at 11 receivers (99 residences) in this portion of the study area currently exceed the NAC.

Montlake (North and South of SR 520)

Current peak-hour traffic noise levels were modeled for 35 receiver locations (representing 106 residences) in the Montlake neighborhood north of SR 520. Noise levels at residences in this area ranged from 59 to 72 dB, with the highest noise levels near Montlake Boulevard East. Noise levels at 14 receivers (37 residences) in this area currently exceed the NAC.

Traffic in the Montlake interchange area

Current peak-hour traffic noise levels in the Montlake neighborhood south of SR 520 were modeled for 33 receiver locations (representing 142 residences). Noise levels in this area ranged from 56 to 74 dB, with the highest noise levels along Montlake Place and Lake Washington Boulevard

East. Noise levels at 12 receivers (63 residences) in this area currently exceed the NAC.

Collectively, noise levels at 26 receivers (100 residences) in the north and south portions of the Montlake neighborhood currently exceed the NAC.

University of Washington/Husky Stadium

Existing peak-hour traffic noise levels were modeled for 16 receiver locations within the UW campus. Two receivers represent noise on the Burke-Gilman Trail. The other receivers in this area represent the UW Medical Center and outdoor uses near Husky Stadium and Lake Washington. Noise levels at these receivers ranged from 52 to 66 dB. Existing peak-hour traffic noise levels exceed the NAC at one receiver near Montlake Boulevard.

Washington Park Arboretum

Existing peak-hour traffic noise levels were modeled for 20 receiver locations in the Arboretum. Receivers were spaced throughout the park to assess how SR 520 traffic noise levels vary with distance from the highway. Areas in the Arboretum that are within 450 feet of the SR 520 alignment currently exceed the residential NAC of 67 dB (which also applies to parks). Overall, the modeled noise levels for the 20 receivers in the Arboretum ranged from 56 to 80 dB equivalent sound level.

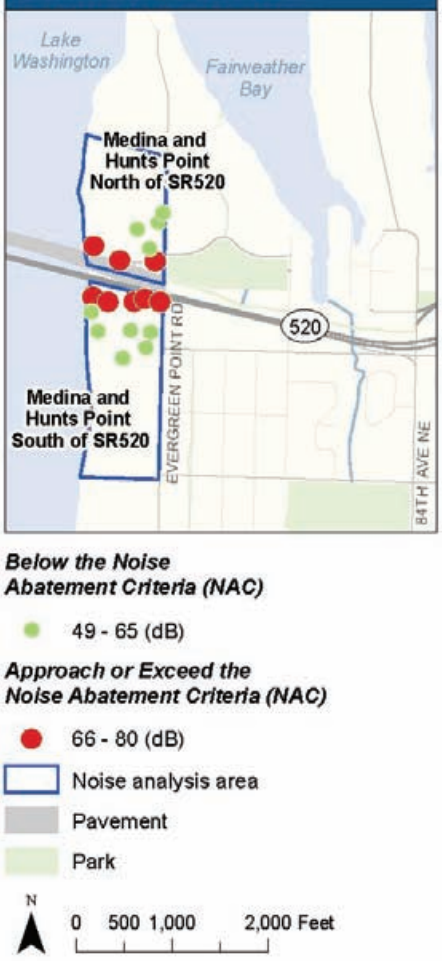
Madison Park and Laurelhurst

Existing peak-hour traffic noise levels were modeled for 23 receiver locations (representing 99 residences) in the Madison Park neighborhood. Noise levels at residences in this area ranged from 57 to 69 dB. Noise levels at 6 receivers (16 residences) in this area currently exceed the NAC. Traffic noise levels were modeled for 7 receiver locations (representing 15 residences) in the Laurelhurst neighborhood. The modeled noise levels in this area ranged from 51 to 61 dB.

Medina

Existing peak-hour traffic noise levels were modeled for 19 receiver locations (representing 61 residences) in the Medina neighborhood (Exhibit 4.7-2). Noise levels in this area ranged from 57 to 75 dB. Noise levels at 9 receivers (26 residences) in this area currently exceed the NAC.

Exhibit 4.7-2. Existing Noise Levels in the Eastside Project Area



4.8 Air Quality

Clean air is important to a community's well-being and the health of the environment. Pollutants in the air can have negative effects on human health and cause harm to animals, plants, and materials. Emissions from cars, trucks, and buses are a major factor affecting air quality, particularly in

urban areas. Maintaining good air quality is important to freeway users, neighbors, and the community at large.

What is the air quality like in the project area?

Washington is subject to air quality regulations issued by U.S. Environmental Protection Agency (EPA), Washington Department of Ecology, and local air agencies such as Puget Sound Clean Air Agency (PSCAA). EPA has developed National Ambient Air Quality Standards (NAAQS) which set limits on concentrations of criteria pollutants. The pollutants include carbon monoxide (CO), lead, ozone, nitrogen dioxide, sulfur dioxide, and particulate matter (PM). Concentration levels of the criteria pollutants must not exceed the NAAQS over specified time periods. Ecology and PSCAA monitor air quality in the Puget Sound region to compare the levels of criteria pollutants found in the atmosphere with the NAAQS. The pollutants of concern in the central Puget Sound region include carbon monoxide, particulate matter, and ozone.

In the early 1990s the region was designated as "non-attainment" because it exceeded the NAAQS for CO and PM. In 1996, however, the Puget Sound region came back into compliance with all applicable federal and state standards for air quality and was redesignated as a "maintenance area," which requires that extra care be taken to prevent future violations. Because of this, PSCAA has a State Implementation Plan (SIP) with regulatory procedures to maintain compliance with the NAAQS. Complying with the CO maintenance plan requires verifying that planned transportation projects will not cause or contribute to a violation of the federal standards for CO. This verification process is referred to as demonstrating conformity. Demonstrating conformity consists of two different analyses:

- A regional analysis: the project must be included in a conforming regional transportation plan and transportation improvement plan.
- A local analysis: the project must analyze the most congested intersections in the project area and demonstrate that CO levels will be below CO standards after the project is in operation.

These analyses are summarized in Chapter 5.

Vehicles also emit mobile source air toxics (MSATs), compounds that negatively affect human health. MSATs are released primarily by diesel engines in trucks, buses, and other highway vehicles as well as non-road equipment. Some of the toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Currently, there are no standards establishing allowable concentrations of MSAT emissions in the air.

DEFINITION

National Ambient Air Quality Standards

The Clean Air Act establishes emissions standards for criteria pollutants. These standards are known as National Ambient Air Quality Standards, or NAAQS. The NAAQS set limits for the following criteria pollutants:

- Carbon monoxide
- Lead
- Nitrogen dioxide
- Particulate matter
- Ozone
- Sulfur dioxide

If a region exceeds the standards, it is designated as "non-attainment." Non-attainment areas are subject to a more stringent permitting program to ensure that new and modified sources of pollution do not impede progress toward cleaner air.

4.9 Energy and Greenhouse Gases

The SR 520 corridor is heavily used and frequently congested with traffic because it is one of only two crossings that serve residents, commuters, and other travelers across Lake Washington. Excessive idling and stop-and-go traffic conditions substantially reduce fuel economy compared with free-flow conditions. Because of the current conditions in the study area, at many times throughout the day the study area is congested and vehicles operate at inefficient speeds, which affects energy consumption and greenhouse gas emissions in the project area.

How much energy is consumed by vehicles using the SR 520 corridor?

Because of traffic congestion, the existing average freeway travel speed of all vehicles driving on SR 520 in the study area is 29 mph. According to the Transportation Discipline Report (Attachment 7), vehicles drive approximately 1.7 million miles daily along the SR 520 corridor. To convert the daily number to an annual number, a conversion factor of 340 days per year was applied to the daily vehicle miles traveled (VMT) number, resulting in an annualized estimate of 562 million vehicle miles traveled.

Table 4.9-1 presents the energy consumption under existing conditions (2006). Vehicles in the study area consume approximately 3.8 million MBtu (million British thermal units) of energy each year. Converting MBtu to gallons of fuel results in an estimate of approximately 30.3 million gallons of fuel consumed annually along the SR 520 corridor under existing conditions.

Table 4.9-1. Energy and Fuel Consumption under Existing Conditions (2006)

		Existing Conditions		
Vehicle Type	Consumption Factor (Btu/mile)	Annual VMT (millions)	MBtu	Gallons of Fuel (millions)
Passenger vehicle[a]	6,005	541	3,249,000	26.2
Heavy-duty truck	23,238	17	392,000	2.8
Transit bus	39,408	4	177,000	1.3
Total		562	3,818,000	30.3

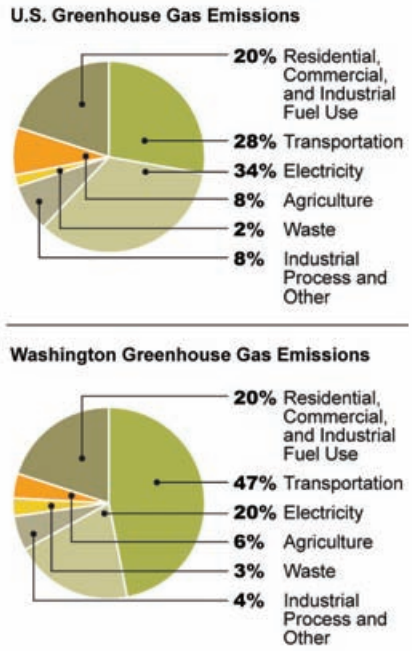
[a] Passenger vehicles include cars, light trucks, and motorcycles.
Notes:
1 gallon of gasoline = 124,000 Btu
1 gallon of diesel = 139,000 Btu
Sources: Transportation Discipline Report (Attachment 7); Energy Information Administration (2007); Department of Energy (2008).

How does transportation affect greenhouse gas emissions?

Vehicles emit a variety of gases during their operation; some of these emissions are classified as "greenhouse gases" (GHGs). The GHGs associated with transportation are water vapor, carbon dioxide (CO_2), methane (CH_4; also known as "marsh gas"), and nitrous oxide (N_2O; used in dentists' offices as "laughing gas"). Any process that burns fossil fuel releases CO_2 into the air, and CO_2 makes up the bulk of GHG emissions from transportation. GHG emissions have been found to contribute to climate change (also referred to as "global warming"). For this reason, a number of federal, state, and local agencies are considering ways to regulate them and to better understand the contribution of individual projects to overall GHG levels.

National estimates show that the transportation sector (including on-road vehicles, construction activities, aircraft, and boats) accounts for almost 30 percent of total domestic GHG emissions. In Washington, however, transportation accounts for nearly half of GHG emissions because Washington relies heavily on hydropower for electricity generation. Most other states rely on fossil fuels such as coal, petroleum, and natural gas to generate electricity. The next largest contributors to total GHG emissions in Washington are fossil fuel combustion in the residential, commercial, and industrial sectors (at 20 percent), and electricity production (also 20 percent). Exhibit 4.9-1 shows GHG emissions by source, nationally and in Washington State.

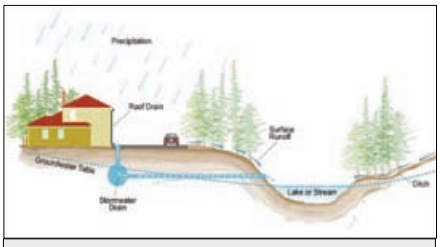
Exhibit 4.9-1. **Greenhouse Gas Emissions by Source**



4.10 Water Resources

Water resources are vital to maintaining the ecosystems of Washington and the environment in which we live, as well as serving our need for clean, drinkable water to support public health and the regional economy. After more than a century of dramatic population growth, poor stewardship, and climate change, we now realize that water resources are not unlimited and must be diligently protected.

Although surface water bodies, stormwater, and groundwater are typically managed and regulated independently, they are interconnected and interdependent. Stormwater runoff follows many pathways and can percolate into soil and become groundwater, and groundwater can move into and out of surface water bodies. The sidebar at right shows how water resources are connected in the environment.



Many Pathways of Water

Water follows many pathways—in streams, ponds, wetlands, and lakes; across roadway surfaces as stormwater runoff; through open ditches or drainage pipes; and below ground in soil and groundwater.

Impervious surfaces such as rooftops, sidewalks, roads, parking lots, and compacted urban soils prevent rain from infiltrating soils as it would naturally. These barriers shift more water into creeks and lakes, and can increase the transport of pollutants from land to adjoining surface waters.

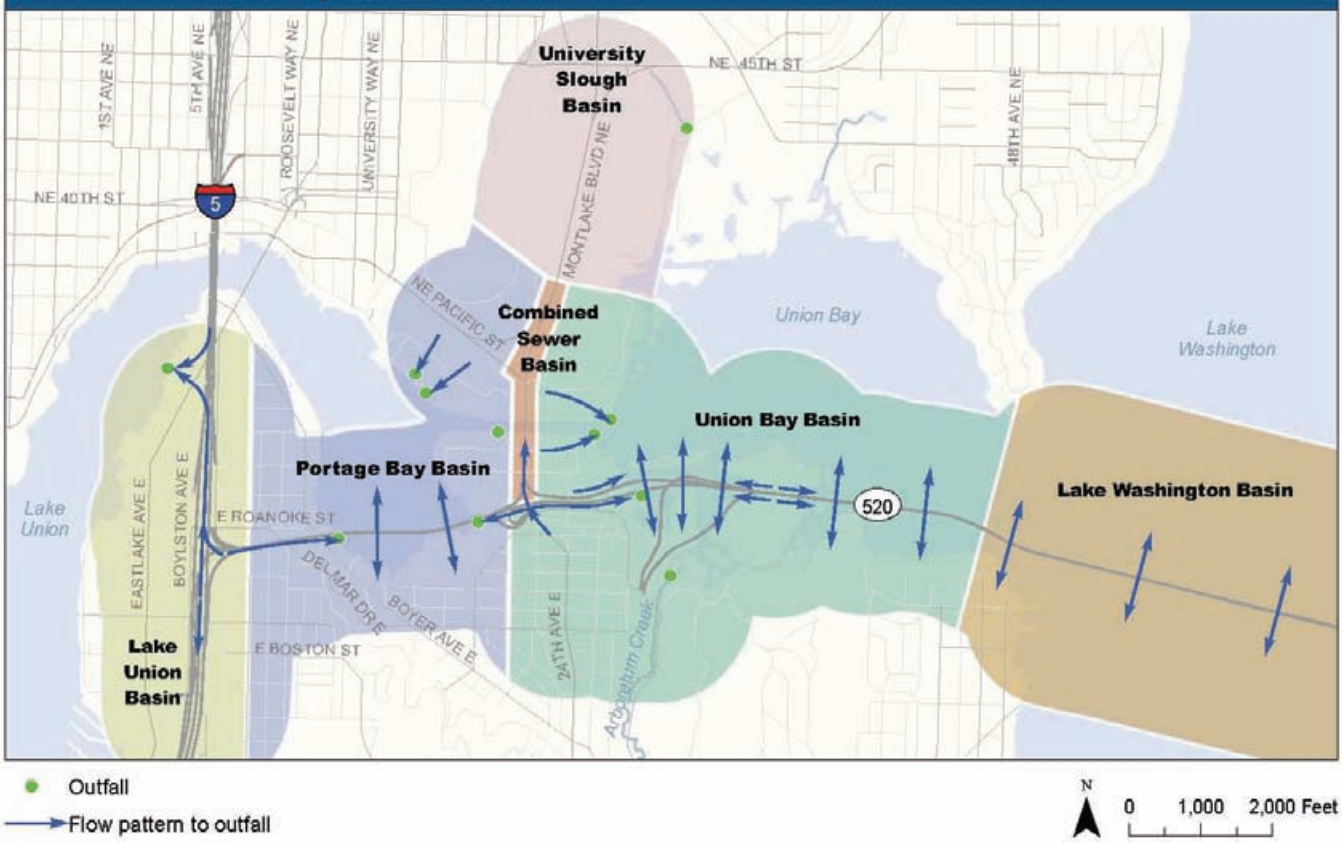
Current state regulations require new and redeveloping construction projects to treat stormwater, and sometimes to control the flow of stormwater from existing and new impervious surfaces.

What surface water bodies are present in the project area?

Surface water bodies in the project area that could be affected by the proposed project include Lake Union, Portage Bay, Union Bay, and Lake

Washington (Exhibit 4.10-1). Many of the existing influences on water quality in the project area are related to runoff from impervious surfaces. Impervious surfaces are areas that do not absorb water but allow it to run off into storm drains or directly into water bodies, carrying pollutants such as metals. In urban areas, impervious surfaces include pavement (such as roads and parking lots) and roofs.

Exhibit 4.10-1. Seattle Drainage Basins and Stormwater Flow



Lake Union and Portage Bay

Impervious surfaces cover approximately 63 percent of the land around Lake Union and Portage Bay. These water bodies receive most of the stormwater draining from the densely developed surrounding residential, commercial, industrial, and transportation land uses (Exhibit 4.10-1).

Ecology has placed Lake Union, Portage Bay, and the Lake Washington Ship Canal on its 303(d) list of polluted waters in the state because it exceeds the water quality criteria for total phosphorus, lead, fecal coliforms, and aldrin (Ecology 2009). Past studies have shown that concentrations of some metals and some polycyclic aromatic hydrocarbons (PAHs) are twice as high in Lake Union sediments as in Lake Washington sediments (Cubbage 1992).

303(d) List

The Washington State Department of Ecology maintains a list of lakes, streams, and ponds in Washington state whose water quality doesn't meet regulatory standards. This list is known as the "303(d) list," after the section of the Clean Water Act that requires states to track this information. You can view the 303(d) list at http://www.ecy.wa.gov/programs/wq/303(d)/index.html

King County has monitored surface water chemistry annually in Portage Bay since 1998 (King County 2009). Most of the water quality parameters measured (temperature, pH, and dissolved oxygen) were within acceptable ranges, except for temperature. Temperatures at 3.28 feet below the surface consistently reached approximately 68°F or higher each August between 1998 and 2002 (King County 2009). High temperatures in surface water can impair the health and survival of aquatic organisms, including salmon and other fish.

Arboretum Creek

Arboretum Creek (also known as Washington Park Creek) is a small stream that originates in the vicinity of the Seattle Japanese Garden in the Washington Park Arboretum, south of the study area. The creek flows about 0.8 mile north to Willow Bay, a minor arm of Union Bay. Upstream of the mouth, the stream flows under Lake Washington Boulevard East and through a narrow, uniform channel immediately parallel to Lake Washington Boulevard East.

Arboretum Creek

Two culverts with a total length of about 400 feet convey the stream under Lake Washington Boulevard East and an Arboretum parking lot. There are high sediment loads and large deposits of fine sediments at the mouth of the creek. Sediments are anoxic, with high biological oxygen demand, and give off hydrogen sulfide (H_2S) when disturbed. No information is available on the water quality of Arboretum Creek.

Lake Washington and Union Bay

Lake Washington is the second largest natural lake in the state, with a surface area of 21,500 acres and a watershed of 472 square miles. Overall, almost two-thirds of the land use in the Lake Washington watershed has been converted to residential, commercial, or industrial uses (King County 2009), although not all of this area is covered by impervious surface. As discussed in Section 4.11, Ecosystems, Lake Washington supports a diverse group of fish species including several species of native salmon and trout.

Although raw sewage can no longer be discharged directly into project area waters, untreated, contaminated discharges occasionally enter these waterways during periods of high precipitation through discharge from combined sewer overflows (King County 2009). For example, a recent incident resulted in the accidental discharge of an estimated 6.4 million gallons of sewage into Ravenna Creek, which discharges into Union Bay (King County 2008b).

Portions of Lake Washington are listed on the 303(d) list as exceeding water quality criteria for fecal coliform, as well as the tissue quality criteria for 2,3,7,8 TCDD (dioxin), polychlorinated biphenyls (PCBs), total chlordane, 4,4' DDD (metabolite of DDT), and 4,4' DDE (breakdown product of DDT) in various fish species (Ecology 2009). Therefore, the overall water

How has wastewater treatment affected Lake Washington?

Lake Washington received increasing amounts of secondary treated sewage between 1941 and 1963, which resulted in high levels of algae growth, with corresponding drops in oxygen level (termed eutrophication) from 1955 to 1973. The Municipality of Metropolitan Seattle (Metro) was established in 1958 and entrusted with the task of diverting sewage from the lake. Between 1963 and 1968, the agency constructed more than 100 miles of large trunk lines and interceptors to carry sewage to treatment plants built at West Point and Renton. Discharge of sewage, except for combined sewer overflows (CSOs), was reduced to zero in the lake by 1968. Rapid water quality improvements followed. Blue-green algae decreased and have been relatively insignificant since 1976.

quality conditions in the project area are degraded compared to historical conditions.

Potential pollutant sources include those typical of urbanized basins such as residential, commercial, and industrial neighborhoods and roads. Stormwater containing pet and wildlife wastes and CSOs are potential contributors of fecal coliform bacteria to the lake.

Eastside

Three streams occur in the Eastside project area. The unnamed tributary to Fairweather Bay is a short, perennial (0.2-mile-long) stream that drains Fairweather Park on the north side of SR 520 and also provides some drainage from the SR 520 roadway and some areas south of the highway. The stream, which discharges into the east shoreline of Fairweather Bay via a discharge pipe under 80th Avenue NE, originates at the outlet of two corrugated metal culverts that discharge into a catch basin on the north side of SR 520.

Fairweather Creek, also referred to as Medina Creek, is a small stream (1.4 miles long) that drains approximately 600 acres from Medina north into Fairweather Bay and Lake Washington (Exhibit 4.10-2).The watershed is moderately developed, primarily with residential uses, and the SR 520 corridor occurs in the lower reaches of the stream.

The stream originates at the Overlake Golf Course ponds where drainage from the Medina and Clyde Hill communities is collected. These ponds function as stormwater flow control facilities that reduce flooding downstream. Beginning at the golf course ponds, Fairweather Creek passes through four culverts (including one under SR 520) before entering Lake Washington. After Fairweather Creek crosses the SR 520 corridor (approximately 0.5 mile east of the Lake Washington shoreline), it flows approximately 400 feet north before discharging into Fairweather Bay. This reach flows through single-family residential neighborhoods, with landscaped lawns immediately adjacent to the stream. Fairweather Creek is on the Ecology 303(d) list for exceeding state water quality standards for dissolved oxygen, temperature, and fecal coliform bacteria (Ecology 2009).

How is stormwater currently managed on SR 520?

Untreated stormwater runoff on SR 520 discharges directly into Lake Union, Portage Bay, and Lake Washington. Stormwater from the I-5/ SR 520 interchange is conveyed north in storm drains to East Allison Street, where it flows west to an outfall in Lake Union (Exhibit 4.10-1). An existing 30-foot-deep stormwater pump station located between the I-5 southbound and express lanes just south of the Roanoke Bridge over SR 520 pumps stormwater into the storm drain system conveyed to East Allison Street.

Exhibit 4.10-2. Eastside Drainage Basins and Stormwater Flow

Fairweather Creek

Untreated Runoff

Stormwater that runs off of SR 520 is not treated. Without treatment, runoff from paved areas carries pollutants like oil, sediment, and dissolved or particulate metals directly into surface waters. Pollutants in runoff are one of a number of reasons that water quality in the project area and region is degraded.

Stormwater from the section of SR 520 between approximately 10th Avenue East and Montlake Boulevard is conveyed in storm drains and discharged to two outfalls in Portage Bay—one under the SR 520 structure at Boyer Avenue East and the other under the Montlake Boulevard eastbound off-ramp. The Portage Bay Bridge discharges directly into Portage Bay (Exhibit 4.10-1).

Stormwater discharges from numerous drains directly into Union Bay.

Stormwater from SR 520 between Montlake Boulevard and Union Bay is conveyed in storm drains that flow east, discharging to outfalls in Union Bay located near the R.H. Thomson Expressway ramps next to the Lake Washington Boulevard interchange (Exhibit 4.10-1).

Stormwater on the west approach to the Evergreen Point Bridge discharges from numerous bridge drains directly into Union Bay. There are no constructed drainage systems where SR 520 crosses Foster Island. Stormwater from the floating bridge deck flows into bridge drains that discharge directly into Lake Washington.

Stormwater from the Eastside transition area flows into Fairweather Bay. There are four primary discharge locations from SR 520 in this area—Fairweather Park, 80th Avenue NE, a culvert under SR 520 at the tip of Fairweather Bay, and Fairweather Creek (Exhibit 4.10-2).

What groundwater resources are located in the study area?

Groundwater in the study area is contained within aquifers, which are geological layers that hold and convey water. There are several aquifers in the study area, but the use of groundwater as a drinking water supply within the area is limited.

Seattle Public Utilities supplies most of the drinking water in the Seattle study area from three primary sources—Chester Morse Reservoir, South Fork Tolt Reservoir, and the Highline Well Field (located in the Renton area). There are 23 water wells of record listed in the area 1 mile north and south of SR 520. The current condition, uses, or continued existence of these wells are unknown. If these wells still exist, they are most likely not used for drinking water supply because they are located in areas supplied by municipal water sources.

Aquifers in the Puget Sound basin located close to the surface are often shallow, making them susceptible to contamination. Deeper aquifers in the Puget Sound basin are better protected. There are three aquifers in the Seattle vicinity of SR 520: the Alluvial Aquifer, the Vashon Advance Outwash Aquifer, and the Sea-Level Aquifer. The Alluvial Aquifer flows toward Portage Bay, the Montlake Cut, and Union Bay from all sides and is present on the shores of Lake Washington. The Vashon Advance Outwash Aquifer underlies all of this area, except where it has been eroded beneath Portage Bay. Groundwater from both aquifers discharges to the lake.

Drinking water in Medina is supplied by Bellevue Utilities Department. Bellevue is a member of the Cascade Water Alliance, an association of regional water districts and cities. The water comes from the Cedar River and Tolt River watersheds in the Cascade Mountains.

Wetlands provide a variety of ecological benefits.

4.11 Ecosystems

Wetlands, fish, and wildlife are essential to the health and sustainability of the natural ecosystem. Although urban development has had significant effects on these natural resources, a wide variety of species uses the habitats within the study area. The ecosystem within the study area provides important environmental benefits to humans as well, including recreational and educational opportunities.

What are wetlands?

Wetlands are transitional zones between aquatic environments and dry land. Their physical, biological, and chemical functions provide a wide variety of ecological benefits. For example, the capacity of wetlands to store water can reduce downstream flooding and trap sediments and other pollutants, improving overall water quality. Wetland vegetation also slows the movement of water, reducing streambank and shoreline erosion. In addition, wetlands can support diverse plant communities, which provide food and habitat for wildlife.

A wetland on Union Bay within the study area with forest, shrub, and emergent vegetation

Wetlands in the project area receive water from several sources. Some are located along the shores of Lake Washington and Portage Bay, where water is present throughout the year. Others are located along streams, on hill slopes, or in depressions in the ground surface. These wetlands receive water when the streams overflow their banks, from subsurface flow when groundwater is close to the surface, and/or directly from rainfall. Many wetlands form in fine, poorly drained soil.

What wetlands are in the project area?

There are 15 wetlands within the project corridor, all of which are associated with the shorelines of Portage Bay or Union Bay in the west approach area (Exhibit 4.11-1). These wetlands have been classified using the Cowardin system (see box at right), developed by the U.S. Fish and Wildlife Service (USFWS). The Cowardin system allows wetlands to be classified based on their vegetation and hydrologic characteristics. Exhibit 4.11-2 illustrates the different types of wetlands and their distinguishing features.

Lake Washington serves as the primary source of water for all the wetlands in the study area. Water levels in Lake Washington and Lake Union are controlled by the U.S. Army Corps of Engineers (USACE) at the Ballard Locks. The USACE lowers the water level by approximately 2 feet each

Cowardin Classification System for Wetlands in the Study Area

Emergent—Characterized by erect, rooted, herbaceous hydrophytes present for most of the growing season in most years. Usually dominated by perennial plants.

Scrub-Shrub—Areas dominated by woody vegetation less than 20 feet tall. Species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted.

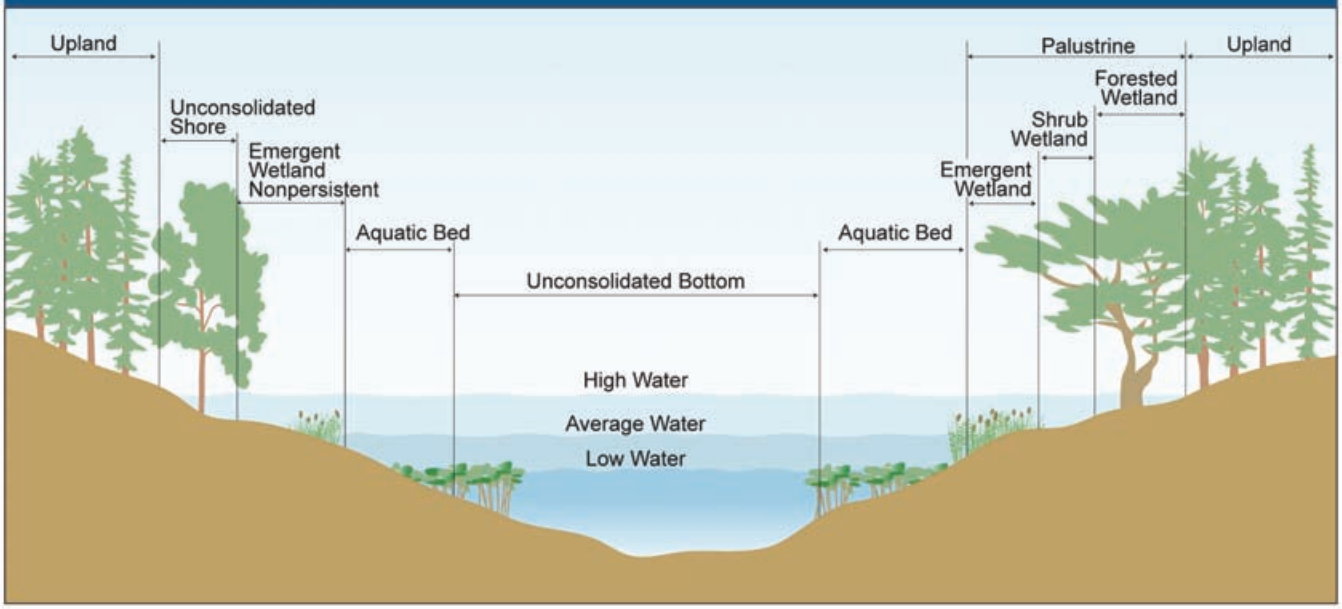
Forested—Characterized by woody vegetation that is 20 feet tall or taller.

Aquatic Bed— Dominated by plants that grow on or below the water surface for most of the growing season.

winter. This fluctuation is the dominant hydrologic change in these wetlands, which otherwise have very stable water levels.

Exhibit 4.11-1. **Wetlands in the Seattle Project Area**

Exhibit 4.11-2. **Wetland Types**



Three wetlands are located along Portage Bay. The largest (approximately 12.7 acres) wraps around the entire southern shoreline of Portage Bay and includes forested, emergent, and aquatic bed communities. The forested

portion of the wetland includes willows and black cottonwood and the emergent portion is dominated by reed canarygrass.

Aquatic bed communities are composed of American white water lily. A very small depressional wetland with scrub-shrub and emergent vegetation is located just south of the SR 520/Montlake interchange. The northernmost wetland is 0.9 acre and is located on the eastern shore of Portage Bay, immediately north of SR 520. The vegetation in this emergent wetland is primarily composed of broadleaf cattail.

Forested wetland on Lake Washington

Union Bay is home to a large wetland complex that covers almost 120 acres, including a portion of the UW campus and the Arboretum. These wetlands include areas of forest, scrub-shrub, emergent, and aquatic bed (floating aquatic plants) habitats.

Vegetation in the forested communities includes red alder, black cottonwood, paper birch, Pacific willow, and Oregon ash. The shrub communities support Pacific and other species of willows, red-osier dogwood, salmonberry, and rose spirea. Invasive species, such as Himalayan blackberry and bittersweet nightshade, are common in these communities. Invasive Eurasian milfoil is also present in the area, but not dominant in the wetlands because it is mostly a submerged plant. Broadleaf cattail, reed canarygrass, slough sedge, and non-native creeping buttercup dominate the emergent communities. The non-native American white water lily dominates the aquatic bed communities.

The Importance of Wetlands and Buffers

Wetlands are transitional zones between aquatic environments and dry land. Their physical, chemical, biological, and social functions provide economic and ecological benefits. For example, the capacity of wetlands to store water and trap sediments can reduce downstream flooding and improve overall water quality. Wetland vegetation slows the movement of water, reducing streambank and shoreline erosion. Many wetlands support diverse vegetation types, which provide food and habitat for wildlife. Wetlands also provide educational and recreational opportunities for humans.

Wetland buffers are the natural, undeveloped areas surrounding wetlands. They are a crucial part of the wetland system and must be protected along with the wetland. Buffers filter sediments and other pollutants from stormwater runoff. They slow and direct runoff water, maintaining water levels in the wetland. In addition, they serve as a "habitat connector," providing a protective pathway for wildlife species moving from wetland to upland habitats. Buffers are vital to the survival of many species that rely on upland areas near wetlands to complete their habitat needs. They also provide a visual and noise barrier between the inner core of the wetland and adjacent human activities.

What functions do wetlands in the study area provide?

Because the study area wetlands are located along the shoreline and are low in the watershed adjacent to or within Lake Washington, they have low potential to alter flood flows or store floodwaters. In addition, as noted above, the USACE controls water levels in Lake Washington at the Ballard Locks. Since the lake level is established by other means, wetlands along SR 520 do not play a major role in regulating surface water flows.

Conversely, study area wetlands do play an important role in water quality. The dense vegetation in these wetlands retains sediments and nutrients, which enter as runoff from adjacent upland areas and paved roads. Because the lake-fringe wetlands are larger than 3 acres and have dense vegetation along the shoreline, they have the greatest potential to improve water quality. This vegetation also protects the shoreline of Lake Washington from erosion, which is a particularly important feature because of the heavy recreational boat traffic in the area.

Most wetlands in the study area provide habitat for a variety of wildlife, from invertebrates to mammals. Stable water levels, dense emergent and shrub vegetation, snags and floating logs, and relatively undisturbed forested and shrub buffers contribute to the habitat suitability of these wetlands. Interspersion of standing water and vegetation and connectivity

to other aquatic and terrestrial habitats are also important indicators of habitat function support.

A variety of birds, reptiles, and amphibians use the wetlands within the study area, including Cooper's hawks, great blue herons, red-winged blackbirds, red-eared slider turtles, Pacific tree frogs, and several types of waterfowl such as mallards and American coots. Wetland-associated mammals in these wetlands include river otters and beavers, as well as terrestrial opossums, raccoons, mice, moles, and voles. The wetlands rate only as moderate for habitat because of non-native vegetation and their proximity to urban areas. The *What wildlife and habitat types are in the project area*? section below provides further details about the presence of the numerous and varied animal species and their use of the study area.

Great blue heron at Foster Island in Lake Washington

Because of their proximity to Seattle, the Arboretum, and the UW, these wetlands provide social values through opportunities for both educational and recreational use. The Arboretum Waterfront Trail is designed to help educate users about wetlands, and the Arboretum as a whole including the wetland areas is an important educational resource for UW researchers and students.

What are the fish resources in the project area?

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, adversely affecting local fish populations.

Lake Washington and its tributaries are home to native and nonnative fish species and stocks, including Chinook salmon, steelhead, bull trout, and other salmonids that are listed by the U.S. government as threatened or endangered species. All anadromous salmonids (fish that migrate from fresh water to and from the ocean) produced in the Lake Washington watershed migrate under or adjacent to the Portage Bay and Evergreen Point bridges, and through Lake Union and the Ship Canal. Other native species living in or using Lake Washington include steelhead and coho and sockeye salmon. Introduced species in Lake Washington include black crappie, carp, smallmouth and largemouth bass, and yellow perch.

DEFINITION

Salmonids

Salmonids are any fish that belong to the family Salmonidae, including salmon, trout, and char.

Although only a few of the larger tributaries in the Lake Washington watershed support sustaining populations of Chinook salmon and steelhead (both threatened species), many smaller tributaries (including those within the project's study area) support other anadromous and resident salmonids such as coho and sockeye salmon.

Tribal Fishing Areas

The Evergreen Point Bridge is within the "usual and accustomed" fishing area of the Muckleshoot Indian Tribe (see sidebar). WSDOT is coordinating with Muckleshoot fisheries staff because the project and its construction could affect fish habitat and access to affirmed treaty fishing areas. WSDOT will also work with coastal and Puget Sound tribes with treaty fishing rights in other areas regarding potential effects of towing or moorage of pontoons.

What are treaty rights of Native Americans in the project area?

In 1854 and 1855, many Indian tribes in the Pacific Northwest entered into treaties with the United States, wherein they reserved the right to fish in areas outside their reservation boundaries in "usual and accustomed" fishing and hunting grounds.

In a usual and accustomed fishing area, Indian tribes have a right to harvest fish free of state interference, subject to conservation principles; to co-manage the fishery resource with the state; and to harvest up to 50 percent of the harvestable fish. Judicial decisions made over the years have re-affirmed these rights.

What is the condition of fish habitat in the area?

Natural shorelines provide important cover, migration, rearing and foraging habitat for juvenile salmonids. Little natural shoreline habitat remains in the Ship Canal and Lake Union (I-5 area), resulting in much less open-water habitat to support fish species compared to Lake Washington. Docks, houseboats, and other structures cover most of the shoreline.

Shoreline modifications in Portage Bay include the Queen City Yacht Club, which has boat moorage on the west side of the Portage Bay Bridge, and the Seattle Yacht Club and NOAA Northwest Fisheries Science Center on the east shoreline. South of the existing Portage Bay Bridge are vegetated shallows with a fringe marsh along the shoreline. The shoreline and shallow-water areas of Portage Bay and Union Bay provide habitat primarily for those species that prefer shallow-water habitats with abundant aquatic vegetation, such as introduced carp, smallmouth bass, and yellow perch.

Montlake Cut is the only entrance and exit for anadromous fish migrating to and from Lake Washington. While much of the Montlake Cut consists of concrete or riprap-armored shoreline, substantial portions of the Union Bay shoreline habitats encompassing Marsh Island and Foster Island are naturally vegetated. These areas provide some habitat and cover for juvenile salmon passing through the lake on their way to Puget Sound, although the shallow water and warm summer temperatures limit the habitat value of the nearshore areas.

Arboretum Creek (also known as Washington Park Creek) is a small stream that originates in the vicinity of the Seattle Japanese Garden in the Washington Park Arboretum, south of the project corridor. In-stream habitat conditions—including food, water volume, cover, water quality, and fish passage—are generally marginally supportive of salmonids. Although salmon and trout may occur in this tributary, they are unlikely to occur upstream of its lower reaches due to barriers associated with SR 520 and surrounding development.

Eastern shoreline of Lake Washington north of the east approach structure

Lake Washington's shoreline is an important fish resource that generally supports juvenile salmonid rearing and migration, including sockeye salmon spawning at some locations. Naturally sloped gravel beaches are present at many public parks and some private residences, but much of the Lake

Washington shoreline has bulkheads or riprap armoring, which favors predatory fish such as bass and bullhead and discourages juvenile salmon.

The Lake Washington shoreline, including the existing and proposed east end of the Evergreen Point Bridge, has been identified as a place where sockeye salmon may spawn based on WDFW map records from the 1970s. However, no recent surveys have been conducted to determine if spawning sockeye salmon currently use this location (Exhibit 4.11-3). More than 85 sockeye shoreline spawning areas are identified in Lake Washington (WDFW 2004), and this area is less than 1 percent of the total spawning area.

Exhibit 4.11-3. **Potential Sockeye Spawning Beach**

The deeper open water areas of Lake Washington also provide habitat for salmonid species. For example, juvenile sockeye spend over 1 year in the lake and inhabit deep water areas, particularly during summer stratification (due to avoidance of high temperatures on the lake's surface). In addition, larger Chinook fry and fingerlings tend to move into deeper waters in late spring/early summer to feed and rear. However, the juvenile Chinook tend to remain relatively near Lake Washington's shores within the surface layer of the lake as they migrate to the Ship Canal (Celedonia et al. 2008). Steelhead migrate as relatively large smolts, moving quickly through Lake Washington and the Ship Canal during the late spring. Because steelhead commonly undergo active rather than rearing migrations, it is likely the Cedar River steelhead pass the SR 520 site within a month of their movement out of the lower Cedar River, likely between late April and early June. Little is currently known about the habitat use of coho salmon in Lake Washington, although coho salmon are mainly found near the shorelines and likely undergo a relatively rapid migration similar to steelhead.

What fish species are specifically protected by state and federal law?

Federally Listed Fish Species

Section 7 of the federal Endangered Species Act (ESA) protects plant and animal species that are in danger of extinction. The ESA establishes a formal process for "listing" a species as threatened or endangered. Once a species is listed, anyone proposing to develop a project that uses federal money or needs a federal permit must consult with the federal resource agency in charge of managing that species and prepare studies to determine if the species and its habitat will be harmed as a result of the project. The consultation process occurs during the NEPA process, but it is separate. The federal agencies with jurisdiction over endangered species in the project area are NOAA Fisheries (responsible for protecting Chinook and steelhead salmon) and the U.S. Fish and Wildlife Service (responsible for protecting bull trout).

What is the Endangered Species Act?

The ESA is an act of Congress passed in 1973 that governs how animal and plant species whose populations are dangerously in decline or close to extinction will be protected and recovered.

SR 520 Corridor

Federally listed species are listed in Table 4.11-1. Lake Washington supports one or more life stages of Chinook salmon, steelhead, and bull trout, which are currently listed as threatened under the ESA (NOAA Fisheries 2009a, USFWS 2009). Lake Washington Chinook salmon are a part of the Puget Sound evolutionarily significant unit (ESU) (NOAA Fisheries 1998, 1999). Lake Washington has two native Chinook salmon populations (North Lake Washington and Cedar River populations) and a nonnative Issaquah Hatchery stock (NMFS 2008). The population of the North Lake Washington stock has remained generally consistent, with escapements (the number of adults that return to the spawning grounds) between 200 and 500 adults, and is considered healthy. The Cedar River Chinook salmon have shown a long-term negative trend in escapements and chronically low numbers of escapements; as a result, this stock is considered depressed.

Table 4.11-1. Occurrence of Federally and State Listed Fish Species in the Study Area

Species	Status	Occurrence in the Study Area
SR 520 Corridor		
Bull trout *Salvelinus confluentus*	Federally Threatened	Overlapping habitat with other salmonids, but very low numbers or nonexistent in most of watershed. Major fish predator.
Chinook salmon *Oncorhynchus tshawytscha*	Federally Threatened	Overlapping habitat with other salmonids; wild and hatchery origin.
Steelhead/rainbow trout (anadromous/resident) *Oncorhynchus mykiss*	Federally Threatened[a]	Overlapping habitat with other salmonids; consume similar prey. Some predation on young salmonids probable.
Pontoon Construction and Transport Route		
Bull trout *Salvelinus confluentus*	Federally Threatened	Use the Grays Harbor estuary, but the low gradients in the Chehalis drainage are not considered to be ideal habitat.
Eulachon *Thaleichthys pacificus*	Proposed for Federally Threatened	Also known as Columbia River smelt, candlefish, or hooligan; range from northern California to southwest Alaska and into the southeastern Bering Sea.
Green sturgeon *Acipenser medirostris*	Federally Threatened	Have a complex anadromous life history and spend more time in the ocean than any other sturgeon; not known to spawn in the Grays Harbor system.

[a] The anadromous (ocean-going) form is listed as threatened although some mixing between this and resident stocks likely occurs.

NOAA Fisheries has also designated critical habitat for the Puget Sound ESU of Chinook salmon (NOAA Fisheries 2005). This critical habitat includes Lake Washington, as well as the Ship Canal and Lake Union between the Ballard Locks and Lake Washington. The designation identified Lake Washington as high-conservation-value habitat due to its

connectivity with the high-value Cedar River watershed and its support of rearing and migration habitat for fish from all four watersheds in the subbasin.

Lake Washington steelhead are part of the Puget Sound distinct population segment (DPS), also listed by National Marine Fisheries Service (NMFS) as threatened (NMFS 2007). The listing indicated that Lake Washington steelhead include spawning populations in the Cedar River, Issaquah Creek, and Bear Creek, with the Cedar River contributing the majority of the escapement. While the Lake Washington population also appears to include a substantial number of rainbow trout, the resident form of steelhead, there is insufficient information to evaluate whether, under what circumstances, and to what extent the resident form may contribute to the viability of steelhead over the long term (NOAA Fisheries 2007). Critical habitat has not yet been designated for Puget Sound steelhead.

A **distinct population segment**, or **DPS**, is the term used for a population projected by a listing under the ESA.

An **evolutionarily significant unit**, or **ESU**, of a fish species is the term used by NOAA Fisheries for a Pacific salmon population protected by a listing under the ESA.

USFWS lists the Coastal-Puget Sound DPS of bull trout as threatened, which includes the population in the Lake Washington watershed (USFWS 1999). Distribution of bull trout in the Lake Washington watershed is uncertain, but individuals occasionally have been observed in recent years at the Ballard Locks and at several other locations in the watershed. Observations of about 20 subadult or adult bull trout have occurred in Lake Washington, Lake Union, the Ship Canal, and the Ballard Locks since 1975 (personal communication, Emily Teachout, Staff Biologist, USFWS, Olympia, Washington, February 6, 2009).

USFWS also designated bull trout critical habitat in Lake Washington, in the Ship Canal, and Lake Union (USFWS 2005). These areas provide foraging, migratory, and overwintering habitat for bull trout outside of currently delineated core areas in the Puget Sound Recovery Unit. No bull trout critical habitat is designated in any Lake Washington tributaries. The Puget Sound/Strait of Georgia population of coho salmon is listed as a species of concern by NOAA Fisheries (2004).

Pontoon Construction and Transport

In addition to the listed salmonids in the Lake Washington watershed, two ESA-listed fish species occur in the Grays Harbor area, a potential construction site for the supplemental stability pontoons. These species include bull trout and green sturgeon. While bull trout use the Grays Harbor estuary, no spawning has been documented within the basin (Washington State Conservation Commission 2001). The low gradients in the Chehalis drainage are not considered to be ideal habitat for bull trout. Grays Harbor is the northernmost estuary with concentrations of green sturgeon (Adams et al. 2002).

State-listed Fish Species

No state threatened or endangered fish species occur within the project vicinity. Other fish species that are designated as priority species (WDFW 2009) may occur within the project vicinity. These are chum, sockeye, and kokanee salmon; steelhead and rainbow trout; and coastal cutthroat trout.

What wildlife and habitat types are in the project area?

Lakes, streams, and wetlands—as well as the upland areas of the SR 520 corridor—support many species of mammals, reptiles, amphibians, and birds. Although the diversity of these species is much diminished from pre-settlement times, the project area contains some high-quality habitat and a wide array of animal and bird life. Biologists identify three general types of habitat along the corridor: urban matrix, open water, and parks and other protected areas.

Typical habitat in the Urban Matrix cover type in the project area

Urban landscapes make up almost two-thirds of the project area. They are dominated by commercial and residential land uses with buildings, pavement, ornamental gardens, lawns, and scattered trees. Wildlife habitat in these areas is limited, although roadside and ornamental trees provide some habitat for common birds. Open water, which makes up 29 percent of the project area, is notable for its prevalence of waterfowl. The proximity of water is also important for bald eagles.

Although they make up only about 7 percent of the total area, forested parks are an important habitat because they often preserve complex, intact upland, riparian, and wetland plant communities. Because of this, the forested parks contain some of the urban area's most diverse wildlife. Wildlife is protected under federal, state, and local regulations.

What wildlife species are specifically protected by state and federal law?

Federally Listed Wildlife Species

SR 520 Corridor

No federally ESA-listed wildlife species are expected to occur in the Seattle, Lake Washington, and Eastside areas (Table 4.11-2). The bald eagle is federally protected under the Bald and Golden Eagle Protection Act. This species and suitable habitat are found within the study area. Bald eagles generally are found along shores of saltwater and freshwater lakes and rivers that support substantial prey.

Table 4.11-2. Occurrence of Federally and State Listed Wildlife Species in the Study Area

Species	Status	Occurrence in the Study Area
SR 520 Corridor		
Bald eagle	Federally Protected under the Bald and Golden Eagle Protection Act	One bald eagle territory occurs in the study area. It has three bald eagle nest sites; one is in the Washington Park Arboretum and two are at the Broadmoor Golf Course. Wintering bald eagles occur around Portage Bay and Lake Union. Wintering bald eagles forage on waterfowl and fish in Lake Washington.
Pontoon Construction and Transport Route		
Bald eagle	Federally Protected under the Bald and Golden Eagle Protection Act	One bald eagle territory occurs in the study area.
Killer whale	Federally Endangered (Southern Resident population)	Resident killer whales congregate in relatively large groups (pods) in coastal areas where they forage primarily on fish. Transient killer whales, whose range extends over a broader area, primarily hunt marine mammals, but also frequent Puget Sound waters. Both can be found at any time of the year, but only resident pods breed in the Strait of Juan de Fuca. They are found there primarily in the spring, summer, and fall within shipping channels.
Humpback whale	Federally Endangered	Humpbacks are generally seen off the coast of Washington from May to November, although they have also been seen earlier in the spring and later in the winter.
Steller sea lion	Federally Threatened	Species may occur in nearshore coastal waters, with smaller numbers in the inside waters of the Strait of Juan de Fuca and Puget Sound.
Brown pelican	Federally Endangered	Species have been observed foraging along the outer Washington coast near estuaries.
Marbled murrelet	Federally Threatened	Suitable foraging habitat occurs throughout the coast and Puget Sound. Suitable nesting habitat and confirmed nesting occurs along outer coast of Washington within 5 miles of the study area. Observed foraging in Strait of Juan de Fuca and Puget Sound.
Leatherback sea turtle	Federally Endangered	Species is associated with pelagic (open water) habitats and is occasionally sighted in bays and estuaries.
Gray whale	Protected under Marine Mammal Protection Act	Species migrates along the outer coast of Washington and within the Strait of Juan de Fuca and Puget Sound in the spring and summer; it is frequently spotted during those times within shipping channels.
Minke whale	Protected under Marine Mammal Protection Act	Species is occasionally found along the outer coast and within the Strait of Juan de Fuca and Puget Sound year-round as single individuals within shipping channels.

Table 4.11-2. Occurrence of Federally and State Listed Wildlife Species in the Study Area

Species	Status	Occurrence in the Study Area
Dall's porpoise	Protected under Marine Mammal Protection Act	Species is known to occur throughout Puget Sound and along the coast year-round.
Harbor porpoise	Protected under Marine Mammal Protection Act	Species is known to occur throughout Puget Sound and along the coast year-round.
Risso's dolphin	Protected under Marine Mammal Protection Act	Species has been documented on the outer Washington coast.
Pacific white-sided dolphin	Protected under Marine Mammal Protection Act	Species is known to occur throughout Puget Sound and along the coast year-round.
Northern right whale dolphin	Protected under Marine Mammal Protection Act	Species is known to occur throughout Puget Sound and along the coast year-round.
False killer whale	Protected under Marine Mammal Protection Act	Small numbers of false killer whales have been observed off the Washington coast in the spring.
Harbor seal	Protected under Marine Mammal Protection Act	This species uses the waters of Grays Harbor and adjacent estuaries. Important haul-out and pupping sandbars occur throughout the mid- and outer estuary. Species is regularly seen just offshore and throughout the Strait of Juan de Fuca and Puget Sound.
California sea lion	Protected under Marine Mammal Protection Act	Migrating individuals may be found throughout Puget Sound, the Strait of Juan de Fuca, and along the outer coast of Washington. There are occasional occurrences of individuals and bachelors during the fall, winter, and early spring. Species is found at Ballard Locks.
Northern elephant seal	Protected under Marine Mammal Protection Act	There are occasional occurrences off the Washington coast, primarily during summer and early fall. In inland waters only occasional bachelor males are found.
Northern fur seal	Protected under Marine Mammal Protection Act	Species is occasionally observed off the Washington coast year-round, but most individuals are encountered from January through May. Species is rarely sighted in the Strait of Juan de Fuca or Puget Sound.
Sea otter	Protected under Marine Mammal Protection Act	The current range of sea otters in Washington extends from just south of Destruction Island on the outer coast to Pillar Point in the Strait of Juan de Fuca.

Sources: USFWS 2007; NOAA Fisheries 2009b, 2009c.

Pontoon Construction and Transport

All marine mammals are protected under the Marine Mammal Protection Act, regardless of their listing status under ESA. Three kinds of marine mammals—cetaceans (whales, dolphins, and porpoise), pinnipeds (seals and

sea lions), and mustelids (sea otters)—occur within the project vicinity. USFWS (2007) and NOAA Fisheries (2009b, 2009c) have identified six species listed under ESA as occurring or potentially occurring in Puget Sound and along the coastal route of the shipped pontoons. The coastal route for transporting the pontoons contains suitable habitat for and/or sightings of five of these species: the leatherback sea turtle, southern resident killer whale, humpback whale, Steller sea lion, and marbled murrelet, as well as designated critical habitat for the southern resident killer whale population (Table 4.11-2). A detailed evaluation of the potential effects of the proposed project on federally listed species will be conducted during ESA consultations with USFWS and NOAA Fisheries.

Bald eagles (discussed above) are known to occur near the study area. Raptor nests and eggs are also protected under the federal Migratory Bird Treaty Act and under the Revised Code of Washington (RCW 77.15.130).

State-Listed Wildlife Species

No state-listed wildlife or marine mammals are expected to occur in the SR 520 Corridor or Pontoon Construction and Transport areas (Table 4.11-2).

4.12 Geology and Soils

Major geologic hazards in the project area are erosion (the weathering away of soils by wind and/or water), landslides, and earthquakes. Local jurisdictions in the project area map geologic hazard areas to ensure that development in these areas, including highway construction, avoids these risks and/or makes use of appropriate design and construction techniques to minimize them.

What are the geologic hazards in the project area?

Exhibits 4.12-1 and 4.12-2 show the geologic hazard areas that have been mapped in the project area.

Erosion and landslides are functions of an area's soil types and topography; the steeper the slope and the finer or more layered the soil, the likelier both are to occur. Engineers can take precautions in highway design and construction to stabilize erosion- and slide-prone areas and maintain the integrity of the roadway. As Exhibit 4.12-1 shows, SR 520 passes through erosion-prone soils southwest of Portage Bay and on the eastern shoreline of Lake Washington.

Exhibit 4.12-3 shows a cross-section of the soil types through the SR 520 corridor and also depicts the project area's ridges and valleys. The beds of Lake Washington and Portage Bay contain deep layers of fine, compressible sediments that were deposited during and after the last retreat of the glaciers. These soft, wet sediments are up to 150 feet thick below the

Exhibit 4.12-1. Geologic Hazards in the Seattle Project Area

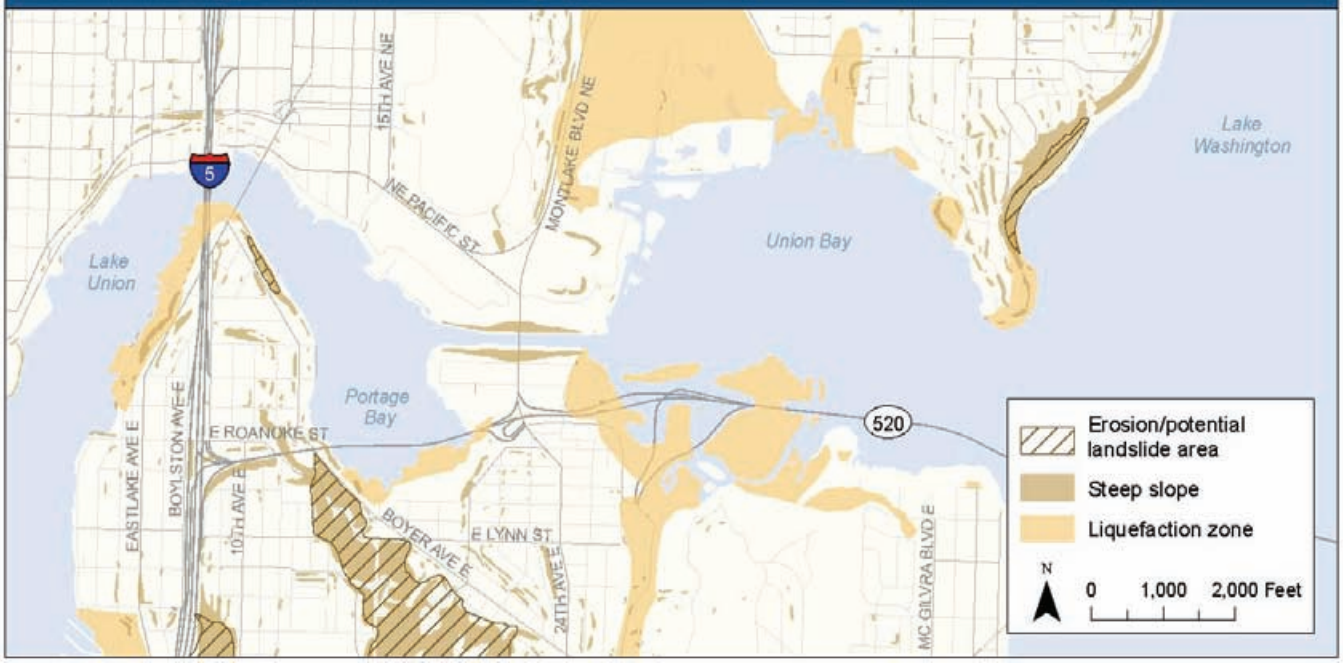


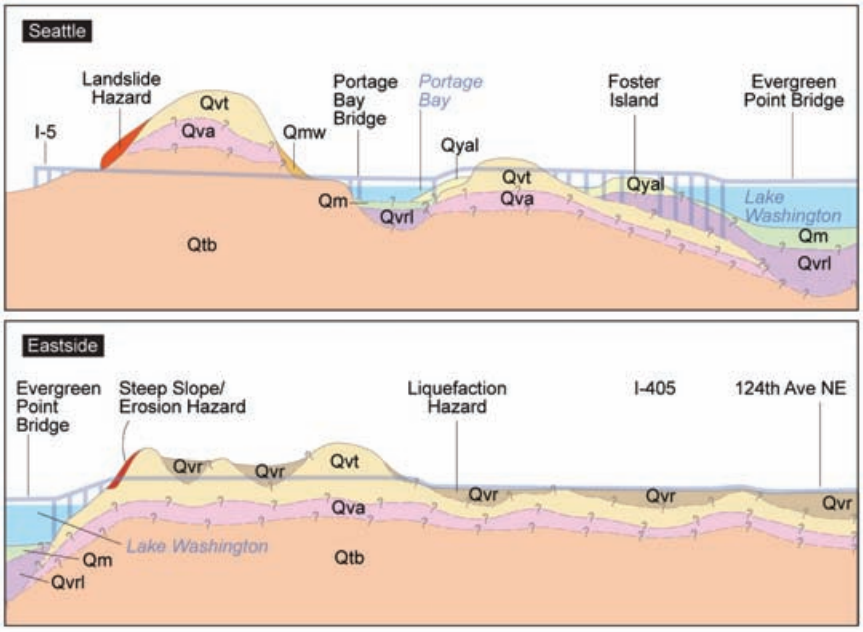
Exhibit 4.12-2. Geologic Hazards in the Eastside Project Area

Erosion/potential landslide area

Liquefaction zone

N 0 500 1,000 2,000 Feet

Exhibit 4.12-3. Cross Section of Project Area Soils



Stratigraphic Sequence (youngest to oldest)

- **Qmw** Mass Wastage *(from erosion and landslides)*
- **Qyal** Younger Alluvium *(may also include areas of peat)*
- **Qm** Marsh/Peat/Bog Deposits *(included because there is a thick layer of peat in Lake Washington and Portage Bay)*
- **Qvr** Recessional Outwash
- **Qvrl** Recessional Lacustrine Sediments *(mostly silt)*
- **Qvt** Glacial Till
- **Qva** Advanced Outwash
- **Qtb** Transitional Beds and Older Glacial Deposits
- Hazard Areas
- Approximate Location

NOTES:

Not to scale.

This illustration shows generalized geologic conditions and potential hazard areas, but does not show actual conditions beneath the proposed project alignment.

SOURCES:

Surficial Geology Map: King County GIS Data (2003), based on Booth et al. (2002).

Schematic Subsurface Profile: CH2M HILL (2004).

bottom of Lake Washington. Over the top of this layer lie more recent deposits of soft peat, silt, and clay up to 45 feet thick. Because of their softness, the lake bed sediments are not suitable for structural foundations such as bridge columns.

Western Washington lies along the "ring of fire," the zone of earthquakes and volcanoes that encircles the Pacific Ocean. Off the Washington coast, two tectonic plates are slowly colliding, with the Juan de Fuca plate pushing its way beneath the North American plate. Although movement of the plates is slow, the forces resulting from their motion are enormous. The collision of the plates causes stresses to build up in the earth's crust over long periods of time. When this stress is released, an earthquake occurs.

Most earthquake tremors in the Puget Sound region are small and cause little damage. They can, however, be powerful and destructive. Every 300 to 600 years or so, an extremely powerful earthquake—up to magnitude 9 or higher on the Richter scale—occurs at the boundary of the North American and Juan de Fuca plates. The last such earthquake was in 1700. A more common but less severe type of earthquake is exemplified by the 2001 Nisqually earthquake, which opened cracks in the Alaskan Way Viaduct and loosened bolts in the west approach span of SR 520. It could have caused collapse of SR 520's hollow bridge columns in the Portage Bay and west approach areas if the shaking had lasted longer.

Column damaged by barge accident

An earthquake's most characteristic physical effect is ground shaking caused by the passage of seismic waves. The amount of ground motion varies with the magnitude of the earthquake, the distance from its source, and the type of soil through which the seismic waves are traveling. If it is strong enough, this motion can damage or destroy buildings, roads, bridges, and other facilities. Earthquakes can also cause permanent movement of the ground, either through slippage along fault lines and steep slopes or through the way the shaking affects the soils. One of the most damaging effects of earthquakes is liquefaction, which results when seismic shaking causes certain soils to act like liquids. As shown in Exhibits 4.12-1 and 4.12-2, several liquefaction zones are present in the project area.

In the Puget Sound region, engineers must take seismic risks into account when they design new facilities or rebuild existing ones. Under current codes and design standards, these facilities are constructed to withstand the level of motion caused by a specified theoretical earthquake. Known as the "design acceleration," this level of motion is based on the probability of an earthquake happening during the useful life of the facility and the type of ground motion likely to occur.

Bridges are structures of particular concern in planning for earthquakes. The Portage Bay Bridge and west approach to the Evergreen Point Bridge in the Seattle project area were built at an earlier stage in the development of seismic design standards, and their features as designed and constructed

are highly vulnerable to earthquake damage. Although seismic retrofitting has addressed some of the problems, these bridges are still twice as likely to be damaged by an earthquake as bridges built to today's minimum design standards.

4.13 Hazardous Materials

Hazardous materials are substances that are toxic or harmful to human health or the environment and that are regulated under federal and state laws. Examples of hazardous materials include asbestos, lead-based paint, petroleum, and toxic chemicals. Hazardous materials can be encountered through demolition, removing underground storage tanks, or building on contaminated properties that may have historically been used for large-scale commercial or industrial use. In addition, acquiring lands with hazardous materials could have high costs for cleanup or disposal.

What properties in the project area are potentially contaminated?

Hazardous materials sites that were identified as having a potential effect on the project were characterized by risk category (see definition at right). As shown in Exhibit 4.13-1, nine low- to moderate-risk sites were identified for evaluation. These sites contain total petroleum hydrocarbons in soil and groundwater; a few sites had levels of these materials above Washington Model Toxics Control Act (MTCA) Method A cleanup levels. One site also had trichloroethylene and perchloroethylene above MTCA cleanup levels. In addition to these sites, the sediments in Lake Washington, Union Bay, and Portage Bay and buried materials in the former Montlake and Miller Street landfills could pose unique concerns and are discussed in more detail below.

Montlake Landfill

The abandoned Montlake Landfill site is located in the 200-acre area south of NE 45th Street between Montlake Boulevard and Union Bay (Exhibit 4.13-1). The Montlake Landfill is also known as the Ravenna Landfill, the Ravenna Dump, the Union Bay Dump, and the University Dump. The City of Seattle operated the Montlake Landfill on University property between 1926 and 1971. The landfill lies over one the largest peat bogs in Washington state. When the landfill was closed in 1971, approximately 2 to 3 feet of earth was used to cap the landfill.

Methane gas is produced as a normal decomposition product in landfills and in peat bogs. Methane gas is lighter than air and can be explosive. A methane gas monitoring study was conducted in 2000 by the Seattle Solid Waste Department, Public Health - Seattle and King County, and the UW. As part of the study, gas samples were collected at over 41 locations at the landfill. Results confirmed the presence of a high concentration of methane

Hazardous Material Risk Categories

Low- to moderate-risk sites have known potential contamination or their contamination can be reasonably predicted. These sites are typically small to medium in size, their potential contaminants are not difficult to treat, and remedial options are straightforward (WSDOT 2009a). Nine low- to moderate-risk sites are located in the project area.

High-risk sites are usually sites that have substantial contamination and would create significant liability for WSDOT through construction activities or property acquisition. These sites are typically large in size and/or have large volumes of contaminated materials or might have a long history of commercial or industrial use (WSDOT 2009a). No high-risk sites are located in the project area.

Model Toxics Control Act

The Model Toxics Control Act sets strict cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised. At the same time, the rules that guide cleanup under the Act have built-in flexibility to allow cleanups to be addressed on a site-specific basis.

Three options (Methods A, B, and C) for establishing cleanup levels at a site are provided.

MTCA Method A uses published tables to determine cleanup action levels for sites with relatively few hazardous substances and undergoing routine cleanup.

MTCA Method B uses risk assessment equations to develop cleanup action levels for all hazardous materials, including those chemicals listed under MTCA Method A.

MTCA Method C applies to industrial sites, uses less stringent exposure assumptions than Method B, and is used when Method A or B levels are not possible or would result in a greater overall threat to human health or the environment.

gas, especially in areas to the north and northeast of the Intramural Activities Building and near the play fields. Permanent methane gas monitoring stations were put in place along the landfill boundary.

Exhibit 4.13-1. Hazardous Material Sites in the Seattle Project Area

A site hazard assessment conducted by Ecology in 2000 concluded that if the Montlake Landfill is left undisturbed, the risk of adversely affecting human health and the environment is low, and no remedial cleanup actions would be required in the near future. However, new projects within 1,000 feet of the landfill need to conduct methane gas mitigation or demonstrate through geotechnical engineering that the project does not need a methane gas mitigation system.

Miller Street Landfill

The Miller Street Landfill is located near the Washington Park Arboretum and east of 26th Avenue North. This site was operated as a municipal landfill between 1909 and 1936. Little historical information is available about the landfill, although it was partially delineated during a 2006 cultural

resources study conducted for the SR 520 project (Onat and Kiers 2007). The northern and eastern boundaries of the landfill extended to the edges of Union Bay. The western boundary appeared to extend to Lake Washington Boulevard, according to 1938 aerial photographs. The southern boundary appeared to be near the present day Miller Street parking lot for the Arboretum. Samples collected in 2006 indicated that the historical debris at the site consisted of a range of domestic refuse.

In a 1984 report on abandoned landfills, the Public Health Department collected soil, gas, and surface water samples at the Miller Street Landfill site (identified as the Arboretum Playfield site in the report). The study concluded that, based on the sample findings, the landfill age, and the relatively benign wastes, the historical landfill was a low environmental health risk (Public Health - Seattle and King County 1984). The Public Health Department recommended no further study.

Sediments from Lake Washington, Union Bay, and Portage Bay

Two sediment-related studies were conducted in Lake Washington and Portage Bay (Cubbage 1992, Moshenberg 2004). These studies showed that relatively low concentrations of pollutants such as metals, PCBs, PAHs, and phthalates are present in the sediment of Lake Washington and Portage Bay compared to that found in Lake Union. However, because the existing sediment quality data are limited and the samples were not collected from areas anticipated to be directly affected by project construction, the risk of encountering contaminated sediments during construction is unknown at this time. Additional sampling and data review will occur prior to the FEIS.

4.14 Navigation

The U.S. Coast Guard is responsible for identifying and maintaining navigation channels in U.S. waters, such as in Lake Washington and Puget Sound. Federal regulations define navigable waterways as those waters that are subject to the ebb and flow of the tide and/or were used for the transport of interstate or foreign commerce historically or is so used currently or will be in the future (33 CFR Part 329). A designation of navigability covers the entire surface extent of the water body.

DEFINITION

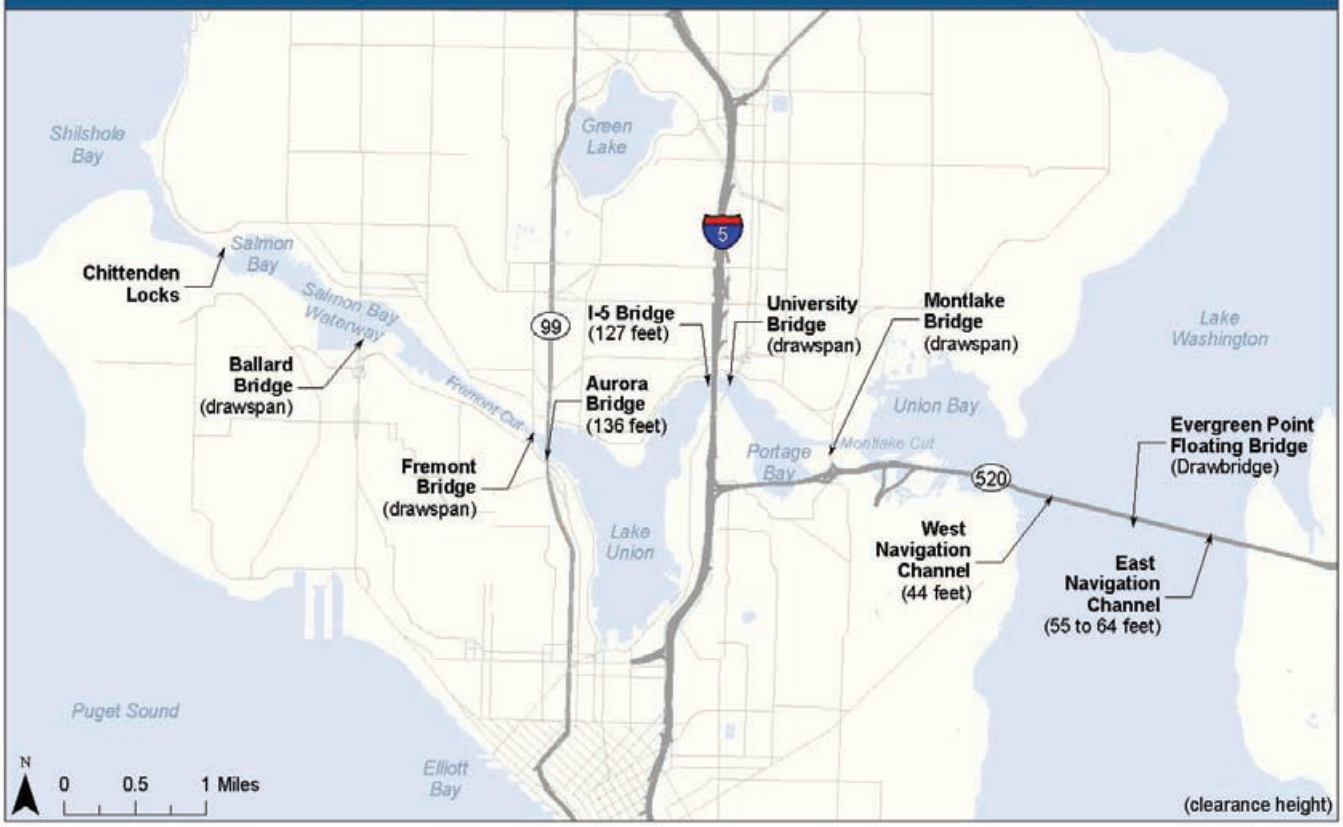
A **navigable waterway** is sufficiently wide, deep, and free from obstructions to allow travel by vessels.

What are current navigation channels and limits on ship passage?

The Chittenden Locks in Ballard are the initial entry point for any vessel wishing to access Lake Washington from Puget Sound (Exhibit 4.14-1). The locks provide passage to the Lake Washington Ship Canal, which is about 8 miles long and has a minimum depth of 30 feet. The canal consists of a series of dredged navigation channels connecting the natural existing basins of Lake Washington, Lake Union, and Salmon Bay. Four drawbridges span

the Ship Canal between the Chittenden Locks and Lake Washington: the Ballard Bridge, the Fremont Bridge, the University Bridge, and the Montlake Bridge. Highway 99 and I-5 cross the Ship Canal on bridges that are 136 feet and 127 feet high, respectively.

Exhibit 4.14-1. Bridges and Navigational Clearances between Chittenden Locks and Lake Washington



Three navigation channels are associated with the floating portion of the Evergreen Point Bridge: the west highrise, midspan drawbridge, and east highrise. The east highrise 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.

West highrise of Evergreen Point Bridge

Lake Washington stretches approximately 10.7 miles south of the Evergreen Point Bridge to the mouth of the Cedar River. North of the bridge, Lake Washington stretches 8.2 miles to the mouth of the Sammamish River. Depths in the lake near the floating bridge are over 200 feet.

Vessel Traffic and Bridge Openings

Vessel traffic on Lake Washington includes commercial, industrial, and recreational use, with recreational boaters being the largest category. The annual number of Evergreen Point Bridge drawbridge openings decreased

from 14 to 0 in 2003, and has increased since 2003 to 10 in 2008. In contrast, the Montlake Bridge and University Bridges opened between 1,000 and 3,000 times per year over the last 10 years. This number of openings is an indicator of the number of sailboats that pass back and forth between Lake Washington and Lake Union or through the Lake Washington Ship Canal to Puget Sound.

East highrise of Evergreen Point Bridge

Foss runs a crane derrick on Lake Washington and makes approximately three to four trips south of the Evergreen Point Bridge each year. The crane derrick is 144 feet tall to the boom, 117 feet long, 60 feet wide, and has a draft of 6 feet. This vessel currently uses the SR 520 drawbridge, but can be modified to pass under the I-90 East Channel Bridge.

NOAA currently docks vessels on Lake Union and has some provisions stored at its Sand Point facility located on the western shore of Lake Washington northeast of the University of Washington. NOAA transports supplies between Sand Point and Lake Union by truck and does not use Sand Point for marine traffic often. They have no current plans for expanded use (personal communication, NOAA, Seattle, Washington, January 2009).

The Seattle Fire Department will be operating three fire boats. Boat E1 is a 50-foot-long fast-attack boat, E3 is a 97-foot-long boat, and E4 is a 108-foot-long boat. These boats are stationed at Fishermen's Terminal and at Fire Station 5 located on the Seattle marine waterfront. These boats would fight fires in the project area, including areas south of the Evergreen Point Bridge. The tallest boat has an extendable mast that can be lowered to a minimum height of 40 feet and a minimum draft of 10 feet.