east lake sammamish trail

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East Lake Sammamish Master Plan Trail

Prepared for:

Federal Highway Administration,

Washington State Department of Transportation, and

King County Facilities Management Division

U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

King County Department of Executive Services
Facilities Management Division

List of Appendices

Appendix A – Environmental Commitments

East Lake Sammamish Master Plan Trail Environmental Commitments

Prepared for

King County Facilities Management Division

Prepared by

Adolfson Associates, Inc.
5309 Shilshole Avenue NW, Suite 200
Seattle, WA 98107

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1. SURFACE RUNOFF AND EROSION

The following measures are designed to control runoff and minimize erosion during construction and maintenance of the trail. These measures would help minimize impacts to streams, fish, and wetlands.

1.1 MITIGATION COMMITMENTS

- Develop and implement a temporary sediment and erosion control plan, a spill containment and countermeasures plan, and a stormwater pollution prevention plan for the project. These plans would outline the best management practices (BMPs) that would be used during construction.
- Conduct construction activities in accordance with requirements outlined in the NPDES permit issued for the project.
- Time construction activities and ditch maintenance to occur during drier periods, when possible.
- Cover or mulch exposed soils, slopes, and graded areas as appropriate.
- Use silt fences, temporary sedimentation ponds, or other suitable sedimentation control devices.
- Minimize areas of soil exposure and retain vegetation where possible. Seed or plant appropriate vegetation on exposed areas as soon as work is completed.
- Route surface water through temporary drainage channels away from disturbed soils or exposed slopes.
- Use clean soils containing little or no silt and clay as fill to reduce the potential for erosion.
- Use a truck tire wash to reduce the potential for turbid runoff from roads.
- Perform hydraulic modeling during the detailed design phase of the project (subsequent to the Master Plan Trail Final EIS) to determine the adequacy of the existing drainage system along the Interim Use Trail, East Lake Sammamish Parkway SE, and East Lake Sammamish Place SE (i.e., ditches and culverts). Improvements would be incorporated during the final design phase where appropriate.
- Provide permanent stormwater management facilities as required by permitting agencies.

1.2 POTENTIAL ADDITIONAL MEASURES

- Perform water quality monitoring during construction in accordance with Ecology's standards.

2. GEOLOGIC ISSUES

The following measures are designed to reduce impacts to geological resources during construction and operation of the trail.

2.1 MITIGATION COMMITMENTS

- Design and construct retaining walls to mitigate seismically induced slope failure.
- Mitigate potential slope instability through geotechnical investigation, engineering design, and construction techniques.
- Maintain and clean culverts as needed to address debris flows.
- Reuse excavated soil along the corridor as appropriate. Dispose of spoils appropriately.

- Perform vibration monitoring of sections of retaining wall requiring pile driving.
- To minimize impacts to adjacent roadways during construction, limit the length and duration of excavation or use engineered shoring.
- Locate utilities prior to construction of retaining walls.

2.2 POTENTIAL ADDITIONAL MEASURES

- To address vibration and settlement, perform pre- and post-construction surveys of adjacent critical structures such as houses and perform monitoring during construction. Depending on the severity of the impacts, additional mitigation could include modifying construction techniques, underpinning structures, or re-leveling and repair as appropriate.
- Placing the new trail on a pile-supported bridge structure would be an option in some areas of the East Alternatives where the new trail is planned to cross a very steep slope and the resulting wall would be very high. Construction of the bridge foundation could be accomplished from either above or below the new trail.
- Monitor utilities during construction using settlement meters.

3. FISHERIES

In addition to the measures listed above for control of surface runoff and erosion, the following measures would help minimize impacts to fish.

3.1 MITIGATION COMMITMENTS

- As required by permitting agencies and where practical, provide fully fish-passable structures at locations where culverts are extended or replaced in fish-bearing streams.
- Stabilize trail shoulders in areas adjacent to streams prior to trail surfacing to prevent erosion and sloughing.
- Avoid allowing silt, asphalt, or concrete to enter stream channels during construction.
- Perform construction activities in or near fish-bearing streams during work windows established in consultation with the regulatory agencies.
- Design stream diversions to minimize sedimentation and ensure the removal of fish. Screen inwater work areas.
- Perform instream work over the shortest period possible.
- Perform routine instream culvert maintenance between June 15 and September 15, unless otherwise authorized by WDFW and the local jurisdiction, to avoid sediment impacts to streams during critical salmonid spawning and incubation periods.
- Mitigate for riparian buffer impacts as required by local jurisdictions.

3.2 POTENTIAL ADDITIONAL MEASURES

- Design stream mitigation and fish passage facilities to target the needs of the specific aquatic species present or potentially present at that site.
- Mitigate for riparian buffer impacts through a combination of onsite and offsite mitigation.

4. WETLANDS AND VEGETATION

The following measures would help minimize impacts to wetlands and vegetation. The measures listed earlier for control of surface runoff and erosion would also minimize wetland impacts.

4.1 MITIGATION COMMITMENTS

- Continue to avoid and minimize wetland and vegetation impacts by reducing trails widths and turning radii for transitions, and shifting alignments to avoid wetlands and buffers.
- Use highly visible temporary construction fencing to delineate wetlands and buffers.
- Preserve and protect native plant species when installing fencing, signage, and other features.
- Update and comply with the project's Vegetation Management Plan regarding management and replacement of vegetation during operation of the trail.
- Compensate for wetland fill impacts as required by the regulatory agencies.

4.2 POTENTIAL ADDITIONAL MEASURES

- Where impacts to visual and noise buffers (planted hedges) might occur, adjacent landowners could potentially replant similar vegetation as permitted by King County on a case-by case basis.
- Explore the use of wetland mitigation banking to compensate for unavoidable wetland and buffer impacts.

5. WILDLIFE

The following measures would help minimize impacts to wildlife.

5.1 MITIGATION COMMITMENTS

- Avoid loud construction noises (i.e., pile driving and asphalt paving) within 0.25 mile of the Marymoor Park bald eagle nest site during the eagle nesting season (January 1 through August 15).
- Avoid loud construction noises (i.e., pile driving and asphalt paving) within 0.25 mile of the osprey nest site located within a half-mile of the trail alignment during the nesting season (March 15 to August 31), as recommended by WDFW. Avoid other construction activities during the nesting season within 300 feet of the osprey nest site.
- Avoid use of noise-producing equipment where the trail passes near Marymoor Park (where existing human disturbance is less intense than other parts of the project area, and where more sensitive wildlife are present) during the early part of the nesting season (February to May).
- Consult with the U.S. Fish and Wildlife Service through the Endangered Species Act, Section 7 consultation process regarding finalized bald eagle protection measures.

5.2 POTENTIAL ADDITIONAL MEASURES

- Consider the use of alternatives to chain-link fencing in order to maintain existing wildlife passage while still discouraging human passage and minimizing visual impacts.
- To ensure protection of the bald eagle nest in Marymoor Park, plant cedar trees or other native evergreen vegetation to create a year-round screen between the nest site and the trail. Deciduous trees currently serve as a screen during the growing season.

6. TRAIL SAFETY, FENCING, AND SIGNAGE

The following measures would benefit wildlife, wetlands, streams and fish, adjacent property owners, and the safety of trail users:

6.1 MITIGATION COMMITMENTS

- Install fencing and signs adjacent to sensitive areas (wetlands and streams).
- Fence or screen stream crossings to protect fish from human disturbance and to maintain riparian vegetation. Prohibit entry of trail users to streambanks and stream channels. Leashes would be required to prevent dogs from entering streams and harassing fish. Appropriate signs would be placed at stream crossings to explain the reasons for restrictions.
- Install signage indicating limits of the trail right of way, trail etiquette, warnings to trail users to be aware of residents and pets crossing the corridor, and yield protocols.
- Provide signage at critical intersections, including Waverly Shores Private Boat Launch at 33rd Street, warning trail users that they are approaching a dangerous intersection.
- Design the trail to meet applicable accessibility guidelines, including grade requirements and current design standards for curves and sight distance, based on a design speed for the fastest users, cyclists.
- Install a 5-foot chain-link or split-rail fence in areas where the trail poses potential safety hazards such as falling off a retaining wall or down a slope.
- Along areas of the trail adjacent to roads, residential driveways, or parking areas, install a guardrail or approved equivalent to separate the trail from areas used by vehicles (except on a case-by-case basis where line of sight distance would be impaired).
- Trim and remove vegetation and/or revegetate with suitable plants adjacent to the trail where necessary in order to maintain sight distances on the approaches to an intersection and to maintain vertical and horizontal clearances from the trail for the safety of trail users.
- Limit trail use to daylight hours for safety.
- King County regulates trails as linear parks. Trails are subject to usage restrictions per King County Rule for Use of Facilities (King County Code Section 7.12.480) and local leash laws (Issaquah Municipal Code 6.08.020, Sammamish Municipal Code 11.05.010, Redmond Municipal Code 7.04.200).
- Provide maps of all trail access points and master keys to locked bollards to all emergency service agencies serving the corridor.
- Provide trail planting strip barriers per AASHTO recommendations.
- Provide sidewalks and crosswalks at many of the public access locations in order to provide for public safety.
- Limit speed for bicyclists per King County's Trail Use Ordinance 8518, which establishes a speed limit of 15 mph for all trails.

- Notify adjacent property owners of the construction schedule.

6.2 POTENTIAL ADDITIONAL MEASURES

- Implement trail patrols by volunteer trail ranger programs.

7. TRAFFIC/PARKING

In addition to the signage measures described above, the following measures would minimize traffic and parking impacts during construction and operation.

7.1 MITIGATION COMMITMENTS

- Implement standard construction measures such as installation of advanced warning signs, highly visible construction barriers, and the use of flaggers.
- Provide alternate access and/or parking in individual cases where driveway access cannot be maintained during construction.
- Signs would be appropriately placed to prevent trail users from parking in private or restricted parking lots located near the trail access points.
- Bollards would be installed at trail/roadway crossings for all Build Alternatives. Informational and regulatory signs would also be installed at all such crossings for trail users and road-based vehicles.
- Guardrails would be used to delineate the trail edge where the trail surface is contiguous with driveways.

7.2 POTENTIAL ADDITIONAL MEASURES

- Institute a public information program regarding hours of construction or parking impacts.
- A residential parking zone (RPZ) permit system could be considered by the City of Sammamish on East Lake Sammamish Place to prohibit parking by trail users.
- Establish shared parking with local businesses for evening and weekend parking use.

8. VIEWS

In addition to the vegetation management measures described above, the following measures would minimize impacts to views along the trail corridor:

8.1 MITIGATION COMMITMENTS

- Use funds from the 1 percent art tax to develop and construct art or interpretive elements at sensitive locations such as gates, transition nodes or entrances, and at special environmental or natural features.

8.2 POTENTIAL ADDITIONAL MEASURES

- Reinstall landscaping where possible to provide visual screens and/or restore trail edge plantings.
- Choose retaining wall materials that are appropriate to the particular location.

9. NEIGHBORHOOD CONCERNS

In addition to the fencing/signage, safety, and traffic/parking measures discussed above, the following measures would help minimize impacts on nearby neighborhoods and businesses during construction and operation of the trail.

9.1 MITIGATION COMMITMENTS

- Notify businesses and residents of the construction schedule.
- Maintain access to residential areas and commercial businesses in the vicinity of the corridor during construction**.**
- In cases where existing trails leading from East Lake Sammamish Parkway to private beaches, private beach clubs, or community beaches cross over the former railbed, work with beach clubs and community groups during detailed design to assess the requirements for access across the trail.
- Coordinately closely with utility providers and property owners to identify and physically locate utilities prior to the initiation of any construction activity. Notify property owners in advance of breaks in service to affected utilities.
- Comply with local regulations regarding construction noise.
- Require construction contractors to take measures to reduce construction noise (e.g., turning off idling equipment, using proper mufflers on equipment, locating equipment and staging areas far from residences, using portable noise barriers).
- Provide litter receptacles, doggy litter bag boxes, and trail etiquette signs at public access points.
- Conduct a fair market value real estate assessment for any properties that need to be acquired associated with the East Alternatives.

9.2 POTENTIAL ADDITIONAL MEASURES

- Implement roadway modifications, including such items as eliminating parking, conversion to a one-way street, elimination of a center turn lane or median, roadway shifting, and use of a barrier, to minimize property acquisition impacts associated with the East Alternatives.

10. CULTURAL RESOURCES

The following measures would minimize impacts to cultural resources.

10.1 MITIGATION COMMITMENTS

- Cultural resources training would be conducted with all construction crews, field supervisors, and inspectors prior to beginning construction.
- Contracts for construction would include clauses addressing cultural resource discovery to encourage reports of discoveries without penalty.
- If cultural resources are identified during construction activities for any of the alternatives, work will halt in the immediate area and the appropriate city or county department, King County Historic Preservation Program, and the Washington State Office of Archaeology and Historic Preservation will be contacted.

10.2 POTENTIAL ADDITIONAL MEASURES

- Archaeological surveys would be conducted prior to any construction activity at the parking and restroom facilities.
- An archaeologist would review locations for proposed retaining wall construction, proposed stormwater management facilities, and proposed access areas to determine what mitigation measures are warranted. Any construction excavation into native soils would likely require additional archaeological fieldwork.
- An archaeologist would be consulted to monitor culvert maintenance excavation in native soils, in addition to the placement of signs, fences, and bollards outside of the existing railbed, to avoid disturbing buried cultural deposits in native soils. Tribal representatives may also request to be present during such excavations.

Appendix B – Geology Technical Report

East Lake Sammamish Master Plan Trail Geology Technical Report

Prepared for

King County Facilities Management Division

Prepared by

HWA GeoSciences, Inc.
19730 - 64th Ave. W, Suite 200
Lynnwood, WA 98036-5957

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1. INTRODUCTION

This report summarizes existing geology for the East Lake Sammamish Master Plan Trail project area, documents methodology and assumptions, and estimates potential geology impacts for each alternative. This report also provides a summary of proposed measures to mitigate potential geology impacts. In addition, compliance with relevant plans and policies is summarized.

1.1 STUDIES AND COORDINATION

The results of this report are based upon field reconnaissance by geologists and engineers from HWA GeoSciences, a review of existing geotechnical borehole logs, and a review of published sensitive area maps and published surficial geology maps. The field reconnaissance included walking the alternative alignments for the proposed trail to evaluate soil exposures, slopes, seepage zones, evidence of mass wasting, and other geologic conditions that may impact the project.

The field reconnaissance was performed in January and February 2000 for the Phase I Interim Use Trail EIS; in April and May 2001 to identify pre-design geotechnical issues; and in December 2003 and January 2004 for the current study. Field observations and interpretations from all three study periods are incorporated in the Master Plan EIS.

The literature review included both in-house project files and outside sources. Outside sources of information included U.S. Geological Survey maps; geologic maps from the Washington Department of Natural Resources Division of Geology; Soil Survey of King County; borehole logs from the Seattle-Area Geologic Mapping Project; Sensitive Areas Maps from King County, City of Redmond, City of Sammamish, and City of Issaquah; the on-line Department of Ecology well records; and others. All sources of information referred to within this report are listed in the references (Section 6).

1.2 RESOURCE MAPPING

A map of surficial (surface) geology was imported from 2000 King County GIS information and overlaid onto maps of the proposed trail. In addition, the boundaries and types of geologic hazard areas were derived directly from GIS data obtained from King County and georeferenced into the maps of the trail. Issues associated with differences in scale between the County maps and maps of the proposed trail are discussed further under Sections 3.1.1 and 3.3 of this technical report.

2. PERMITS AND APPROVALS

This section summarizes the applicable regulations and the associated permits and approval processes for the Master Plan Trail relating to geological hazards and resources.

Washington State's Growth Management Act (Chapter 36.70A RCW) requires all cities and counties to identify critical areas within their jurisdictions and to formulate development regulations for their protection. Among the critical areas designated by the Growth Management Act are geologically hazardous areas. The Cities of Issaquah, Sammamish, and Redmond, along with King County, have each developed geologically hazardous areas maps or folios. Before development is allowed in these mapped critical areas, detailed geotechnical studies must be prepared to discuss specific standards relating to site geology and soils, seismic hazards, and facility design. Geologic hazards are discussed further in Section 3.3 of this technical report.

3. AFFECTED ENVIRONMENT

3.1 TOPOGRAPHY AND GEOLOGY

The project study area is herein defined as the area between East Lake Sammamish Parkway and the eastern shoreline of Lake Sammamish. On a broader scale, this area is located in the central portion of the Puget Lowland, a north-south depression situated between the Olympic Mountains and the Cascade Range in western Washington. Truncating the Puget Lowland from the Cascade foothills to the eastern edge of the Olympics is the Seattle Fault (see Section 3.3.1 of this report). The continental crust south of the fault is being thrust northward, causing uplift, which has resulted in the series of bedrock hills south of the project area, from Tiger Mountain to the Newcastle Hills.

The topography in the vicinity of the project area is dominated by a series of north-south trending elongate ridges and drift uplands. The uplands are separated by large troughs excavated by glacial processes during the Pleistocene Epoch. These troughs are now occupied by tidal waters, large lakes, or river valleys such as Puget Sound, Hood Canal, Lake Washington, Lake Sammamish, and the other large water bodies of western Washington (Liesch et al., 1963; Mullineaux et al., 1965; Booth, 1987).

The geology of the Puget Sound region includes a thick sequence of glacial and non-glacial soils overlying bedrock. Glacial deposits were formed by ice originating in the mountains of British Columbia (the Cordilleran ice sheet) and from alpine glaciers that descended from the Olympic and Cascade Mountains. These ice sheets invaded the Puget Lowland at least six times during the early to late Pleistocene Epoch, approximately 2 million to 10,000 years before present (Booth et al., in press). The southern extent of these glacial advances was near Olympia, Washington. During periods between these glacial advances and after the last glaciation, portions of the Puget Lowland filled with alluvial sediments deposited by rivers draining the western slopes of the Cascades and the eastern slopes of the Olympics.

The most recent glacial advance, the Fraser Glaciation, included the Vashon Stade, during which the Puget Lobe of the Cordilleran ice sheet advanced and retreated through the Puget Sound basin. Radiocarbon dates indicate that the Vashon ice sheet occupied the Puget Sound area about 15,000 years ago and retreated to the north approximately 13,000 years ago (Thorson, 1981). Existing topography, surficial geology and hydrogeology in the project area were heavily influenced by the advance and retreat of the Vashon ice sheet.

The topography in the vicinity of the Build Alternatives is shown on the Plan Sheets in Volume II. The topography and existing features shown on the figures were derived from an aerial photogrammetric survey conducted by King County in 1999. The proposed trail is located along the eastern slope of the glacial trough now occupied by Lake Sammamish. The top of the slope ranges generally from 300 to 500 feet in elevation. The Sammamish Plateau forms a broad upland to the east of the slope.

3.1.1 Surficial Geology

In general, the surficial geology in the study area consists of dense to very dense, glacially consolidated deposits forming the slopes, with loose to medium dense deposits derived from post-glacial erosion and landsliding forming the low areas. The Interim Use Trail, East Lake Sammamish Parkway, and East Lake Sammamish Place are built on cuts into the dense soils and fills built over dense soils, as well as over loose alluvial soils. Previous borings indicate the potential for peat deposits to exist under recent fill soils in the valleys and lowlands.

Surficial geology in the study area is shown on the maps in the Interim Use Trail EIS and is derived from Minard and Booth (1988) and Booth and Minard (1992).

The boundaries of the geologic units shown on the attachments referenced in this technical report do not always match the surficial geology observed in the field. This is because the surficial geology map was imported from the 2000 King County GIS CD, which was created from existing geologic maps at approximately a 1:24,000 scale (1 inch = 2,000 feet). In contrast, the maps for the Corridor and East Alternatives are at a scale of 1:2,400 (1 inch = 200 feet). Also, not all deposits of a particular type that can be observed are shown on these attachments, for similar reasons. This is most common for landslide deposits (Qls), where most of the historical landslides were too small to map at 1:24,000.

The mapping should be considered general in nature and may not accurately depict the geology at a given location, considering the small scale at which it was mapped and the large scale at which the alternatives are portrayed. Boundaries between geologic units are shown as abrupt and distinct changes; in reality many boundaries are more gradual.

3.1.2 Geologic Units

Various geologic units are encountered along the project corridor and are referred to throughout this document. Very few geologic units have precise boundaries. The geology of an area can change drastically, both horizontally and vertically, within a few feet or, in some instances, can remain fairly consistent for hundreds of feet. The high degree of potential local variability was demonstrated in the published geotechnical borehole logs and water well logs reviewed for this study.

Typical descriptions of the geologic units are presented below, based on the descriptions from the published geologic maps. In general, the geologic units are presented from the most recent deposits to the oldest. Geologic units younger than Vashon-age glacial till have not been overridden by glaciers. The Vashon-age glacial till and the older units have been glacially consolidated and are typically very dense or hard.

3.1.2.1 Modified Land (ml)

The term “modified land” is used to describe surficial geologic conditions that have been modified by human activities such as cutting, filling, grading, leveling, sluicing, shoreline protection, and roadbed or railroad bed construction. Fill material is usually composed of glacial soils or alluvium from various locations and may consist of clay, silt, sand, and/or gravel. Dumped rock, construction debris and boulders may also be present. Locally, some effort at compaction may have been made during placement of these fills, and their relative density varies widely. The engineering properties of fill can be very different from location to location.

3.1.2.2 Landslide Deposits (Qls)

Landslide deposits typically consist of intermixed debris from nearby soil units that has been transported downslope as landslides, slumps, and debris flows. The slides often occur along steep hillsides and along the sides of steep stream gullies, which have eroded headward from shorelines and valleys into the bluffs. Organic material, including logs and tree stumps, is often embedded in slide debris.

3.1.2.3 Mass Wasting Deposits (Qmw)

This map unit is used to indicate areas where deposits from landslides and debris flows have accumulated, forming an indistinct surface morphology such that individual landslide events cannot readily be mapped.

This unit is sometimes referred to as colluvium or landslide debris. This unit is mapped in a large area between Pine Lake Creek (near NE 8th Street) to Louis Thompson Road. According to Booth and Minard (1992), the deposit resulted from sliding and other mass wasting at the contact point (upslope of the deposits) between the free-draining advance outwash (Qva) at the surface and the relatively impermeable silt and clay of the transitional beds underneath (Qtb).

3.1.2.4 "Wetland" Deposits (Qw)

The geologic unit mapped as "wetland" deposits consists predominantly of peat, alluvium, and other past lowland soils, which are poorly drained and intermittently wet. These soils are similar in composition and consistency to the younger alluvium (see below). It should be noted that the term "wetland" deposits is a geologic descriptor; the mapped geologic unit does not necessarily coincide with actual wetlands.

3.1.2.5 Fan Deposits (Qf)

Coarse sand, gravel, and boulders have been deposited in alluvial fans at the outlets of streams emerging from slopes into Lake Sammamish. The deposits are relatively small in extent in comparison to other geologic units, and grade laterally into the younger alluvium (see below).

3.1.2.6 Younger Alluvium (Qyal)

Alluvial sediment has been transported from upland slopes by water in streams, rivers, and creeks and deposited along stream banks and the Lake Sammamish shoreline. The younger alluvium typically consists of silt and fine to medium sand, but the particle size range correlates to the water velocity at the time of deposition. High-velocity streams typically deposit coarse sediment including medium- to coarse-grained sand, gravel, cobbles, and boulders. Low-velocity streams typically deposit fine-grained sediment including silt and fine sand. Organic material, consisting of partially decayed wood and plants, is likely to occur as interbeds or lenses in these alluvial deposits. Wetlands tend to develop on the fine-grained alluvium, whereas the coarse-grained deposits are well drained.

3.1.2.7 Older Alluvium (Qoal)

Older alluvium is similar to younger alluvium, but older alluvium is found at higher elevations and typically forms steeper slopes than younger alluvium. The older alluvium may include lake-bottom sediments that are interbedded with floodplain deposits.

3.1.2.8 Vashon Recessional Outwash (Qvr)

During the last episode of Vashon-era glaciation, meltwater streams emanating from retreating glaciers deposited sand and gravel. Hummocky, unsorted masses of sand and gravel were deposited at the glacial ice margins as the ice melted. These stratified or unsorted sand and gravel deposits are termed recessional outwash. This unit has not been overridden by glacial ice and is usually medium dense, ranging in composition from silty fine sand to clean coarse gravel with occasional cobbles and boulders. The unit is typically porous and well drained but may become saturated with water if it lies over sediments with low permeability. The recessional outwash may be a source of spring water discharge or domestic water supply (Turney et al., 1995).

3.1.2.9 Vashon Ice-Contact Deposits (Qvi)

This unit consists of sand, gravel, silt, and clay deposited in water close to melting glacial ice. It is therefore a stratified deposit, containing minor inclusions of till (described below). Ice-contact deposits contain more silt than Vashon recessional outwash, and because the ice-contact deposits formed over or adjacent to melted-out and collapsing ice they are locally steeply bedded.

3.1.2.10 Vashon Glacial Till (Qvt)

Glacial till typically consists of a heterogeneous mix of gravelly sand with scattered cobbles and boulders in a clay/silt matrix deposited beneath glacial ice. This very dense unit is locally referred to as “hardpan.” The predominant glacial till encountered in the area is of Vashon age. Glacial till typically exhibits high shear strength and low compressibility. Glacial till is generally considered the most competent bearing soil in the area, aside from bedrock. Temporary excavations in glacial till will generally stand near vertical for tens of feet high until weathering causes the face to slough. Excavation can be difficult because the till is so compact. Competent sections of till form steep slopes above the lake shoreline, and wetlands typically form on top of flat-lying till with low permeability.

3.1.2.11 Vashon Advance Outwash (Qva)

Meltwater streams emanating from advancing glaciers deposited stratified glacial advance outwash, which may resemble recessional outwash. Advance outwash was overridden by glaciers and typically consists of dense to very dense fine sand to coarse gravel with cobbles and occasional boulders. This unit is regionally important as an aquifer. Where underlain by low-permeability sediment, the unit may discharge spring water from surface outcrops.

3.1.2.12 Transitional Beds (Qtb)

Underlying the advance outwash, the glacial and non-glacial deposits known as transitional beds consist of silt and very fine-grained massive sand in the upper portion. The lower portion consists of laminated, thin to thick-bedded clay and silty clay. Most of these fine-grained soils were deposited in glacial meltwater lakes and were subsequently covered with granular advance outwash before being overridden and densely consolidated by the ice. Locally this unit may be distorted or sheared, thereby having a lower mass strength than the surrounding soil. Undisturbed sections of compacted silt may form relatively steep slopes above the shoreline.

3.1.2.13 Olympia Beds (Qob)

Olympia beds consist of lightly to moderately oxidized sand and gravel beds with some silt that is interpreted to be non-glacial alluvium. This unit is exposed at the north end of the Lake Sammamish shoreline and typically underlies the transitional beds, or the advance outwash where the transitional beds are locally absent.

3.1.2.14 Blakely Formation Bedrock (Tb)

This unit consists of medium to coarse-grained sandstone and conglomerate with some siltstone. Outcrops of this bedrock are generally moderately to highly weathered. Exposures are present in the slope east of Lake Sammamish State Park. Two large landslide areas (Qls) have been mapped within the area mapped as Blakely Formation.

3.2 GROUNDWATER

No groundwater supply wells have been installed within 0.25 mile of the northern portion of the corridor (Ecology, 2003; Turney et al., 1995), which is within the alluvial plain at the north end of Lake

Sammamish, roughly within Redmond city limits. Several groundwater supply wells are located within 0.25 mile of the southern portion of the corridor, which is within the alluvial plain at the south end of Lake Sammamish, south of the Sammamish city limits, within Issaquah and unincorporated land. These wells were completed at depths ranging from 50 to 250 feet below the ground surface. The rate of groundwater pumping from these wells for domestic supply is unknown. Water levels in the wells rise nearly to the surface. Thick layers of low-permeability silt and clay between the ground surface and the well screen restrict downward infiltration of water to the deeper aquifers. This hydraulic separation between the shallow alluvium and the deeper aquifer, as well as the upward pressure of groundwater in the deeper aquifer, indicate that surface activities related to the trail will have negligible effect on deeper groundwater supplies.

Groundwater is also present in the alluvium within the shoreline of Lake Sammamish. Groundwater in shoreline alluvium generally occurs at depths less than 10 feet and is hydraulically connected to adjacent streams or the lake. Surface water infiltrates into the alluvium and discharges as groundwater directly toward Lake Sammamish.

Several groundwater supply wells are located within 0.25 mile of the middle portion of the project corridor (Ecology, 2003; Turney et al., 1995), which is at the toe of the hillsides sloping down from the Sammamish Plateau and coincident with Sammamish city limits. These wells were completed at depths ranging from 50 to 250 feet below the ground surface. The rate of groundwater pumping from these wells for domestic supply is unknown. As in the southern portion of the project corridor, water levels in the wells rise nearly to the surface, or at least to the elevation of Lake Sammamish. Thick layers of low-permeability silt and clay separate the alluvium from coarse-grained deeper aquifers.

3.3 GEOLOGIC HAZARDS

Washington State's Growth Management Act (Chapter 36.70A RCW) requires all cities and counties to identify critical areas within their jurisdictions and to formulate development regulations for their protection. Among the critical areas designated by the Growth Management Act are geologically hazardous areas, which are defined as areas that because of their susceptibility to erosion, sliding, earthquake, or other geologic events are not suited for development consistent with public health and safety concerns. Geologically hazardous areas discussed in this report include seismic hazards, steep slopes, landslide hazard areas, erosion hazards, and coal mines.

The Cities of Issaquah, Sammamish, and Redmond, along with King County, have each developed geologically hazardous areas maps or folios (see Section 6 of this report for reference information for these maps). In general, before development is allowed in these mapped critical areas, detailed geotechnical studies must be prepared to discuss specific standards relating to site geology and soils, seismic hazards, and facility design.

The approximate locations of mapped geologic hazard areas with respect to the corridor were presented in the NEPA Environmental Assessment for the Interim Use Trail and Resource Protection Plan (May, 2002). The boundaries and types of geologic hazard areas were derived directly from GIS data obtained from King County and georeferenced into the maps of the alternatives. The hazard areas were originally mapped at a scale of 1:24,000, and therefore the boundaries often do not match with the topography shown at a scale of 1:1,200 on the alternative maps (e.g., the seismic hazard shoreline boundaries do not match the topographic mapping).

3.3.1 Seismic Hazards

3.3.1.1 Puget Sound Region Earthquakes

Seismic hazard areas are generally defined as those areas subject to severe risk of earthquake damage as a result of seismically induced ground shaking, ground settlement, or soil liquefaction. The project area, along with the entire Puget Sound region, is susceptible to moderately high seismic activity. Consequently, moderate to high levels of shaking should be anticipated during the design life of the proposed project. Seismic coefficients necessary for project design will be obtained from the most updated International Building Code prior to final trail design.

Earthquakes in Western Washington occur in three distinct settings: shallow, crustal earthquakes that occur in the North American plate; deep, Wadati-Benioff zone earthquakes within the subducted oceanic crust (Juan de Fuca plate); and offshore, subduction zone earthquakes. Since the 1850s, over 25 earthquakes of Magnitude 5.0 or greater have occurred in the Puget Sound region. Historical earthquake damage in the Puget Sound region has resulted only from Wadati-Benioff zone earthquakes, with the 1949, 1965, and 2001 events creating the most damage. The February 28, 2001 Nisqually earthquake (Magnitude 6.8) resulted in lateral spreading of the railbed shoulder at one location and of East Lake Sammamish Parkway at two locations. Liquefaction during that earthquake resulted in sand boils near the mouth of Issaquah Creek in Lake Sammamish State Park (Creager et al., 2001).

In addition to the recorded historic earthquakes, paleoseismic evidence suggests that a major earthquake (Magnitude 7) occurred about 1,100 years ago on the Seattle Fault, which has been mapped east-west through the project corridor at Monohan, and through downtown Seattle and westward across Bainbridge Island (Bucknam et al., 1992; Johnson et al., 1994). The Seattle Fault is a south-dipping reverse fault, which forms the leading edge of the Seattle uplift, a 40-kilometer-wide fold-and-thrust belt (Brocher et al., in press). Recent research indicates that the Seattle Fault is probably the highest hazard for the Seattle metropolitan area of the three types of earthquake sources (Frankel et al., 1996). A major earthquake along the Seattle Fault could rupture the ground surface, either at an existing limb of the fault or an entirely new one, resulting in a scarp up to several feet high.

Geologic and geophysical evidence also indicates that large subduction zone earthquakes (Magnitude 8 to 9) can occur along the Washington and Oregon coast. The paleoseismic record suggests five or six subduction zone events have occurred over the last 3,500 years (Atwater, 1987). Tree ring data and Japanese historical records date the latest subduction zone earthquake to 1700 (Yamaguchi et al., 1997). Although horizontal and vertical accelerations in the project vicinity are not expected to be as large for a subduction zone quake as for a Seattle Fault quake, the duration of shaking for a subduction zone quake could be several minutes.

3.3.1.2 Liquefaction

When shaken by an earthquake, certain soils lose strength and temporarily behave as if they were liquid. This phenomenon is known as liquefaction. The seismically induced loss of strength can result in failure of the ground surface, which is typically expressed as lateral spreads, surface cracks, and settlement. A structure can sustain substantial damage during a large seismic event if it is supported in or on a soil susceptible to liquefaction. Seismically induced liquefaction typically occurs in loose, saturated, sandy material commonly associated with recent river, lake, and beach sedimentation. In addition, seismically induced liquefaction can be associated with areas of loose saturated fill.

Large portions of the north and south ends of the project corridor, where the corridor is located on alluvial plains, are potentially liquefiable during a seismic event. Other liquefaction-prone areas include old beach deposits along the eastern lakeshore and localized stream alluvium. Possible effects of liquefaction include settlement and cracking of the Interim Use Trail and road embankments. Portions of the proposed trail located along hillsides may be susceptible to seismically induced lateral spreading of embankment fills and any loose native soils. The 2001 Nisqually Magnitude 6.8 earthquake (a Benioff-zone earthquake) caused settlement of embankment fill along the Parkway in a couple of locations (STA_{COR} 216+75 to 218, and STA_{EAST} 363 to 365) and at one location along the railbed (STA_{COR} 548+50 to 550, eastern side). The Parkway failure at STA_{COR} 216+60 to 218 resulted in settlement of the southbound lane and shoulder.

3.3.2 Steep Slope and Landslide Hazard Areas

Steep slope areas are generally defined as those that rise at an inclination of 40 percent or more with a vertical change in elevation of at least 10 feet. There are many areas of mapped steep slopes along the proposed trail corridor, but most of the larger areas of mapped hazards are to the east of East Lake Sammamish Parkway. Smaller areas of steep slopes and landslide hazard are mapped between East Lake Sammamish Parkway and Lake Sammamish. Many sections of slopes that have been cut for railbed and roadway construction meet the criteria for steep slopes but are too small for mapping at the scale of the sensitive areas maps.

Generally, landslide hazard areas can be defined as follows:

- Any area with a combination of:
  - Slopes greater than 15%;
  - Impermeable soils (typically silt and clay) frequently interbedded with granular soils (predominately sand and gravel); and
  - Springs or groundwater seepage.
- Any area which has shown movement during the Holocene Epoch (from 10,000 years ago to present) or is underlain by mass wastage debris of that epoch.
- Any area subject to instability as a result of rapid stream erosion, stream bank erosion, or undercutting by wave action.
- Any area that shows evidence of, or is at risk from, snow avalanches.
- Any area located on an alluvial fan that is presently subject to, or potentially subject to, inundation by debris flows or deposition of stream transported sediments.

Areas of known landslides are included in the mapped landslide hazard areas. Some of these areas have a history of repeated landsliding while others do not. Frequently, these areas of repeat landsliding are located within areas mapped as steep slope hazard areas. Landslide deposits and landslide scars are indicators of historical or past landslides.

The degree of sloughing and sliding also varies with the steepness and height of the slope. Steeper, higher slopes are more likely to create larger slides, whereas shorter slopes are capable of producing smaller areas of sloughing across the surface.

3.3.3 Erosion Hazards

Erosion hazard areas are defined as those areas containing soils that may experience severe to very severe erosion. Erosion potential along the project corridor varies with surficial geology and soil type, topography, occurrence of groundwater seepage and surface runoff, vegetative cover, and the built environment. Surface and subsurface soils in the plains at the north and south ends of Lake Sammamish consist of alluvium and lake deposits. Soils along hillsides typically consist of overconsolidated glacial deposits, overlain by variable thicknesses of colluvium (slope deposits) and locally by alluvium. The native soils were modified by cut and fill earthwork for construction of the railbed, Parkway, streets, and homes. The greatest erosion potential appears to be along the existing cut and fill slopes of the Interim Use Trail, the Parkway, streets, and driveways.

3.3.4 Coal Mine Hazards

Coal mine hazard areas are those areas over or adjacent to or affected by mine workings such as adits, tunnels, drifts, or air shafts. No mapped coal mine hazards are mapped within 400 feet of the project corridor.

4. IMPACTS AND MITIGATION

This section analyzes the potential impacts of construction, operation, and maintenance of the trail facilities on the geologic environment (e.g., excavation of soils for construction of a trail retaining wall, potential sliding of existing steep slopes onto the trail). Operation impacts to the geologic environment associated with the daily use of the trail are likely to be negligible.

Some degree of mitigation is possible for the identified impacts. However, in some cases, it may not be practical from a construction or financial standpoint to implement certain mitigation alternatives. For example, construction of the project through an area of liquefaction-prone soils can be mitigated by ground improvement, replacement of the susceptible soils, designing for the liquefaction-prone area by constructing on pile-supported foundations or a raft of non-liquefiable material, and/or by planning a maintenance schedule for re-leveling and repair. However, ground improvement and designing for the liquefaction-prone soils would likely be impractical because the implications of failure are relatively minor and the cost of repair would be much less than the cost of initial mitigation. Planned maintenance and repair as necessary may be more appropriate for a trail.

4.1 CORRIDOR AND EAST ALTERNATIVES

This section describes the general impacts and mitigation common to the Corridor Alternative and the East Alternatives, followed by impacts and mitigation specific to various construction techniques that might be used for the proposed trail.

4.1.1 Groundwater

Impacts

Surface activities related to the trail construction or operation may temporarily change the local water flow at culverts or wetlands, but the effect is expected to be minor. These activities would include temporary dewatering of excavations for culvert replacement. Such dewatering would be shallow (typically 10 feet or less) and of limited duration. Thick layers of low-permeability silt and clay separate the alluvium near the surface from coarse-grained deeper aquifers. The intervening low-permeability sediment and the upward vertical gradients (i.e., the upward pressure of groundwater in the deeper aquifer) would reduce potential impacts to groundwater flow or quality due to trail construction or operation.

Mitigation

No mitigation measures are proposed because only shallow groundwater would be impacted, in a minimal manner for short duration.

4.1.2 Geologic Hazards

4.1.2.1 Seismic Hazard Areas

Impacts

Construction or operation of the trail would not affect existing seismic hazard areas; however, use of the trail may be impacted in the event of a seismic event. The entire project study area may be subjected to earthquake shaking and should be considered to have a moderate to high seismic risk. There is also potential for loss of strength, settlement, and lateral displacement of soils supporting the Interim Use Trail and roadways where these are founded in or over liquefiable soils. The magnitude of settlement, soil movement, and loss of strength is a function of the soil thickness, soil quality, groundwater level, location, and magnitude of the seismic event.

The project corridor crosses the Seattle Fault zone and, as such, the risk for liquefaction and lateral spreading occurring anywhere along the project corridor during a large earthquake is high. However, the impacts to the proposed trail are anticipated to be minimal because of the past loading of the alluvial and beach soils beneath the Interim Use Trail and roadways, resulting from the weight of the fill and of the vehicles and the freight traffic on the former railbed. Ramps or transitional sections of the trail connecting the Parkway and the Interim Use Trail that are constructed over liquefiable soils would likely be more susceptible to damage from liquefaction. Rupture of the fault could result in a scarp several feet high across the trail.

Mitigation

Using the appropriate seismic parameters in design can reduce the impact of earthquake shaking on the proposed trail and facilities. Specific areas of liquefiable soils could be identified from the critical areas maps and geotechnical subsurface explorations during the design phase. Damage due to soil liquefaction can be reduced or eliminated by a number of methods. For example, the ground could be improved by densifying or replacing potentially liquefiable materials that may be present beneath the project corridor. However, as stated earlier, the appropriate level of mitigation would likely be to re-level and repair the trail as needed, as occurred along the Parkway after the 2001 Nisqually earthquake.

4.1.2.2 Landsliding and Steep Slopes

Impacts

Construction of the planned retaining walls would involve cutting into steep slopes and filling out onto steep slopes.

There is potential for sliding of existing steep slopes, including natural slopes, cut slopes, and fill slopes. Sliding can be triggered by a seismic event, by the natural process of stabilization of a steep slope to a flatter profile, by an increase in the amount of water in the soil (from excessive rainfall), or by construction that adds fill to, traverses, or cuts into a steep slope. Most cut slopes along the project corridor (road cuts, railroad cuts, driveway cuts, and grading for houses) were observed to be in an oversteepened condition and subject to soil creep. It is evident that shallow landsliding has occurred in the recent past in many locations. Notable landslides include a repaired slide near STA_{EAST} 488+75, of which the headscarp had encroached into the travel lanes of East Lake Sammamish Parkway, and a chronic surficial slide area in the highest railroad cuts at STA_{COR} 332+00.

Mitigation

For existing steep slopes along the project corridor that would not be impacted by construction, little mitigation would be required outside of continued maintenance (e.g., removal of leaning trees, continued clearing of drainage ditches, and cleanup of slide debris as slides occur). In some areas, steepening of the slopes can be accomplished without reducing the stability below normally accepted standards. In other areas requiring cutting or filling, retaining structures would be added to eliminate the possibility of sliding. The potential for instability along slopes impacted by construction would be mitigated by site-specific geotechnical investigation, engineering design, permitting, and construction techniques. Slope instabilities within and in the vicinity of the project corridor could continue along slopes not modified by trail construction, particularly in steep slopes along the fill embankment for East Lake Sammamish

Parkway and in cuts along the Interim Use Trail. Such instabilities would likely be consistent with those observed in recent years, such as surficial slides and pavement distress.

4.1.2.3 Debris Flows

Impacts

Construction or operation of the trail would not affect debris flows; however, use of the trail may be impacted in the event of a debris flow. Debris flows derived from upstream landslides triggered by intense storms could overtop the proposed trail at existing stream culverts, possibly burying the trail and/or scouring it. Streets and driveways could be similarly affected.

Mitigation

Continued maintenance of culverts and cleanup as needed are likely the most practical mitigation measures, as well as enforcement by local jurisdictions of their critical areas ordinances in regard to development of upslope properties.

4.1.2.4 Erosion Hazards

Impacts

Based on information from the King County Soil Survey, the native soils along the project corridor are rated as having slight inherent erosion potential. However, the existing cut slopes along the project corridor are highly prone to erosion. Most of the cut slopes exhibit some degree of soil creep into the road and driveway ditches and ditches along the Interim Use Trail.

Mitigation

Soil that is not disturbed during construction would not need mitigation. During construction, contractors would employ BMPs to control erosion within the construction limits along the project corridor. These BMPs would be consistent with critical area codes and grading regulations of local jurisdictions and would include the following:

- Prepare and implement a Temporary Erosion and Sediment Control Plan.
- Mulch the slopes of ditches with straw or matting to reduce erosion in areas where accumulated sediment is removed.
- Minimize areas of soil exposure.
- Retain vegetation where possible, especially on steeper slopes. Seed or plant appropriate vegetation on exposed areas as soon as work is completed.
- Route surface water through temporary drainage channels around and away from disturbed soils or exposed slopes.
- Use clean soils containing little or no silt and clay as fill to reduce the potential for erosion.
- Use silt fences, temporary sedimentation ponds, or other suitable sedimentation control devices.
- Cover exposed soil stockpiles and exposed slopes with plastic sheeting, as appropriate.
- Use straw mulch and erosion control matting to stabilize graded areas and reduce erosion and runoff impacts to slopes where appropriate.

- Intercept and drain water from any surface seeps if they are encountered.
- Use a truck tire wash to reduce the potential for turbid runoff from roads.
- Incorporate contract provisions allowing temporary cessation of work under certain, limited circumstances, if weather conditions warrant. Some construction activities that are difficult to mitigate through BMPs should be limited to the drier summer months. (See Section 3.5, Fish Resources, for discussion of construction timing requirements related to fisheries.)

4.1.2.5 Coal Mine Hazards

Impacts

Most underground coal mines in the area have been abandoned and can create hazardous conditions. For example, as the roof and sides of an underground mine gradually fail, the area over the mine may subside. More dramatically, a sudden collapse of a shallow mine may occur. Structures located above subsurface mines can be damaged during such events. However, based upon information from the Washington State Department of Natural Resources, no known coal mines are mapped within 400 feet of the project corridor.

Mitigation

The nearest abandoned coal mine workings are mapped at the present Lakeside Industries gravel pit, which is approximately 2,000 feet northeast of the trail corridor where it crosses beneath I-90. Because of the distance from the trail, it is unlikely that abandoned mine workings would pose a threat to the trail.

4.1.3 Construction-Period Impacts and Mitigation

The broadly defined task of constructing a new trail or widening an existing corridor can be divided into a number of more specific construction activities. The purpose of this section is to better define the construction activities and accordingly the impacts that could occur during the construction of the trail. This section includes descriptions of activities (specifically wall types) that may not be applicable to all alternatives.

Construction of the Corridor or East Alternatives would involve similar general construction activities. The primary difference would be in the magnitude of these activities (for example, the length, height and type of retaining walls needed).

4.1.3.1 Soil Disturbance

Impacts

Construction of the trail could result in erosion associated with vegetation removal, culvert replacement, excavation (including over-excavation), fill placement, and spoils removal or stockpiling. Erosion could in turn lead to silt-laden runoff being transported off-site, resulting in water quality degradation of local surface waters. This is especially critical where ditches parallel the project corridor (for example, from the entrance to Lake Sammamish State Park in Issaquah north along the Interim Use Trail). Truck traffic could also track mud into the streets. The severity of potential erosion would be a function of the quantity of vegetation removed, construction site topography, weather during certain construction activities, and volume of soils stockpiled.

Mitigation

BMPs would be implemented during earthwork activities to reduce the amount of silt-laden runoff leaving the construction sites. Clean soils containing little or no silt and clay would be used as fill to help reduce the potential for erosion. For areas where ditches parallel the construction site, temporary culverts or temporary bypasses would be used to isolate the ditch from the exposed sediment. A truck tire wash would be located at construction sites. Some construction activities that are difficult to mitigate through BMPs should be limited to the drier summer months.

4.1.3.2 Construction-Induced Vibrations and Settlement

Impacts

Many construction methods may result in vibrations that could cause settlement or damage to nearby structures, including homes and road embankments. These methods include installation of driven piles, installation of auger cast piles, excavation for wall construction, and compaction of fill.

Mitigation

Mitigation could include a pre-construction and post-construction survey of adjacent critical structures and a monitoring program during construction. Dependent upon the severity of the impacts, additional mitigation could include modifying construction techniques (such as the choice of pile type or installation equipment), underpinning structures, or re-leveling and repair as appropriate. Vibration damage is rarely incurred by adjacent structures that are of newer construction during these types of wall construction activities. See Section 4.1.3.5 for further discussion of vibration impacts and mitigation related to retaining wall construction.

4.1.3.3 Disposal of Construction Spoils

Impacts

Construction would generate relatively large volumes of spoils that would need to be disposed. Spoils disposal could result in transportation of soil, dust, and mud off-site through erosion or by being tracked off-site by truck tires. Erosion was discussed in the previous section on soil disturbance. Impacts due to increased truck traffic are addressed in Section 3.11, Transportation, in Chapter 3 of the EIS. Private drives used as haul roads would likely experience pavement damage and possibly settlement due to the heavy loading of construction traffic.

Mitigation

Disposal of the spoils would depend upon whether they are clean or contaminated, the type of soil (coarse-grained or fine-grained), the moisture content of the soil, regional demand for fill soils at the time the project is undertaken, availability of disposal sites, and other factors. Site-specific analysis, construction planning and sequencing, and an economic evaluation would be undertaken to determine the appropriate disposal method prior to construction. Damage to private drives from construction traffic could be mitigated by repair or replacement of pavement, and regrading as needed, after trail construction.

4.1.3.4 Excavation and Filling

Impacts

Excavation and filling would be needed to grade and widen areas in order to accommodate width of the trail. This could involve creation of soil stockpiles, transportation of excavated material to a stockpile or an off-site location, and filling of a disposal site should excavated soils need to be disposed.

Mitigation

Mitigation would include implementation of BMPs, specifically installing erosion protection and following the Temporary Erosion and Sedimentation Control Plan for the project. Other mitigation would include limiting times of hauling and reusing excavated soil elsewhere along the project corridor as appropriate.

4.1.3.5 Construction of Retaining Walls

Introduction

Under the Corridor or East Alternatives, retaining walls would be needed along many of the locations where cuts or fills would be made along existing slopes. Walls would be used to reduce the widths of cuts and fills, in order to minimize encroachment upon existing features such as houses, roads, driveways, and wetlands. The impacts would include construction of the walls, maintenance of the walls, a potential for slope instability, and changed drainage courses. The slope stability and drainage issues can be designed for and thus completely mitigated at wall locations. The relative magnitude of the remaining impacts would depend on wall type, wall location (construction access, potential over-excavation requirements, and surrounding conditions), wall height, and wall length. Tables B-1 and B-2 at the end of this section summarize the proposed stationing where walls would be required, the length of the wall, the area of wall face (average height times the length), and the most appropriate wall types for the conditions at that location.

There are numerous types of walls, each with its own advantages and disadvantages, depending on engineering considerations such as retained earth properties, foundation conditions, height, and construction access. Other influences such as property ownership, cost, and aesthetics are also factors. The following sections briefly describe the impacts of each category of wall that could be appropriate for use on this project.

Impacts of Constructing Walls Used to Retain Cut Slopes

Potential types of walls that could be used to retain cut slopes along the project corridor include:

- soldier pile and lagging walls,
- tie-back walls,
- soil nail walls, and
- gravity walls.

Although constructing any of these types of walls would require removing soil from the site, each of these walls has different construction needs and techniques and thus different impacts. Construction activities required to install each wall type are discussed below.

Soldier pile and lagging wall. Soldier pile and lagging walls are constructed by installing vertical soldier piles and then placing lagging to hold back the soil (see Diagram B-1). These walls derive their support from lateral pressure on the soldier piles below the front of the wall. They are particularly appropriate where there is limited area for structure behind the wall and the foundation conditions are good. They can be constructed from either the top or bottom of the wall so that the disturbance on the other side can be minimized.

The soldier piles are usually either driven or auger-cast piles placed on 4- to 8-foot spacing. Driven piles can be either H-piles or sheet piles depending upon wall height, retained soil, and back slope inclination. Driven piles can create construction vibrations and possibly settlement near the pile. Auger-cast piles are pre-drilled. The hole may be cased with the auger or a steel pipe or filled with drilling fluid. Drilling fluid is usually a naturally occurring bentonite clay-based mud. Steel, usually an H-pile, is placed in the augured hole and structural concrete is tremied down, as the casing is lifted or displacing the drill fluid. If drilling mud is used, there is a discharge of bentonite mud in a contained area on the ground surface.

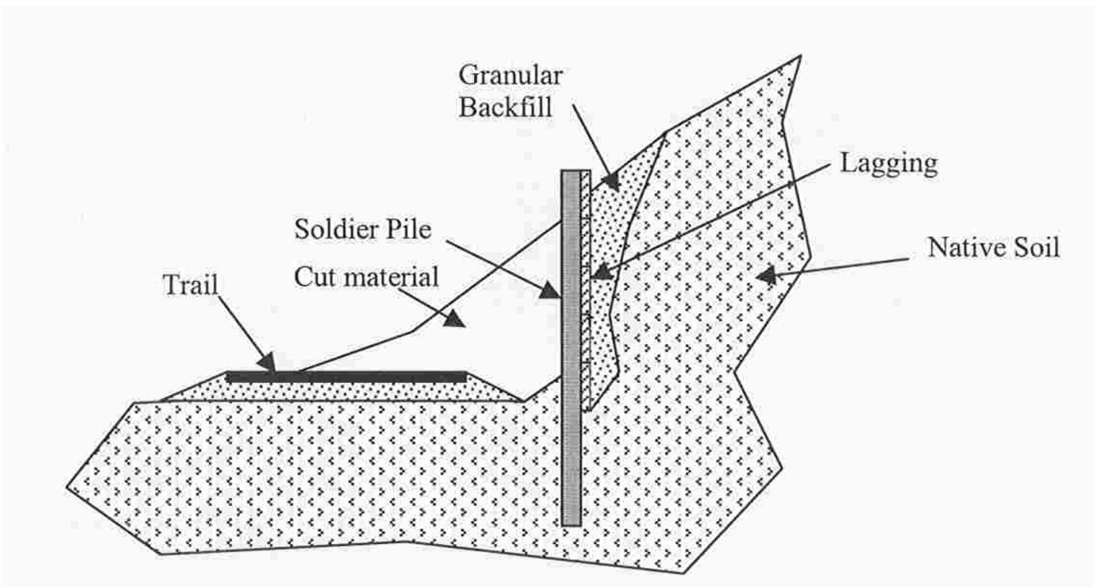

Diagram B-1. Conceptual Illustration of Soldier Pile and Lagging Wall

After the piles are installed, the soil between the piles is removed and replaced with lagging. The lagging is generally either treated wood or pre-cast concrete. The small area left between the lagging and the native soil is then backfilled with a granular material such as pea gravel.

Possible impacts can include vibrations associated with pile driving, settlement from the vibrations, typical construction impacts from stockpiling and transporting soil, and potential erosion of soil from the cut face prior to placement of lagging.

Tie-back wall. Tie-back walls are constructed similarly to cantilever walls with the exception that anchors are installed through the face into the soil behind to hold the wall (see Diagram B-2). The addition of the anchor involves drilling holes at a downward angle of about 15 to 25 degrees, installing a steel tendon, grouting an anchor, and backfilling the rest of the hole. The anchor rod is put into tension against a wailer that spans the front of the wall.

Impacts from this method include those associated with soldier pile and lagging walls and additional potential impacts to utilities from tie-back installation. Property ownership and the ability to obtain easements in the tie-back area are frequently issues.

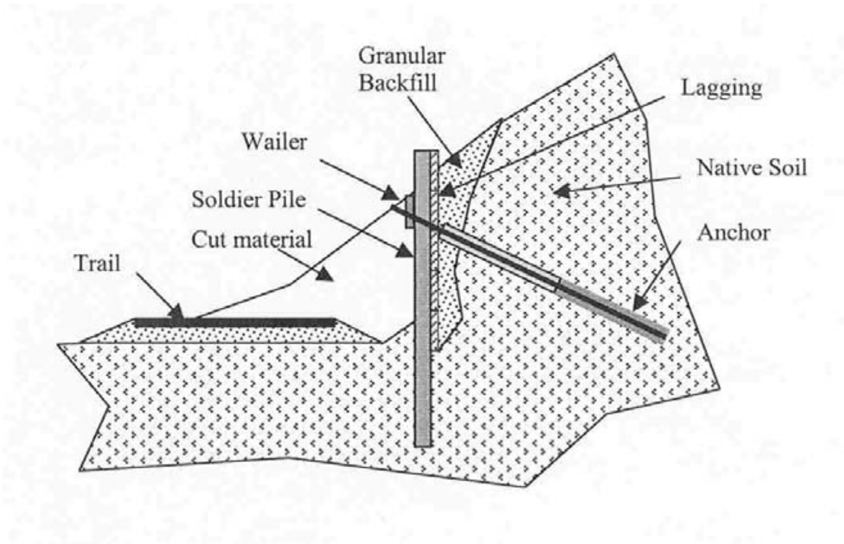

Diagram B-2. Conceptual Illustration of Tie-Back Wall

Soil nail wall. Soil nails are similar to the anchors in the tie-back wall except there are more of them, they are shorter, and they are fully grouted with high-strength grout. The soil is excavated in short lifts, and as each lift is excavated, soil nails are installed (see Diagram B-3). A drainage mat and a reinforcing grid are placed against the soil face, and a shotcrete facing is applied. Soil nailing is particularly appropriate when excavation is in very dense soils.

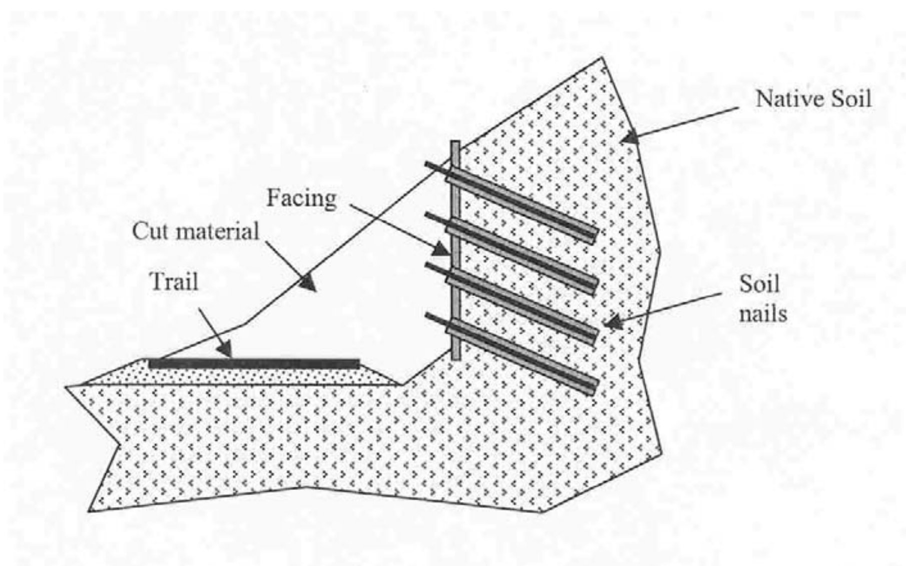

Diagram B-3. Conceptual Illustration of Soil Nail Wall

Impacts can include general earthwork impacts and impacts from the installation of nails on utilities and property boundaries.

Gravity walls. There are many readily available alternatives for gravity walls. Some of the more common types include filled units such as gabion baskets, segmental concrete units such as Ultra-block™, Lock-Block™, or ecology blocks and large rocks. These walls are typically excavated in short segments (along the length of the wall) and the units are then placed with compacted backfill behind the wall (see Diagram B-4). This type of wall is particularly well suited to areas with a minimum backslope and space for construction behind the wall. Impacts can include typical earthwork construction impacts, as defined in Sections 4.1.3.1 through 4.1.3.4.

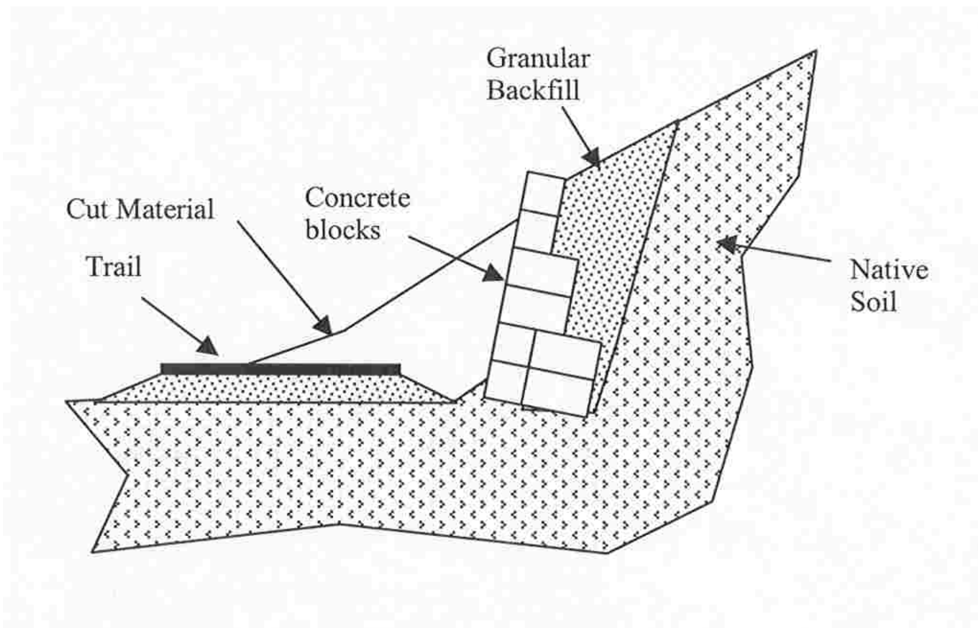

Diagram B-4. Conceptual Illustration of Gravity Wall

Impacts of Constructing Retaining Walls Used to Support Fill

Potential wall types for the fill walls along the trail alignments include:

- soldier pile and lagging walls,
- Mechanically Stabilized Earth (MSE) walls,
- gravity walls, and
- cantilever walls.

Each of these walls requires different construction methods and accordingly has different impacts. Soldier pile and lagging walls and gravity walls were discussed above in the section titled Impacts of Constructing Walls Used to Retain Cut Slopes. Construction activities for MSE and cantilever walls are discussed below.

Mechanically Stabilized Earth walls. MSE walls include any wall that relies upon the interaction between a mechanical device (such as geogrid) and the soil to stabilize the soil and allow it to stand near vertical. A common type of MSE wall is a geogrid reinforced segmented masonry unit (SMU) wall such as Lock-Block™ or Keystone™. The wall site is prepared by clearing and grubbing the wall footprint. If unsuitable soils are exposed at the wall footing, they are removed and replaced with structural fill. Generally the over-excavation is limited to immediately under the footprint of the wall. If the wall footing is in a low-lying area, localized dewatering, typically with sumps and pumps in the excavation, may be required.

One of the requirements for MSE walls is the need for adequate room behind the wall to lay out the reinforcing. For some of the potential wall locations, additional room may need to be created (i.e., soil removed) in order to install the reinforcing. Generally, the reinforcing is tied into the facing units and holds the facing up (see Diagram B-5). The sequence for construction can involve placing the reinforcing, backfilling and compacting a lift of fill, placing another layer of reinforcing, tying it into the facing, backfilling on top of the second layer of reinforcing, and repeating.

MSE walls are particularly well suited for use as high walls where there is a wide bench on which to construct the wall. They will work under some circumstances where the foundation soils are marginal.

Impacts can include erosion of exposed soils and stockpiles, potential slope instability of the slope to receive the fill, disposal of potentially turbid dewatering effluent, and construction vibrations from fill compaction.

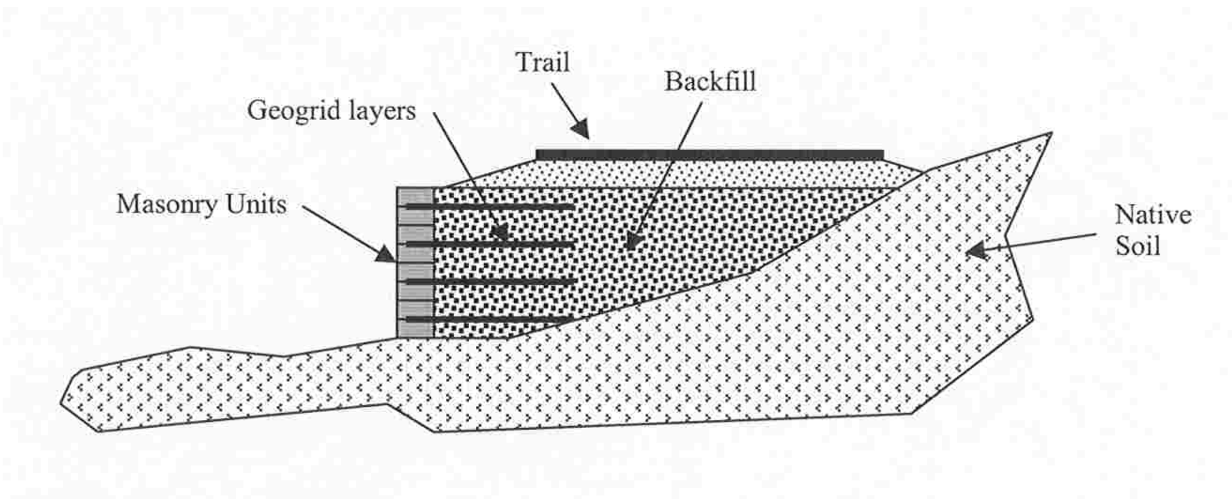

Diagram B-5. Conceptual Illustration of MSE Wall

Cantilever walls. Cantilever walls are constructed by building a concrete structure on a prepared surface and backfilling behind (see Diagram B-6). They are particularly well suited as use for low walls where the foundation conditions are good. Impacts can include erosion of exposed soils and stockpiles, potential slope instability of the slope to receive the fill, and construction vibrations from fill compaction.

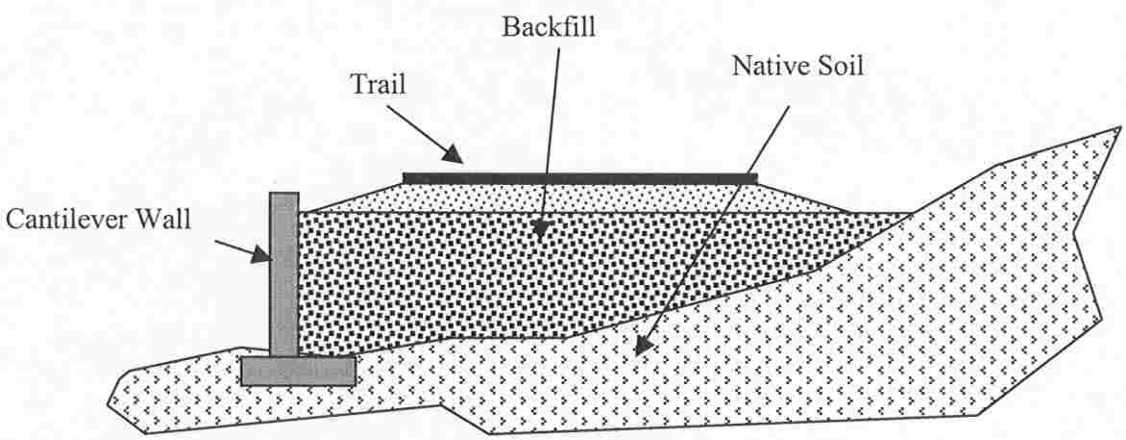

Diagram B-6. Conceptual Illustration of Cantilever Wall

Summary of Wall Types and Potential Mitigation for Retaining Walls

In general, choosing the most appropriate wall type, designing the wall for the conditions (soil, access, and space), taking care during construction, and using BMPs would mitigate most of the impacts discussed above. For example, selection of a wall that can be constructed from the Interim Use Trail or roadway would reduce impacts to sensitive areas, such as wetlands. Some of the impacts would be substantive only in certain areas or at certain times (such as vibrations due to pile driving), whereas other impacts would need mitigation at all times and for all of the Corridor or East Alternatives (such as controlling construction erosion).

Generally all of the erosion impacts that could result from constructing retaining walls can be mitigated by proper use of BMPs. Proper wall design that evaluates both the internal stability of the wall and the overall stability of the slope would mitigate existing slope instability issues at wall locations. For impacts due to potential vibration from pile driving, a pre-and post- construction photo survey of critical areas or structures could be completed. Vibration and noise impacts could be minimized by work hour restrictions, or wall types could be chosen that have small noise impacts when adjacent to acoustically sensitive areas (homes, wildlife, etc). Additionally, vibration monitoring during construction can help demonstrate compliance with permit requirements.

Tables B-1 and B-2 present potential wall types for the Corridor and East Alternatives. Final wall selection would be made during final design. This list is not intended to limit the final design if new technologies become available that reduce wall construction impacts.

Table B-1. Summary of Potential Retaining Wall Types for Corridor Alternative

Station		Length of Wall (feet)	Left / Right	Square Footage of Wall Face (est.)	Possible Wall Types
from	to				
218.60	232.00	1340	Left	3518	MSE or gravity
242.00	255.00	1300	Left	2600	MSE or gravity
242.00	255.00	1300	Right	2600	MSE or gravity
259.50	265.50	600	Left	900	MSE or gravity
282.50	301.00	1850	Left	2467	MSE or gravity
286.50	301.00	1450	Right	677	Cantilever from STA 288 to 301. Gravity from STA 286.5 to 288
308.50	311.20	270	Right	135	Gravity
308.50	311.20	270	Left	1080	Cantilever, gravity or MSE
326.00	330.50	450	Right	1200	MSE or gravity
330.50	333.50	300	Right	675	Cantilever
332.50	334.50	200	Left	200	MSE or gravity
335.75	351.50	1575	Left	3623	MSE or gravity
348.70	351.70	300	Right	300	Cantilever
353.20	359.40	620	Left	930	MSE or gravity
368.25	374.50	625	Left	1563	MSE or gravity
420.80	421.20	40	Left	80	MSE or gravity
429.30	454.00	2470	Left	6175	MSE or gravity
435.20	440.50	530	Right	795	Gravity
447.50	545.00	9750	Right	37781	Cantilever or soil nail
462.50	467.50	500	Left	1000	MSE or gravity
463.50	469.50	600	Right	550	MSE or gravity
479.00	486.00	700	Right	1050	Cantilever
492.50	506.00	1350	Right	11764	Cantilever, possibly needing tiebacks
529.00	537.00	800	Left	2711	MSE or gravity
546.00	582.00	3600	Left	9000	MSE or gravity
546.00	582.00	3600	Right	5400	MSE or gravity
559.50	566.50	700	Right	2538	Cantilever
572.50	590.25	1775	Left	4978	MSE or gravity
597.00	619.50	2250	Left	4500	MSE or gravity

Note: Wall stationing was taken from preliminary plans dated 11/12/03. Wall heights were measured from preliminary profiles and may not reflect the most current plans.

Table B-2. Summary of Potential Retaining Wall Types for East Alternatives

Station		Length of Wall (feet)	Left / Right	Square Footage of Wall Face (est.)	Probable Wall Types
from	to				
219.00	231.00	1200	Left	3920	MSE or gravity
238.00	255.00	1700	Left	8713	MSE or gravity
245.70	255.40	970	Right	1657	MSE or gravity
260.00	266.00	600	Left	1050	MSE or gravity
287.00	300.00	1300	Left	8947	Cantilever
302.00	307.00	500	Left	2179	Cantilever
310.00	312.00	200	Left	833	Cantilever
314.00	315.60	160	Left	640	Cantilever
317.20	322.00	480	Right	1920	MSE or gravity
325.00	332.00	700	Left	8225	Cantilever
335.00	338.00	300	Left	2050	MSE or gravity
340.00	344.00	400	Left	3300	MSE or gravity
346.00	348.00	200	Left	625	MSE or gravity
351.00	354.00	300	Left	2580	MSE or gravity
355.00	376.00	2100	Left	12821	MSE or gravity
428.00	435.00	700	Left	2638	MSE or gravity
435.50	438.50	300	Left	2050	Cantilever
441.00	447.00	600	Left	1636	MSE or gravity
447.00	463.00	1600	Left	11718	Cantilever, tied back or bridge
466.00	473.00	700	Left	3344	MSE or gravity
475.50	485.25	975	Right	3900	Cantilever
477.25	482.00	475	Left	4038	Cantilever
491.50	505.00	1350	Right	11230	Cantilever, tiedback, soil nail
507.50	511.50	400	Right	1080	Cantilever
512.50	514.50	200	Right	0	MSE or gravity
518.50	519.50	100	Right	0	MSE or gravity
528.50	533.00	450	Left	1491	MSE or gravity
534.00	537.00	300	Left	750	MSE or gravity
551.00	569.00	1800	Left	18554	Cantilever
565.00	569.00	400	Right	633	MSE or gravity
572.50	590.25	1775	Left	4785	MSE or gravity
597.00	619.50	2250	Left	4500	MSE or gravity

Note: Wall stationing was taken from preliminary plans dated 11/12/03. Wall heights were measured from preliminary profiles and may not reflect the most current plans.

4.1.4 Summary Comparison of Corridor and East Alternatives

4.1.4.1 Corridor Alternative

Impacts

The Corridor Alternative has fewer public access points for construction equipment, which may result in the need for using more private drives as haul roads and possibly the construction of new access roads. The walls proposed for the Corridor Alternative are generally shorter and can be constructed with typical MSE or gravity wall construction (see Table B-1). This would result in a lower estimated overall cost for construction of the walls (Table B-3). Fill walls along the Corridor Alternative are likely to be founded on soft soils that would require over-excavation.

Mitigation

Mitigation would involve implementation of BMPs, and restoration of any damaged pavements of private drives. Final selection of wall type would be made during detailed design and permitting.

4.1.4.2 East Alternatives

Impacts

Potential walls for either of the East Alternatives would be taller and more extensive than those for the Corridor Alternative along those sections where the paved trail would be built along the Parkway or East Lake Sammamish Place instead of the Interim Use Trail alignment. These taller walls would require more costly construction methods (Table B-3). There is also the potential for settlement of these roadways or of buried utilities during construction of the trail, and for utility breakage due to tie-back or soil nail construction. Note that the costs for wall construction under the East Alternatives shown in Table B-3 do not include the cost of traffic control that would likely be needed because of the proximity of these alternatives to East Lake Sammamish Parkway.

Mitigation

Mitigation of potential impacts to the roadways resulting from adjacent excavation during trail construction would include limiting the length and duration of excavations, and/or using engineered shoring.

Placing the new trail on a pile-supported bridge structure would be an option in some areas of the East Alternatives where the new trail is planned to cross a very steep slope and the resulting wall would be very high. Construction of the bridge foundation could be accomplished from either above or below the new trail. Generally, the foundation would be either driven or auger-cast piles. The driven piles could be H-piles, pipe piles, timber piles, or pre-cast concrete piles. Selection of pile type, size, and spacing would depend upon the soil properties, potential for obstructions, design loads, and availability of construction materials. Impacts from driving piles would be vibrations and noise. Driving piles requires large construction equipment and a large laydown area near the wall to store the piles. Installation of a bridge-supported structure would not improve the slope stability of the slope like an engineered wall would. Sloughing of over-steepened slopes would continue around the bridge foundation piles.

Impacts to utilities may be mitigated by conducting a three-dimensional survey of utilities prior to design, calling the utilities locating service to mark utilities during construction, digging test holes to expose adjacent utilities, and possibly monitoring the utilities during construction with settlement meters. Final selection of structure types would be made during detailed design and permitting and could further reduce the impacts. The extent and magnitude of construction-related damages, if any, could be documented by pre-construction photo surveys of the road condition.

Table B-3. Comparison of Estimated Costs of Retaining Wall Construction, Corridor and East Alternatives

Wall Size and Type (Cut or Fill)	Est. Average Cost for Wall Construction (per square foot in 2003 $)*	Walls Common to Both Corridor and East Alternatives**			Corridor			East		
		Sq Ft of Wall Face	Length of Wall (ft)	Est. Cost	Sq Ft of Wall Face	Length of Wall (ft)	Est. Cost	Sq Ft of Wall Face	Length of Wall (ft)	Est. Cost
Fill wall under 5 ft. (max ht)	$39	9,480	4,030	$379,180	44,100	21,140	$1,731,360	3,290	1,350	$129,164
Fill wall 5 to 10 ft (max ht)	$84	0	0	0	0	0	0	48,860	10,510	$4,110,470
Fill wall over 10 ft (max ht)	$123	0	0	0	0	0	0	53,530	6,180	$6,604,906
Cut wall less than 10 ft	$84	0	0	0	45,450	14,600	$3,823,600	5,610	1,780	$471,955
Cut wall greater than 10 ft	$123	0	0	0	11,760	1,350	$1,451,030	11,230	1,350	$1,385,580
	Total	9,480	4,030	$379,180	101,310	37,090	$7,005,980	122,520	21,160	$12,702,075
Note: All heights and lengths are estimates based on preliminary plans and cross-sections. All estimated costs are conservative, for conventional construction techniques and are presented for comparison purposes only, not for construction or bidding.										

* Wall costs taken from Seattle Landslide Study in 1997 dollars and converted to 2003 dollars using inflation assumptions taken from "The Inflation Calculator", www.westegg.com/inflation, accessed on July 27, 2004. An inflation of 12.17% between 1997 costs and 2003 was used. All dollar values have been rounded to the nearest dollar and all wall footage estimates have been rounded to the nearest 10.

** The walls common to both alternatives were separated out from each alignment to indicate commonalities between the alignments.

4.2 CONTINUATION OF THE INTERIM USE TRAIL ALTERNATIVE

Impacts

The Continuation of the Interim Use Trail Alternative would require ongoing ditch and culvert maintenance, trimming of vegetation, invasive vegetation removal, and repair or replacement of sensitive areas fencing beyond 2015. Impacts associated with ditch and culvert maintenance may include erosion due to removal of sloughed material from ditches. Eroded soils could result in increased siltation and sedimentation of surface waters. Slope instabilities within and in the vicinity of the project corridor could continue, particularly in steep slopes along the fill embankment for East Lake Sammamish Parkway and in cuts along the Interim Use Trail. Such instabilities would likely be consistent with those observed in recent years, such as surficial slides and pavement distress.

Mitigation

BMPs would be used to reduce erosion, siltation, and sedimentation potential. Scheduling ditch cleaning during periods of less rainfall would allow exposed soil to revegetate and decrease the erosion potential. (See Appendix C, Fish and Fish Habitat Technical Report, and Section 3.5, Fish Resources, in Chapter 3 of the EIS for discussion of construction timing requirements related to fisheries.) Slopes where accumulated sediment is removed to prevent ditch infilling would be mulched with straw or matting to reduce erosion.

4.3 NO ACTION

Impacts

Ditch and culvert maintenance, trail surfacing maintenance (until Interim Use Trail closure in 2015), trimming of vegetation, and invasive vegetation removal would be conducted for this alternative. As described for the Continuation of the Interim Use Trail Alternative above, impacts associated with ditch and culvert maintenance may include erosion due to removal of sloughed material from ditches. Eroded soils could result in increased siltation and sedimentation of surface waters.

Mitigation

Best management practices (BMPs) would be used to reduce the potential for erosion, siltation, and sedimentation. Scheduling ditch cleaning during periods of less rainfall would allow exposed soil to revegetate and reduce potential erosion. (See Appendix C, Fish and Fish Habitat Technical Report, and Section 3.5, Fish Resources, in Chapter 3 of the EIS for discussion of construction timing requirements related to fisheries.) Slopes where accumulated sediment is removed to prevent ditch infilling would be mulched with straw or matting to reduce erosion.

5. INDIRECT AND CUMULATIVE IMPACTS

5.1 INDIRECT IMPACTS

“Indirect effects” are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8). No indirect or secondary impacts are anticipated.

5.2 CUMULATIVE IMPACTS

A “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7) Construction of the Build Alternatives would require a large net import of borrow material (sand and gravel) for use as fill, therefore contributing to the depletion of existing borrow sources over time.

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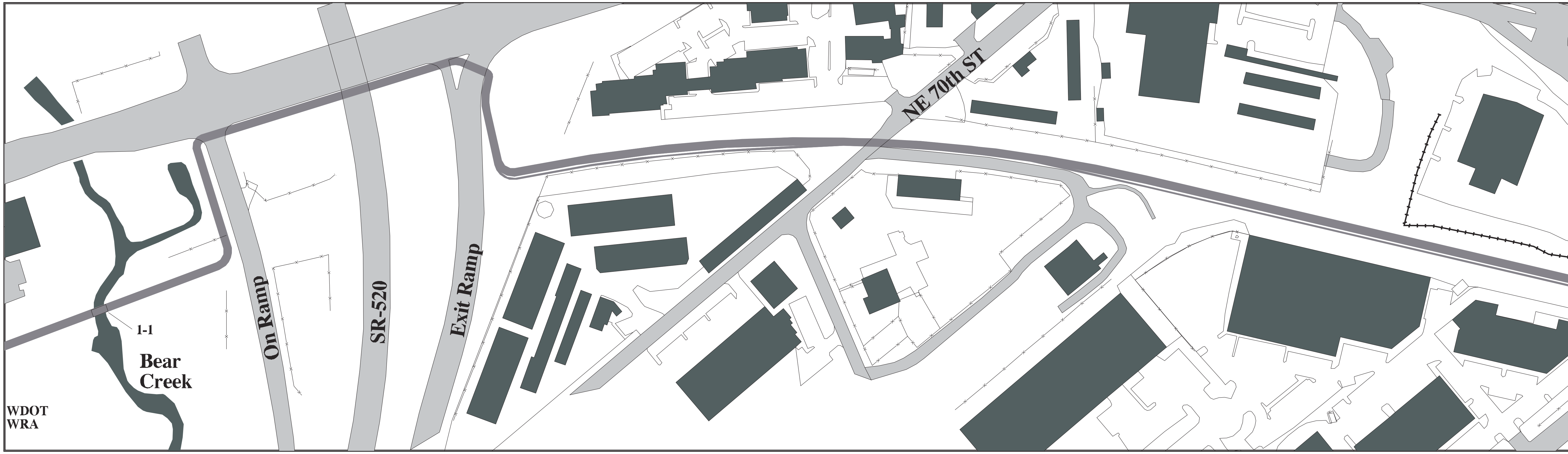

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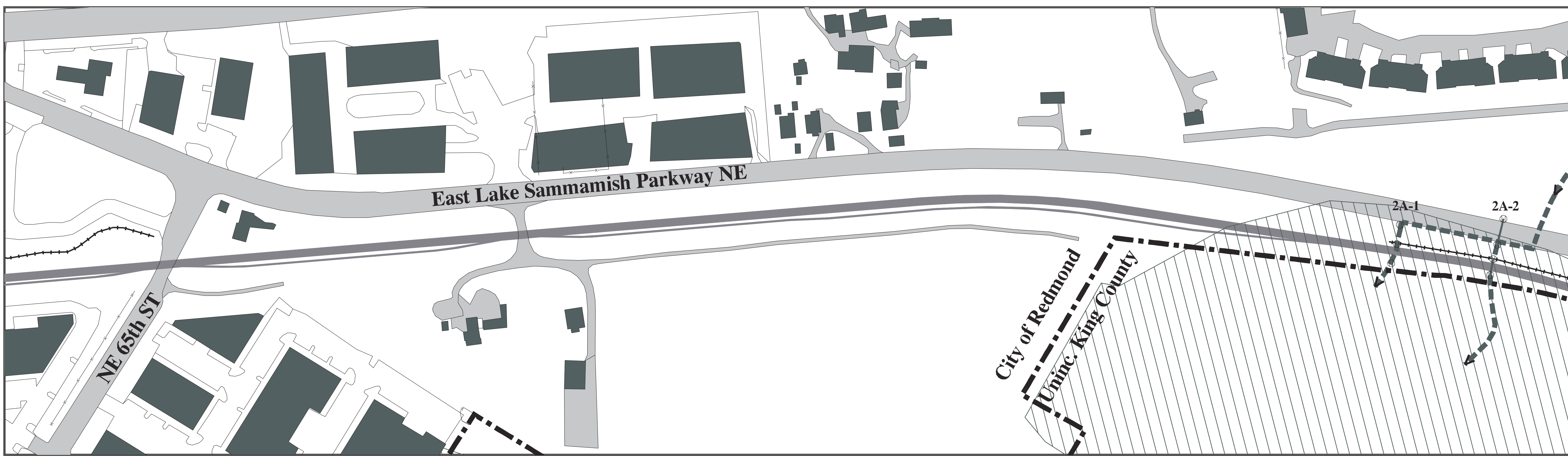

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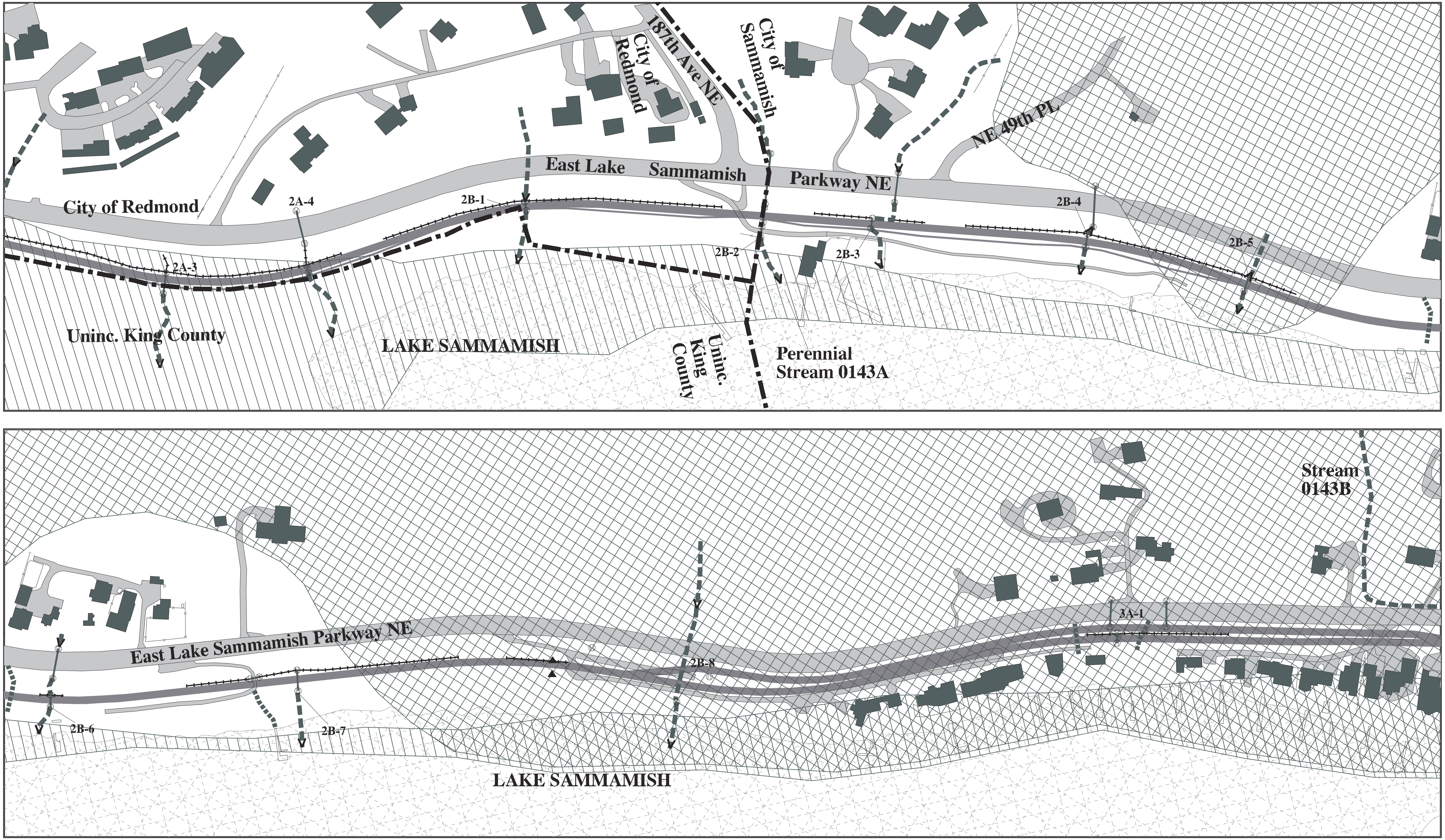
0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Seismic Hazard Area
- Erosion Hazard Area
- Slide Hazard Area
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

* Areas within 30 feet of either side of the trail that are not mapped as Deciduous Trees, Coniferous Trees, or Grassy Field are classified as Urban Matrix. Urban Matrix is a mix of buildings, asphalt, ornamental gardens, and shrubby/grassy areas with scattered trees.

Attachment B-1
East Lake Sammamish Trail
Geologic Hazard Areas



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Attachment B-2
East Lake Sammamish Trail
Geologic Hazard Areas

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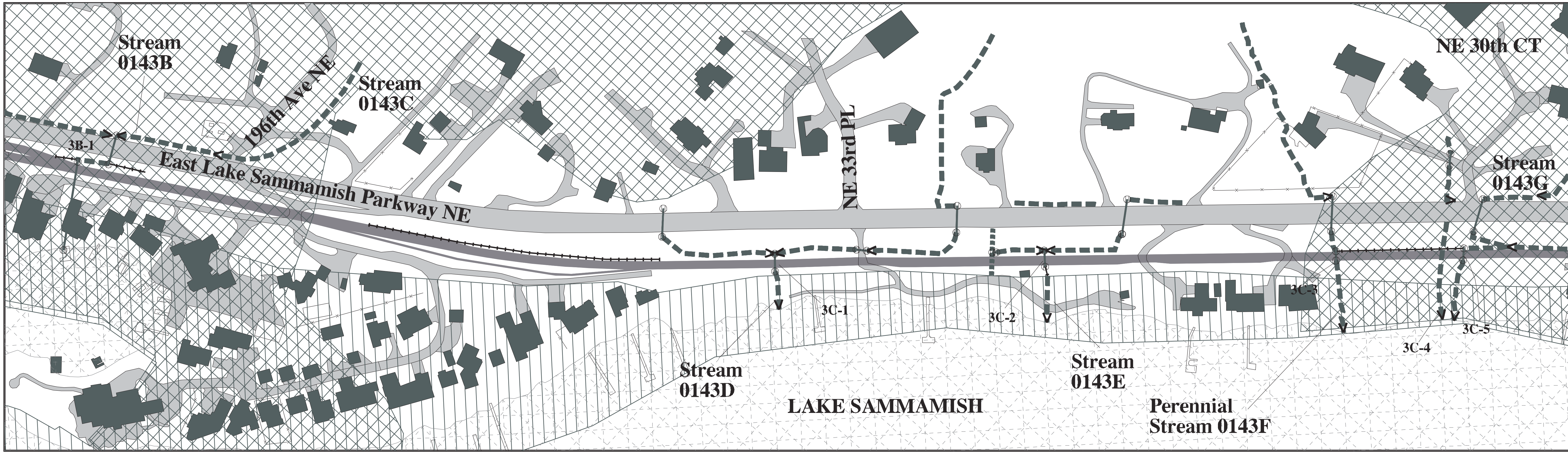

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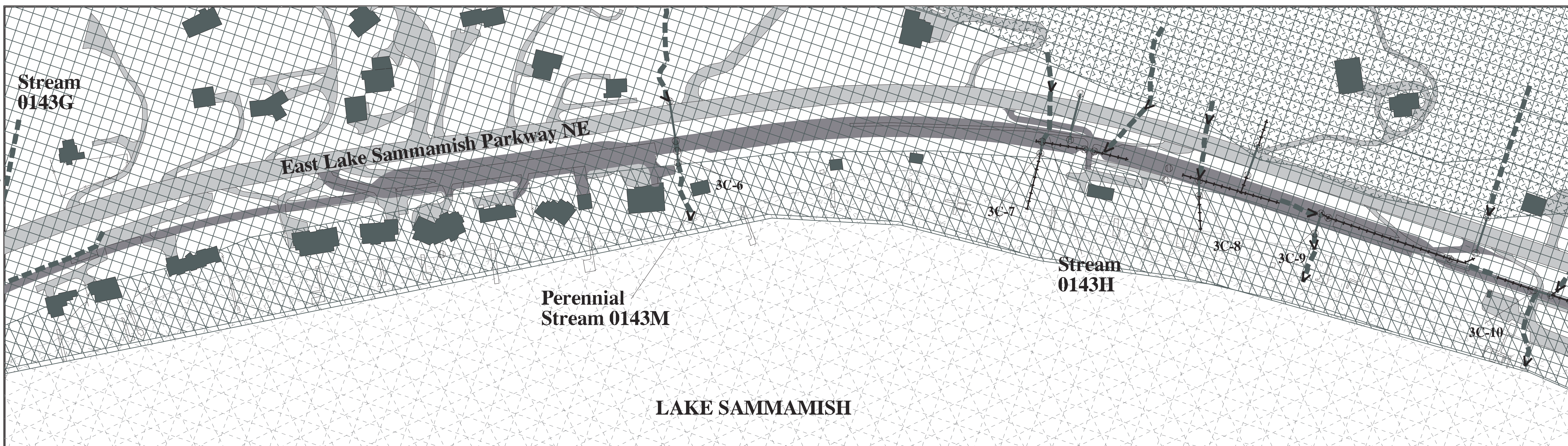

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Scale in Feet

Trail Alignments
Roads
Driveways
Seismic Hazard Area
Erosion Hazard Area
Slide Hazard Area

Residential Path
Stream
Ditch

Unverified Culvert
Culvert Inlet or Outlet

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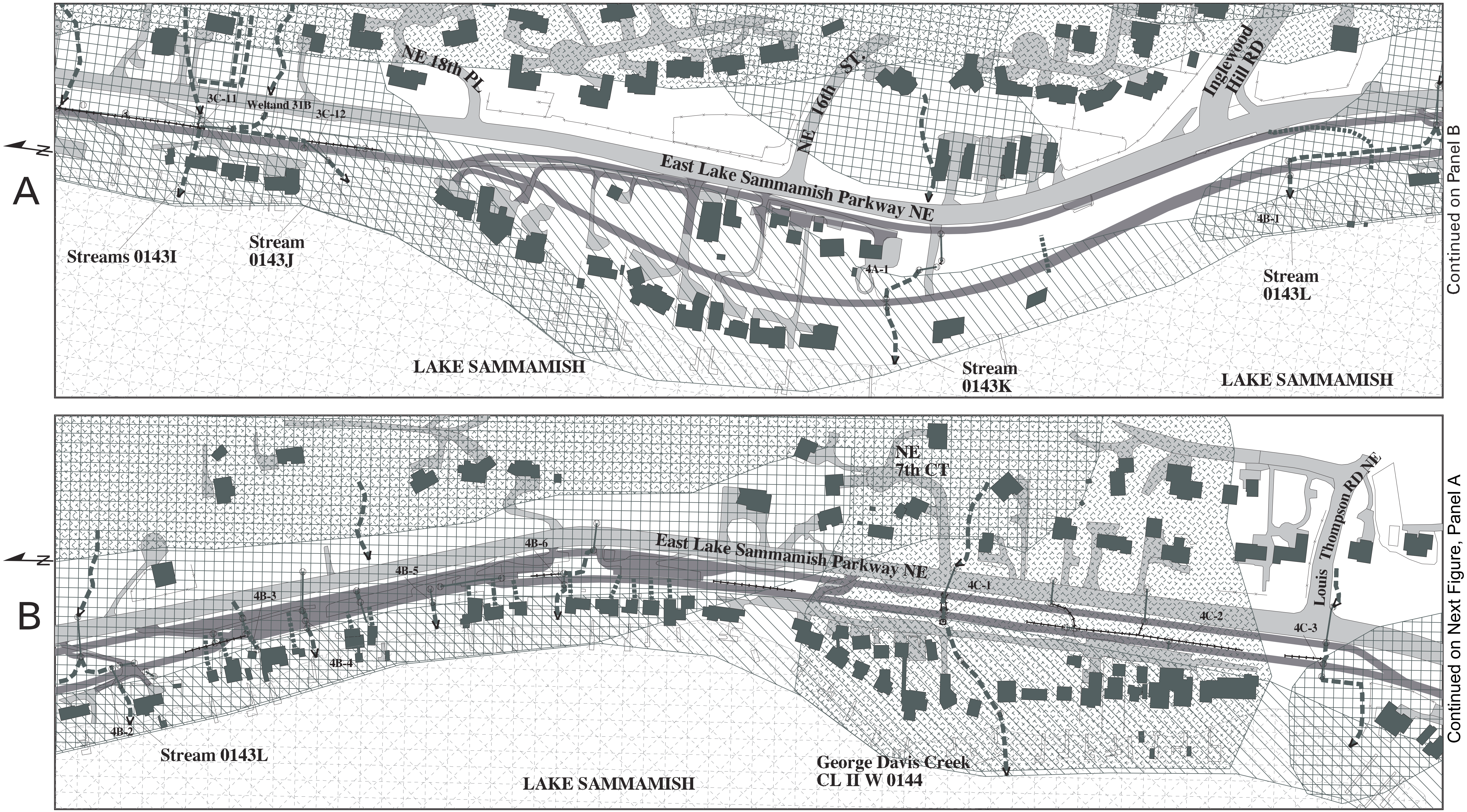
Attachment B-3
East Lake Sammamish Trail
Geologic Hazard Areas



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Scale in Feet

- Trail Alignments
- Roads
- Driveways
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- Slide Hazard Area
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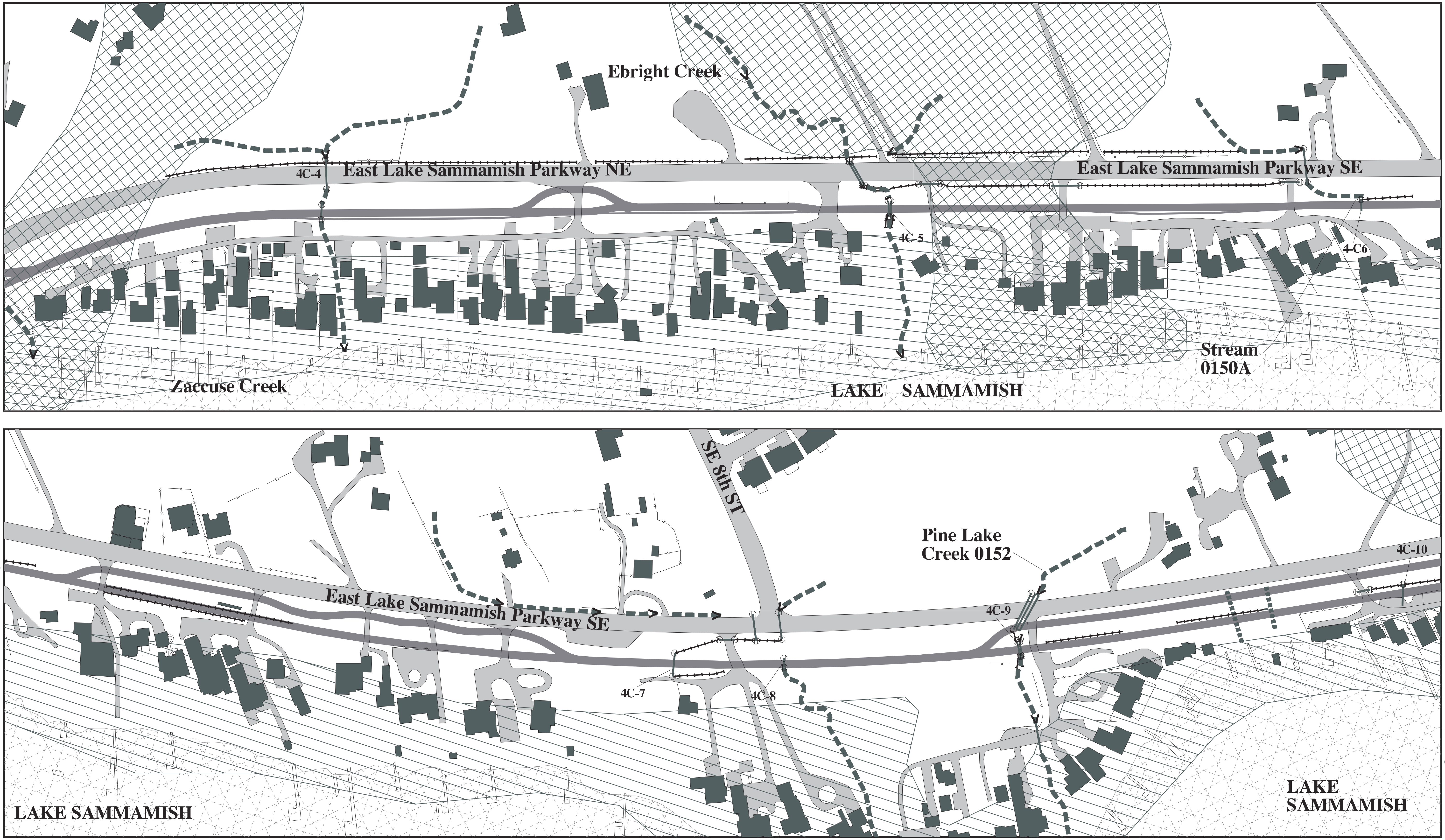
Attachment B-4
East Lake Sammamish Trail
Geologic Hazard Areas



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Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Seismic Hazard Area
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- Slide Hazard Area
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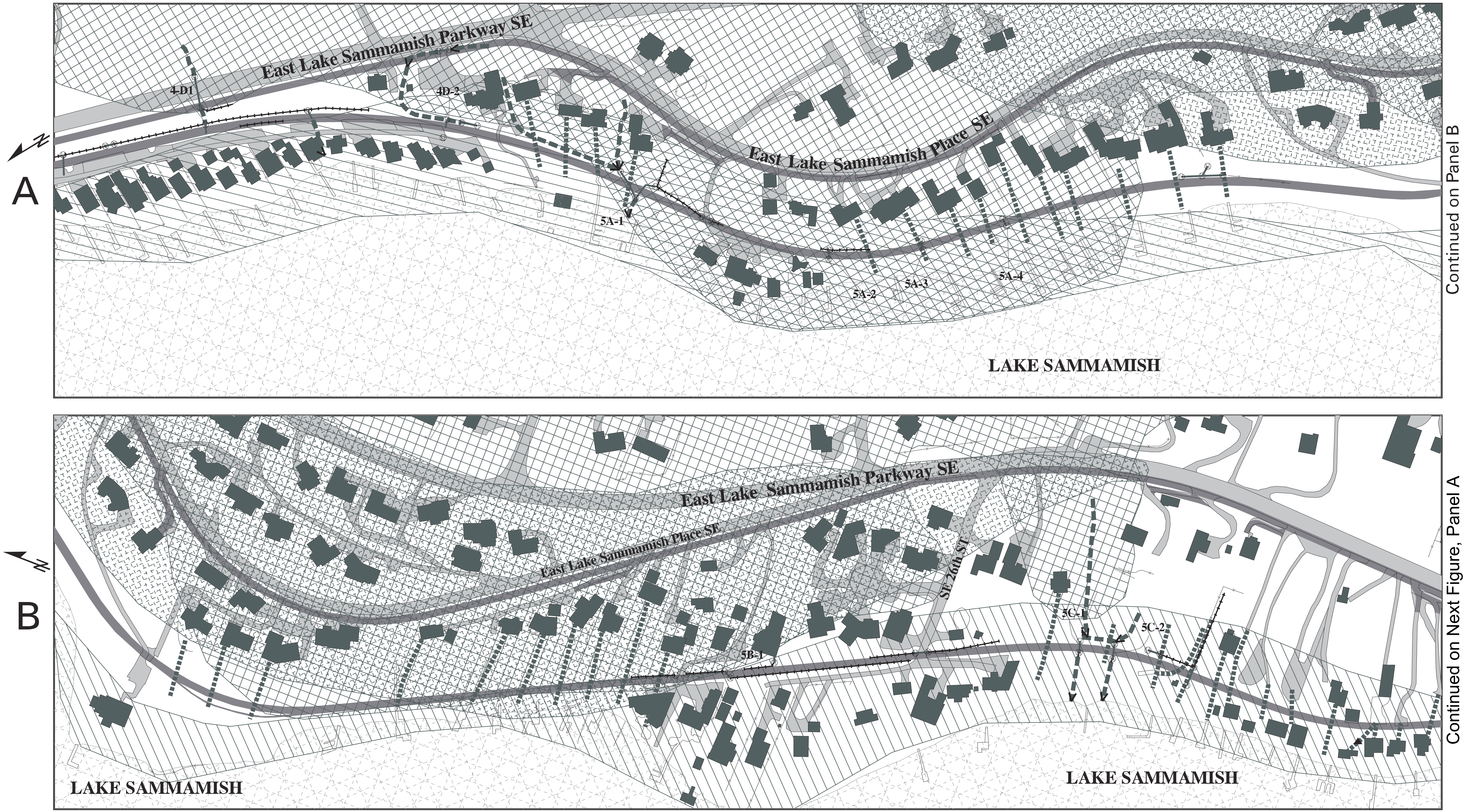
Attachment B-5
East Lake Sammamish Trail
Geologic Hazard Areas



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Scale in Feet

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- Driveways
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- Residential Path
- Stream
- Ditch
- ▲ Unverified Culvert
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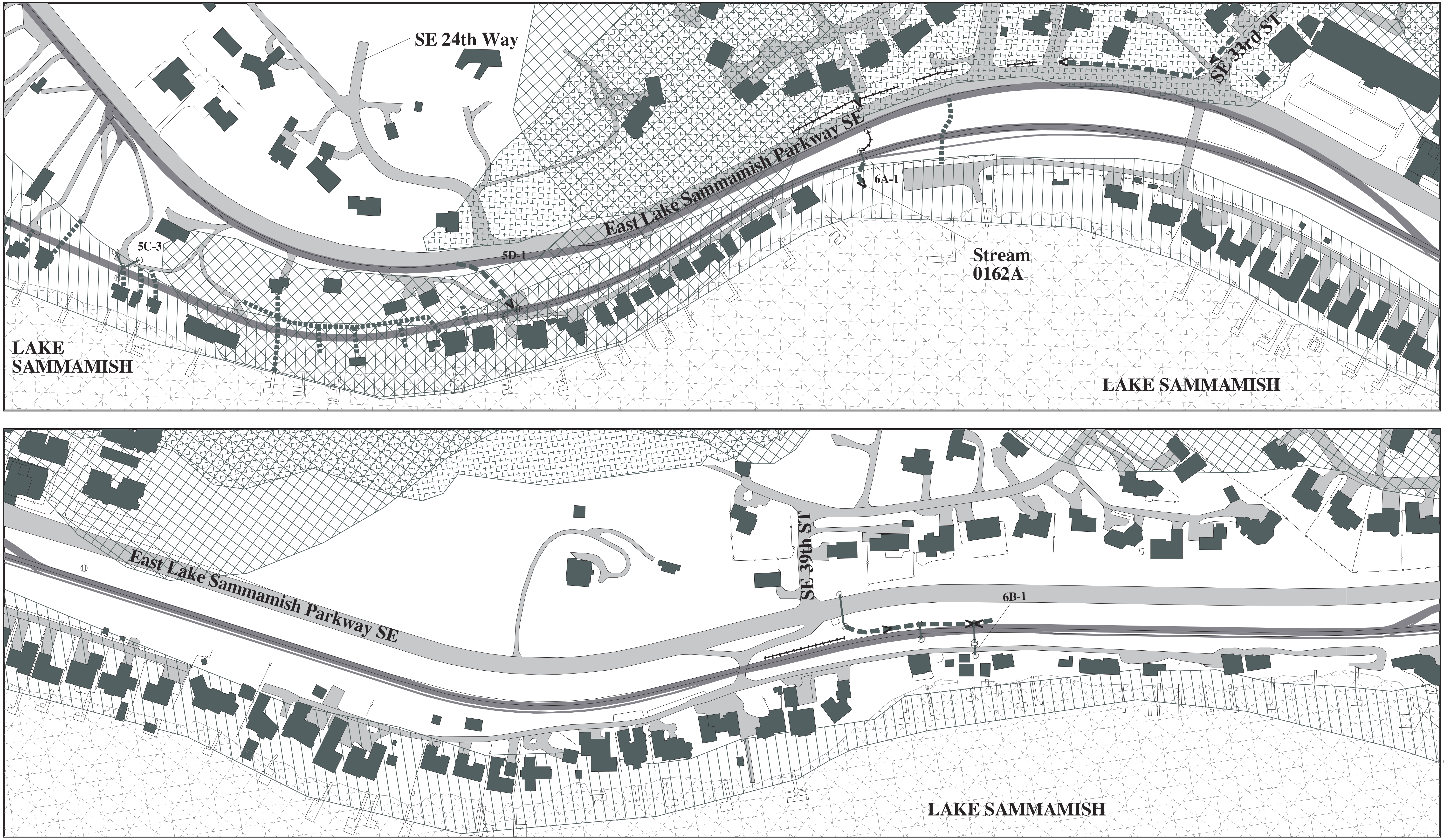
Attachment B-6
East Lake Sammamish Trail
Geologic Hazard Areas



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Scale in Feet

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Attachment B-7
East Lake Sammamish Trail
Geologic Hazard Areas

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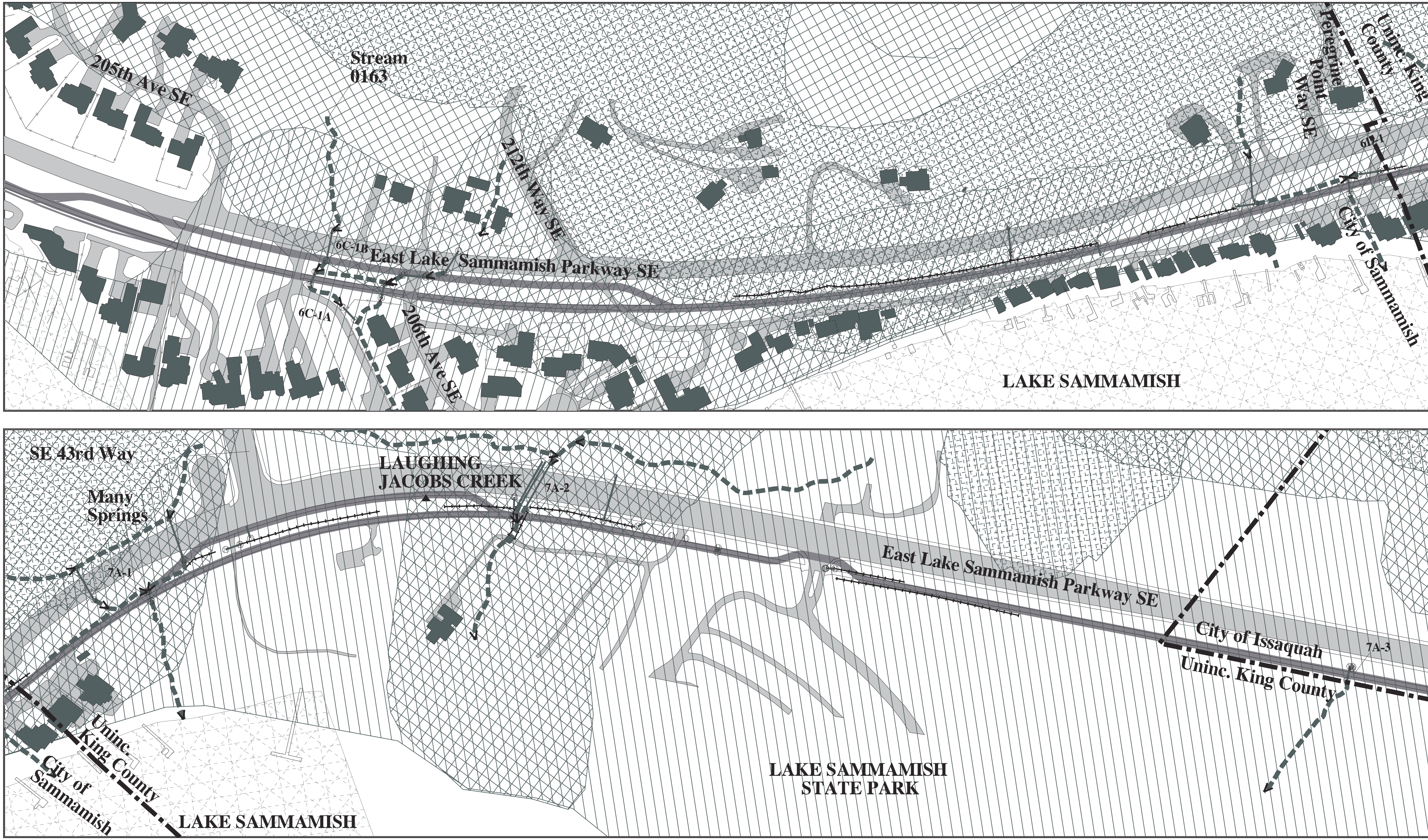

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Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Seismic Hazard Area
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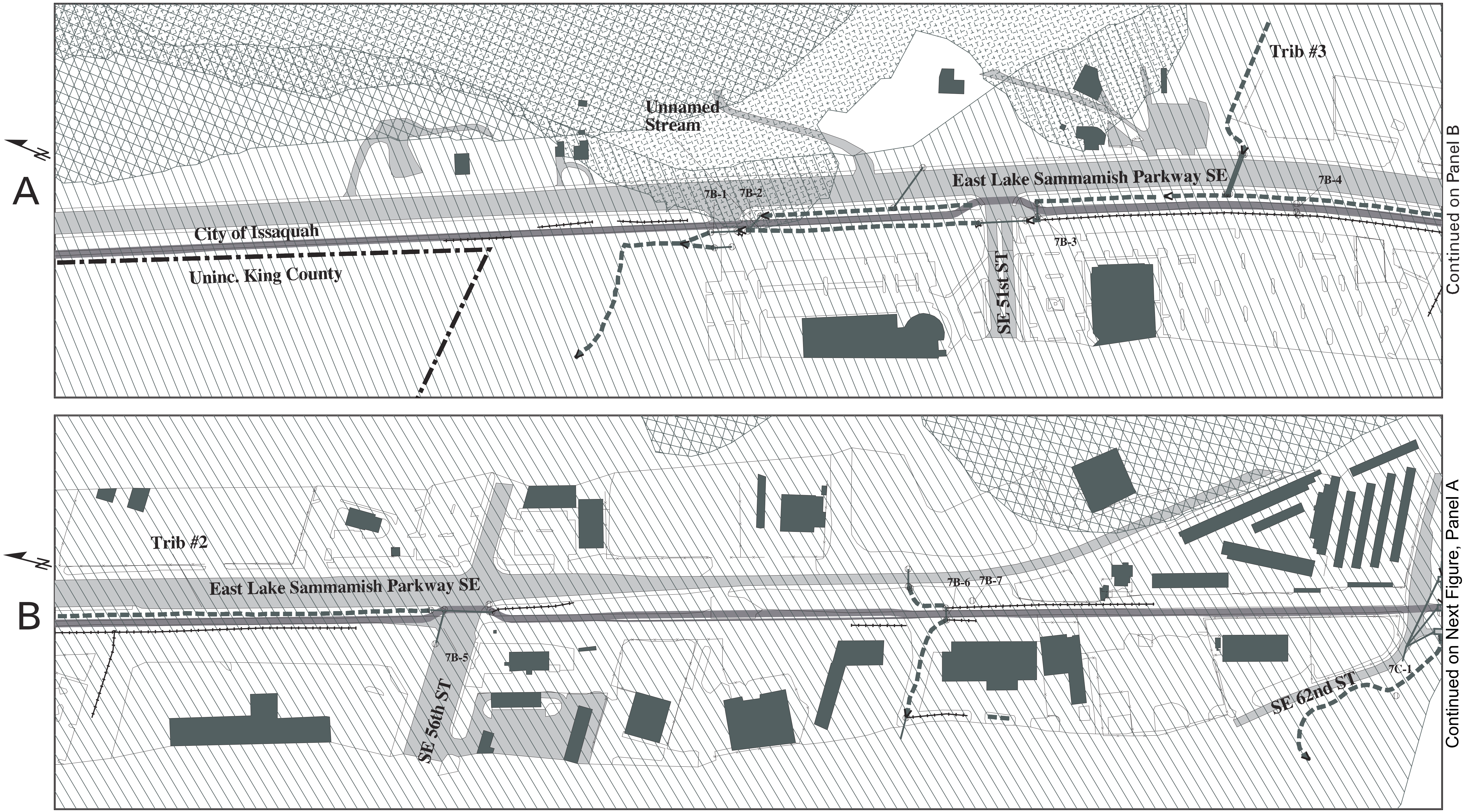
Attachment B-8
East Lake Sammamish Trail
Geologic Hazard Areas



File: ./eastlake/plotamls/p_17x11_200sc-2views-haz-042805.aml jbw_bsizehaz-9-042805 Date: May 04, 2005

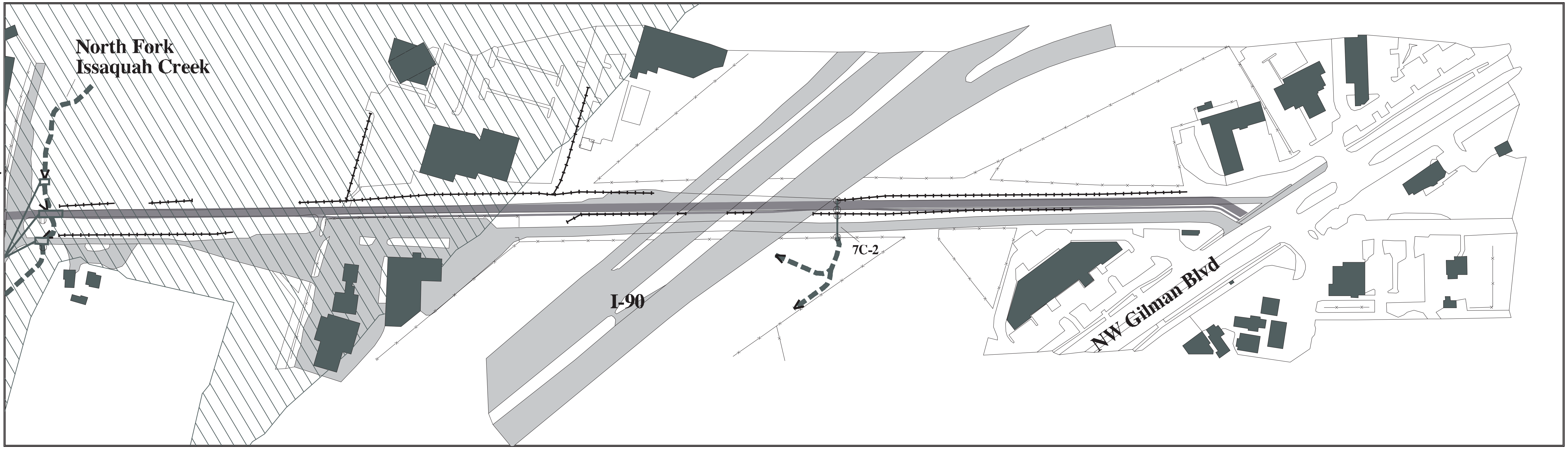
0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Seismic Hazard Area
- Erosion Hazard Area
- Slide Hazard Area
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

* Areas within 30 feet of either side of the trail that are not mapped as Deciduous Trees, Coniferous Trees, or Grassy Field are classified as Urban Matrix. Urban Matrix is a mix of buildings, asphalt, ornamental gardens, and shrubby/grassy areas with scattered trees.

Attachment B-9
East Lake Sammamish Trail
Geologic Hazard Areas



File: ./eastlake/plotamls/p_17x11_200sc-2views-haz-042805.aml jbw_bsizehaz-10-042805 Date: May 04, 2005

0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Seismic Hazard Area
- Erosion Hazard Area
- Slide Hazard Area
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

* Areas within 30 feet of either side of the trail that are not mapped as Deciduous Trees, Coniferous Trees, or Grassy Field are classified as Urban Matrix. Urban Matrix is a mix of buildings, asphalt, ornamental gardens, and shrubby/grassy areas with scattered trees.

Attachment B-10
East Lake Sammamish Trail
Geologic Hazard Areas

Appendix C – Wildlife and Vegetation Technical Report

East Lake Sammamish Master Plan Trail Wildlife and Vegetation Technical Report

Prepared for

King County Facilities Management Division

Prepared by

Parametrix
411 – 108th Avenue NE, Suite 1800
Bellevue, WA 98004
(425) 458-6200
www.parametrix.com

October 2006

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APPENDIX C-1. WILDLIFE SPECIES LIKELY TO OCCUR IN THE VICINITY OF THE EAST LAKE SAMMAMISH MASTER PLAN TRAIL PROJECT

Scientific Name	Common Name
* = Species observed during site visits.	
Amphibians	
Ambystoma macrodactylum	Long-toed Salamander
Ensatina eschscholtzii	Ensatina
*Hyla regilla**	Pacific Tree frog*
Rana catesbiana	Bullfrog
Reptiles	
Thamnophis sirtalis	Common Garter Snake
Thamnophis elegans	Western Terrestrial Garter Snake
*Thamnophis ordinoides**	Northwestern Garter Snake*
Chrysemys picta	Painted Turtle
Clemmys marmorata	Western Pond Turtle
Birds	
*Ardea herodias**	Great Blue Heron*
Phalacrocorax auritus	Double-crested Cormorant
Podilymbus podicpes	Pied-billed Grebe
Podiceps auritus	Horned Grebe
Podiceps nigricollis	Eared Grebe
Podiceps grisegena	Red-necked Grebe
Aechmorphorus occidentalis	Western Grebe
*Branta canadensis**	Canada Goose*
Anas crecca	Green-winged Teal
Anas discors	Blue-winged Teal
Anas cyanoptera	Cinnamon Teal
Anas americana	American Wigeon
Anas clypeata	Northern Shoveler
Anas strepera	Gadwall
*Anas platyrhynchos**	Mallard*
*Anas americana**	American Wigeon*
Aythya collaris	Ring-necked Duck
Aythya marila	Greater Scaup
*Aythya affinis**	Lesser Scaup*
Bucephala clangula	Common Goldeneye
Bucephala islandica	Barrow's Goldeneye
*Bucephala albeola**	Bufflehead*
*Fulica americana**	American Coot*

Scientific Name	Common Name
* = Species observed during site visits.	
Lophodytes cucullatus	Hooded Merganser
Mergus merganser	Common Merganser
*Rallus limicola**	Virginia Rail*
Pandion haliaetus	Osprey
*Haliaeetus leucocephalus**	Bald Eagle*
*Accipiter striatus**	Sharp-shinned Hawk*
Accipiter cooperii	Cooper's Hawk
*Buteo jamaicensis**	Red-tailed Hawk*
Falco columbarius	Merlin
*Charadrius anadensis**	Killdeer*
Actitis macularia	Spotted Sandpiper
Larus delawarensis	Ring-billed Gull
*Larus glaucescens**	Glaucous-winged Gull*
*Columba livia**	Rock Dove*
Columba fasciata	Band-tailed Pigeon
Bubo virginianus	Great Horned Owl
Strix varia	Barred Owl
Calypte anna	Anna's Hummingbird
Selasphorus rufus	Rufous Hummingbird
*Ceryle alcyon**	Belted Kingfisher*
Picoides pubescens	Downy Woodpecker
*Picoides villosus**	Hairy Woodpecker*
*Colaptes auratus**	Northern Flicker*
*Sphyrapicus anade**	Red-breasted Sapsucker*
*Dryocopus pileatus**	Pileated Woodpecker*
Contopus sordidulus	Western Wood-pewee
*Empidonax traillii**	Willow Flycatcher*
Progne subis	Purple Martin
Tachycineta thalassina	Violet-green Swallow*
Hirundo rustica	Barn Swallow
*Cyanocitta stelleri**	Steller's Jay*
*Corvus brachyrhynchos**	American Crow*
*Parus atricapillus**	Black-capped Chickadee*
Psaltriparus minimus	Bushtit
*Sitta anadensis**	Red-breasted Nuthatch*
*Thryomanes bewickii**	Bewick's Wren*
Troglodytes troglodytes	Winter Wren
*Regulus satrapa**	Golden-crowned Kinglet*
*Regulus calendula**	Ruby-crowned Kinglet*
*Turdus migratorius**	American Robin*

Scientific Name	Common Name
* = Species observed during site visits.	
Ixoreus naevius	Varied Thrush
Bombycilla cedrorum	Cedar Waxwing
*Sturnus vulgaris**	European Starling*
Vireo solitarius	Solitary Vireo
Vireo huttoni	Hutton's Vireo
Vireo gilvus	Warbling Vireo
Vermivora celata	Orange-crowned Warbler
*Dendroica petechia**	Yellow Warbler*
Dendroica coronata	Yellow-rumped Warbler
*Dendroica nigrenscens**	Black-throated Gray Warbler*
Dendroica townsendi	Townsend's Warbler
Geothlypis trichas	Common Yellowthroat
Wilsonia pusilla	Wilson's Warbler
Piranga ludoviciana	Western Tanager
*Pheucticus melanocephalus**	Black-headed Grosbeak*
*Pipilo maculatus**	Spotted Towhee*
Passerculus sandwichensis	Savannah Sparrow
Passerella iliaca	Fox Sparrow
*Melospiza melodia**	Song Sparrow*
*Zonotrichia leucophrys**	White-crowned Sparrow*
*Junco hyemalis**	Dark-eyed Junco*
Carduelis pinus	Pine Siskin
*Agelaius phoeniceus**	Red-winged Blackbird*
Molothrus ater	Brown-headed Cowbird
*Carpodacus purpureus**	Purple Finch*
*Carpodacus mexicanus**	House Finch*
Carduelis pinus	Pine Siskin
Carduelis tristis	American Goldfinch
Coccothraustes vespertinus	Evening Grosbeak
*Passer domesticus**	House Sparrow*
Mammals	
*Didelphis virginiana**	Virginia Opossum*
Sorex vagrans	Vagrant Shrew
Scapanus townsendi	Townsend's Mole
Scapanus orarius	Coast Mole
Sylvilagus floridanus	Eastern Cottontail
Aplodontia rufa	Mountain Beaver
*Castor canadensis**	Beaver*
Ondatra zibethicus	Muskrat
Sciurus carolinensis	Eastern Gray Squirrel

Scientific Name	Common Name
* = Species observed during site visits.	
Peromyscus maniculatus	Deer Mouse
Microtus oregoni	Creeping Vole
Microtus townsendi	Townsend's Vole
Rattus rattus	Black Rat
Rattus norvegicus	Norway Rat
Mus musculus	House Mouse
Procyon lotor	Raccoon
Mustela frenata	Long-tailed Weasel
Mephitis mephitis	Striped Skunk
Canis latrans	Coyote
Vulpes vulpes	Red Fox
*Odocoileus hemionus**	Mule Deer*

APPENDIX C-2. AGENCY LETTERS OF RESPONSE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Washington Fish and Wildlife Office
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503
Phone: (360) 753-9440 Fax: (360) 534-9331

JUN 24 2003

Dear Species List Requester:

We (U.S. Fish and Wildlife Service) are providing the information you requested to assist your determination of possible impacts of a proposed project to species of Federal concern. Attachment A includes the listed threatened and endangered species, species proposed for listing, candidate species, and/or species of concern that may be within the area of your proposed project.

Any Federal agency, currently or in the future, that provides funding, permitting, licensing, or other authorization for this project must assure that its responsibilities under section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act), are met. Attachment B outlines the responsibilities of Federal agencies for consulting or conferencing with us.

If both listed and proposed species occur in the vicinity of a project that meets the requirements of a major Federal action (i.e., "major construction activity"), impacts to both listed and proposed species must be considered in a biological assessment (BA) (section 7(c); see Attachment B). Although the Federal agency is not required, under section 7(c), to address impacts to proposed species if listed species are not known to occur in the project area, it may be in the Federal agency's best interest to address impacts to proposed species. The listing process may be completed within a year, and information gathered on a proposed species could be used to address consultation needs should the species be listed. However, if the proposed action is likely to jeopardize the continued existence of a proposed species, or result in the destruction or adverse modification of proposed critical habitat, a formal conference with us is required by the Act (section 7(a)(4)). The results of the BA will determine if conferencing is required.

The Federal agency is responsible for making a determination of the effects of the project on listed species and/or critical habitat. For a Federal agency determination that a listed species or critical habitat is likely to be affected (adversely or beneficially) by the project, you should request section 7 consultation through this office. For a "not likely to adversely affect" determination, you should request our concurrence through the informal consultation process.

Candidate species and species of concern are those species whose conservation status is of concern to us, but for which additional information is needed. Candidate species are included as an advance notice to Federal agencies of species that may be proposed and listed in the future. Conservation measures for candidate species and species of concern are voluntary but recommended. Protection provided to these species now may preclude possible listing in the future.

For other federally listed species that may occur in the vicinity of your project, contact the National Marine Fisheries Service (NOAA Fisheries) at (360) 753-9530 to request a list of species under their jurisdiction. For wetland permit requirements, contact the Seattle District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

Thank you for your assistance in protecting listed threatened and endangered species and other species of Federal concern. If you have additional questions, please contact Tami Black at (360) 753-4322 or Yvonne Dettlaff at (360) 753-9582.

Sincerely,

for Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

Enclosure(s)

ATTACHMENT A

June 19, 2003

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CRITICAL HABITAT, CANDIDATE SPECIES, AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED EAST LAKE SAMMAMISH TRAIL PROJECT IN KING COUNTY, WASHINGTON

(T24N R6E S5-8,16-17; T25N R6E S17-20,29,31-32)

FWS REF: 1-3-03-SP-1502

LISTED

There are two bald eagle (*Haliaeetus leucocephalus*) nesting territories located in the vicinity of the project at T24N R6E S17 and T25N R6E S18. Nesting activities occur from January 1 through August 15.

Wintering bald eagles may occur in the vicinity of the project. Wintering activities occur from October 31 through March 31.

Bull trout (*Salvelinus confluentus*) may occur in the vicinity of the project.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species include:

1. Level of use of the project area by listed species;

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project; and

3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) that may result in disturbance to listed species and/or their avoidance of the project area.

PROPOSED

None

CANDIDATE

None

CRITICAL HABITAT

None

SPECIES OF CONCERN

The following species of concern have been documented in the county where the project is located. These species or their habitat could be located on or near the project site. Species in **bold** were specific occurrences located on the database within a 1-mile radius of the project site.

Beller's ground beetle (*Agonum belleri*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Hatch's click beetle (*Eanus hatchi*)
Larch Mountain salamander (*Plethodon larselli*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Emys (= Clemmys) marmorata marmorata*)
Northern sea otter (*Enhydra lutris kenyoni*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific fisher (*Martes pennanti pacifica*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Pacific lamprey (*Lampetra tridentata*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Valley silverspot (*Speyeria zerene bremeri*)
Western toad (*Bufo boreas*)
Aster curtus (white-top aster)
Botrychium pedunculosum (stalked moonwort)

ATTACHMENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with the U.S. Fish and Wildlife Service (FWS) when a Federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with the FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species that is/are likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with the Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our Endangered Species Division, 510 Desmond Drive SE, Suite 102, Lacey, WA 98503-1273.

* "Construction project" means any major Federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes Federal action such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction.

WASHINGTON STATE DEPARTMENT OF
Natural Resources

DOUG SUTHERLAND
Commissioner of Public Lands

September 5, 2006

Sue Martin
Parametrix Inc
411 108th Ave NE – Ste 1800
Bellevue WA 98004-5571

REC'D SEP - 7 2006

SUBJECT: East Lake Sammamish Trail, King County #554-1521-039, 01/03 (T24N R06E S05-08,16,17; T25N R06E S17-20,29,31,32)

We've searched the Natural Heritage Information System for information on significant natural features in your project area. Currently, we have no records for rare plants or high quality native ecosystems in the vicinity of your project.

The information provided by the Washington Natural Heritage Program is based solely on existing information in the database. In the absence of field inventories, we cannot state whether or not a given site contains high quality ecosystems or rare plant species; there may be significant natural features in your study area of which we are not aware.

The Washington Natural Heritage Program is responsible for information on the state's rare plants as well as high quality ecosystems. For information on animal species of concern, please contact Priority Habitats and Species, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia WA 98501-1091, or by phone (360) 902-2543.

Please visit our internet website at http://www.dnr.wa.gov/nhp for more information. Lists of rare plants and their status, rare plant fact sheets, as well as rare plant survey guidelines are available for download from the site. Please feel free to call me at (360) 902-1697 if you have any questions, or by e-mail at sandra.moody@wadnr.gov.

Sincerely,

Sandy Swope Moody

Sandy Swope Moody, Environmental Review and Grants Coordinator
Washington Natural Heritage Program

Asset Management & Protection Division, PO Box 47014, Olympia WA 98504-7014
FAX 360-902-1789

1111 WASHINGTON ST SE ▮ PO BOX 47000 ▮ OLYMPIA, WA 98504-7000
TEL: (360) 902-1000 ▮ FAX: (360) 902-1775 ▮ TTY: (360) 902-1125
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RECYCLED PAPER

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

Date: JUL 2 8 2003

Dear Habitats and Species Requester:

Enclosed are the habitats and species products you requested from the Washington Department of Fish and Wildlife (WDFW). This package may also contain documentation to help you understand and use these products.

These products only include information that WDFW maintains in a computer database. They are not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife, nor are they designed to provide you with guidance on interpreting this information and determining how to proceed in consideration of fish and wildlife. These products only document the location of important fish and wildlife resources to the best of our knowledge. It is important to note that habitats or species may occur on the ground in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site-specific surveys are frequently necessary to rule out the presence of priority habitats or species.

Your project may require further field inspection or you may need to contact our field biologists or others in WDFW to assist you in interpreting and applying this information. Generally, for assistance on a specific project, you should contact the WDFW Habitat Program Manager for your county and ask for the area habitat biologist for your project area. Refer to the enclosed directory for those contacts.

Please note that sections potentially impacted by spotted owl management concerns are displayed on the 1:24,000 scale standard map products. If specific details on spotted owl site centers are required they must be requested separately.

These products are designed for users external to the forest practice permit process and as such, does not reflect all the information pertinent to forest practice review. The Forest Practice Rules adopted August 22, 1997 by the Forest Practice Board and administered by the Washington Department of Natural Resources require forest practice applications to be screened against marbled murrelet detection areas and detection sections. Marbled murrelet detection locations are included in the standard priority habitats and species products, but the detection areas and detection sections are not included. If your project is affected by Forest Practice Regulations, you should specially request murrelet detection areas.

WDFW updates this information as additional data become available. Because fish and wildlife species are mobile and because habitats and species information changes, project reviews for fish and wildlife should not rest solely on mapped information. Instead, they should also consider new information gathered from current field investigations. Remember, habitats and species information can only show that a species or habitat type is present, they cannot show that a species or habitat type is not present. These products should not be used for future projects. Please obtain updates rather than use outdated information.

November 2002

APPENDIX C-3. SPECIES LISTED IN U.S. FISH AND WILDLIFE SERVICE

Species Listed in U.S. Fish and Wildlife Service Letter of Response, but not Expected to Occur in the Vicinity of the Proposed East Lake Sammamish Trail Project Corridor

The U. S. Fish and Wildlife Service (USFWS) identified six threatened or endangered wildlife species that could potentially occur in the project area, one of which (the bald eagle) is described in detail in Section 3.4 in Chapter 3 of the EIS. The other five such species (Canada lynx, gray wolf, grizzly bear, marbled murrelet, and northern spotted owl) are not expected to occur in the project area. No suitable habitat exists in the project area for these species, which require large undisturbed territories or old growth coniferous forest.

Other special-status species identified by USFWS as potentially occurring in the project vicinity but that are not expected to occur include the following.

Oregon Spotted Frog. The Oregon spotted frog, a candidate for listing as threatened or endangered, is most often associated with non-woody wetland plant communities in still or slow-moving perennial ponds, lakes, or streams (Leonard et al., 1993). This species historically occurred in the Puget Sound lowlands (including the project vicinity) but has been virtually eliminated from the area, likely because of degradation and loss of wetlands and the introduction of non-native predators such as bullfrogs (Leonard et al., 1993). The nearest known extant population is over 60 miles from the project corridor, in Thurston County (McAllister and Leonard, 1997). The species is not expected in the project vicinity because of the presence of non-native fish and bullfrogs and the lack of suitable breeding habitat.

Olive-Sided Flycatcher. The olive-sided flycatcher, a species of concern, is a summer resident in the coniferous forests of western Washington. This edge-adapted species prefers large patches that have a relatively open canopy and are adjacent to clearings (Smith et al., 1997). Nesting olive-sided flycatchers are not likely in the project vicinity because conifers in the area occur in patches that are too small to support the species.

Long-Eared Myotis. The long-eared myotis, a species of concern, occurs in several habitats, from arid grasslands and dry Ponderosa pine forest to mesic coniferous forests (Nagorsen and Brigham, 1993). Their preferred habitat is coniferous forests (Maser, 1998). Buildings and loose bark attached to trees are used for day roosts, and abandoned buildings are used for maternal colonies as well. The presence of this species in the project vicinity is probably limited by the availability of roost sites.

Long-Legged Myotis. The long-legged myotis, a species of concern, occurs primarily in coniferous forests (Maser, 1998). This bat uses buildings, crevices in rock cliffs, fissures in the ground, and the bark of trees for summer day roosts (Nagorsen and Brigham, 1993). Maternity colonies are located in attics, fissures in the ground, and under the bark of trees. The long-legged myotis forages over water and woodland openings, as well as over the forest canopy (Nagorsen and Brigham, 1993). Because the project vicinity contains only scattered, small patches of coniferous trees, and not contiguous coniferous forests, this species is not likely to occur in the area.

Pacific Townsend's Big-Eared Bat. The Pacific Townsend's big-eared bat, a species of concern, is associated with a variety of habitats, from arid grasslands to mesic coniferous forest (Nagorsen and Brigham, 1993). Caves, old mines, and buildings are used by this bat species for both roost sites and maternity colonies (Nagorsen and Brigham, 1993). Although widely distributed, this species is rarely observed in large numbers and appears to be particularly sensitive to human disturbance. There are no known breeding sites for the Pacific Townsend's big-eared bat in the Puget Sound region (WDFW, 1991).

References

Leonard, W.P., H.A. Brown, L.L.C Jones, K.R. McAllister, and R.M. Storm. 1993. *Amphibians of Washington and Oregon.* Seattle Audubon Society, Seattle, WA.

Maser, C. 1998. *Mammals of the Pacific Northwest: From the Coast to the High Cascades.* Oregon State University Press, Corvallis, OR.

McAllister, K.R. and W.P. Leonard. 1997. *Washington State Status Report for the Oregon Spotted Frog*. Washington Department of Fish and Wildlife, Olympia, WA.

Nagorsen, D.W. and R.M. Brigham. 1993. *Bats of British Columbia.* UBC Press, Vancouver, BC.

Smith, M.R., P.W. Mattocks, Jr., and K.M. Cassidy. 1997. *Breeding Birds of Washington State. Volume 4.* In: K. Cassidy, C.E. Grue, M.R. Smith, and K.M. Dvornich (eds.), Washington State Gap Analysis – Final Report. Seattle Audubon Society Publications in Zoology No. 1, Seattle, WA.

WDFW (Washington Department of Fish and Wildlife). 1991. *Management Recommendations for Washington's Priority Habitat and Species.* Olympia, WA.

APPENDIX C-4. PLANT SPECIES IDENTIFIED IN PROJECT VICINITY

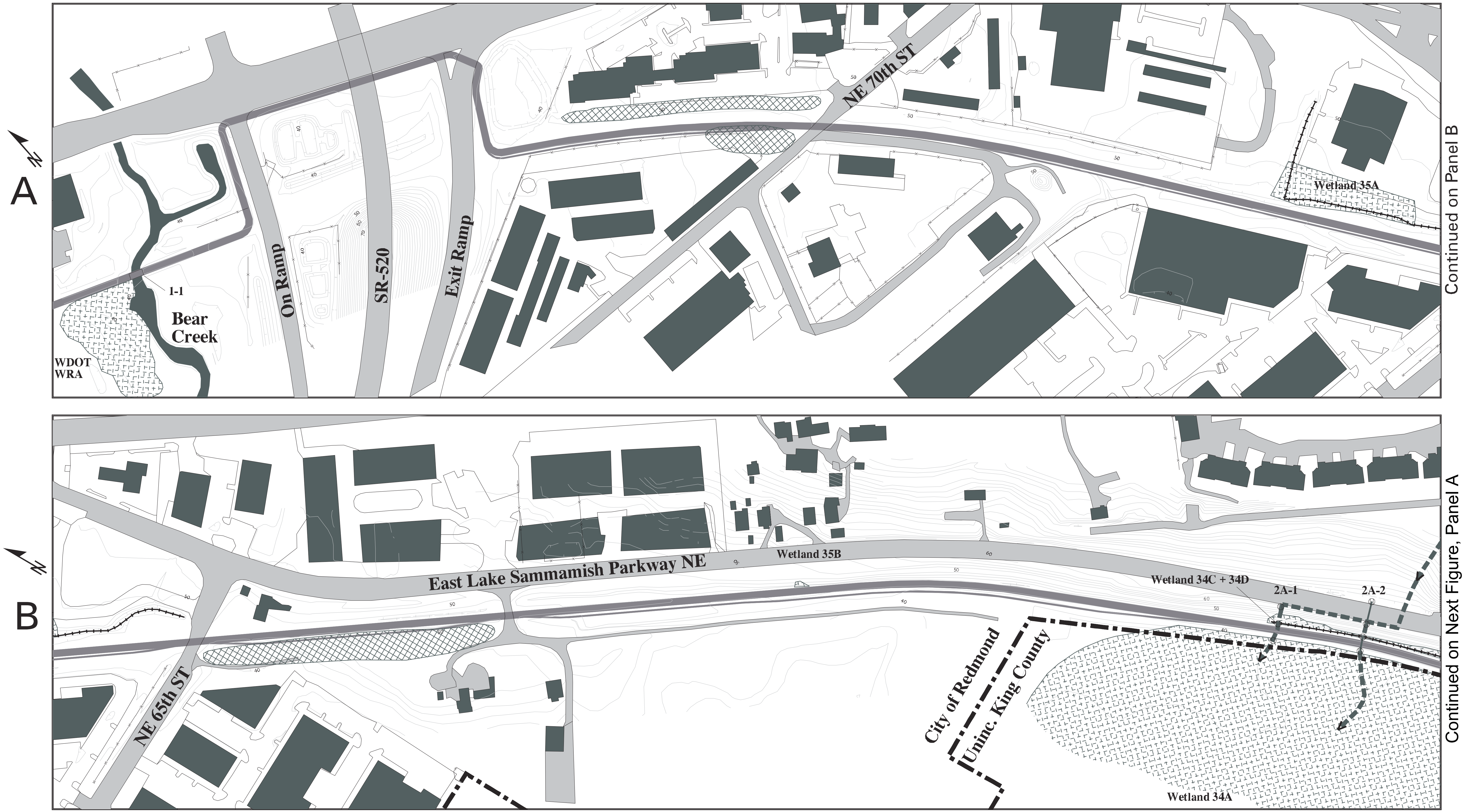
Scientific Name	Common Name
Ferns	
Athyrium filix-femina	lady fern
Blechnum spicant	deer fern
Polypodium glycyrrhiza	licorice fern
Polystichum munitum	sword fern
Pteridium aquilinum	bracken fern
Water Plants	
Alisma plantago-aquatica	broadleaf water-plaintain
Angelica genuflexa	kneeling angelica
Callitriche heterophylla	different leaved water-starwort
Lemna major	duckweed
Typha latifolia	cattail
Oenanthe sarmentosa	water parsely
Grasses, Sedges, and Rushes	
Agrostis spp.	bentgrass
Alopecurus aequalis	short-awn foxtail
Alopecurus pratensis	meadow foxtail
Anthoxanthum odoratum	sweet vernalgrass
Dactylis glomerata	orchard grass
Echinochloa crusgalli	large barnyard grass
Elyrtigia repens	quackgrass
Festuca arundinacea	tall fescue
Festuca rubra	red fescue
Glyceria elata	tall mannagrass
Holcus lanatus	common velvetgrass
Lolium multiflorum	Italian ryegrass
Lolium perenne	perennial ryegrass
Phalaris arundinacea	reed canarygrass
Phleum pratense	common timothy
Poa annua	annual bluegrass
Poa pratensis	Kentucky bluegrass
Poa palustris	fowl bluegrass
Setaria lutea	yellow foxtail
Juncus effusus	soft-rush
Juncus ensifolius	dagger-leaved rush
Juncus bufonius	toad rush
Carex deweyana	Dewey sedge
Carex obnupta	slough sedge

Scientific Name	Common Name
Luzula parviflora	small flowered woodrush
Scirpus atrocinctus	woolgrass
Scirpus microcarpus	small-fruited bulrush
Forbs	
Allium sp.	onion
Bellis perennis	English daisy
Cardamine oligosperma	bitter toothwort
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Conium maculatum	poison-hemlock
Convolvulus sepium	hedge bindweed
Conyza canadensis	horseweed
Daucus carota	Queen Anne’s lace
Dicentra formosa	bleeding heart
Dipsacus sylvestris	teasel
Epilobium angustifolium	tall fireweed
Epilobium ciliatum	Watson's willowherb
Equisetum fluvitale	water horsetail
Equisetum arvense	field horsetail
Equisetum telmateia	giant horsetail
Equisetum hyemale	scouring-rush
Galium trifidum	small bedstraw
Galium spp.	bedstraw
Geranium molle	dovefoot geranium
Geranium robertianum	herb-Robert
Geum macrophyllum	large leaved avens
Glecoma hederacea	creeping charlie
Gnaphalium chilense	cudweed
Hydrophyllum tenuipes	pacific waterleaf
Hypericum perforatum	St. Johnswort
Hypochaeris radicata	false-dandelion
Impatiens noli-tangere	impatiens
Iris pseudacorus	yellow iris
Lactuca muralis	wild lettuce
Lamium purpureum	hens bit
Lapsana communis	nipplewort
Lotus corniculatus	birds-foot treefoil
Lysichiton americanum	skunk cabbage
Lythrum salicaria	purple loosestrife
Maianthemum dilatata	wild lily-of-the-valley
Matricaria discoidea	pineapple weed

Scientific Name	Common Name
Mentha arvensis	field mint
Myositis scirpoides	forget-me-not
Plantago lanceolata	English plantain
Plantago major	broadleaf plantain
Polygonum cuspidatum	Japanese knotweed
Polygonum sachalinense	giant knotweed
Polygonum spp.	smartweed
Prunella vulgaris	selfheal
Ranunculus acris	meadow buttercup
Ranunculus repens	creeping buttercup
Rubus laciniatus	evergreen blackberry
Rubus ursinus	dewberry
Rumex acetosella	sheep sorrel
Rumex crispus	curly dock
Rumex obtusifolius	bitter dock
Scilla hispanica	Spanish bluebells
Senecio jacobea	tansy ragwort
Senecio vulgaris	old-man-in-the-spring
Solanum dulcamara	bittersweet
Stachys cooleyae	Cooley hedgenettle
Taraxacum officinale	dandelion
Tellima grandiflora	fringecup
Tolmeia menziesii	piggy-back plant
Urtica dioica	stinging nettle
Verbascum thapsus	mullein
Veronica americana	American speedwell
Veronica scutellaria	marsh speedwell
Vicia spp.	vetch
Shrubs	
Acer circinatum	vine maple
Amelanchier alnifolia	serviceberry
Corlyus cornuta	hazelnut
Cornus sericea	red-osier dogwood
Cytisus scoparius	Scots broom
Gaultheria shallon	salal
Ilex aquilinum	English holly
Lonicera involucrata	black twinberry
Mahonia aquifolium	tall Oregon-grape
Oemleria cerasifomis	Indian plum
Physocarpus capitatus	Pacific ninebark
Prunus lauroceraus	cherry laurel

Scientific Name	Common Name
Ribes divericata	gooseberry
Ribes sanguineum	red-flowering currant
Rosa canina	dog rose
Rosa nutkana	Nootka rose
Rosa pisocarpa	peafruit rose
Rubus discolor	Himalayan blackberry
Rubus spectabilis	salmonberry
Rubus parviflorus	thimbleberry
Salix lasiandra	Pacific willow
Salix sitchensis	Sitka willow
Sambucus racemosa	red elderberry
Spiraea douglasii	hardhack
Symphoricarpos albus	common snowberry
Vaccinum ovatum	evergreen huckleberry
Trees	
Acer macrophyllum	bigleaf maple
Aesculus hippocastanum	European horsechestnut
Alnus rubra	red alder
Betula papyrifera	paper birch
Betula pendula	European black birch
Crataegus monogyna	English hawthorne
Fraxinus latifolia	Oregon ash
Malus fusca	Pacific crabapple
Picea sitchensis	Sitka spruce
Populus alba	white cottonwood
Populus balsamifera	black cottonwood
Populus deltoides	quaking aspen
Populus nigra	Lombardy popular
Prunus domestica	cherry
Prunus emarginata	bitter cherry
Pseudotsuga menziesii	Douglas-fir
Rhamnus purshiana	cascara
Robinia pseudoacacia	black locust
Salix (hybrid)	willow
Salix lasiandra	Pacific willow
Salix scouleriana	Scouler's willow
Thuja plicata	western redcedar
Tsuga heterphylla	western hemlock

APPENDIX C-5. VEGETATION COVER TYPE MAPS



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0 200 400

Scale in Feet

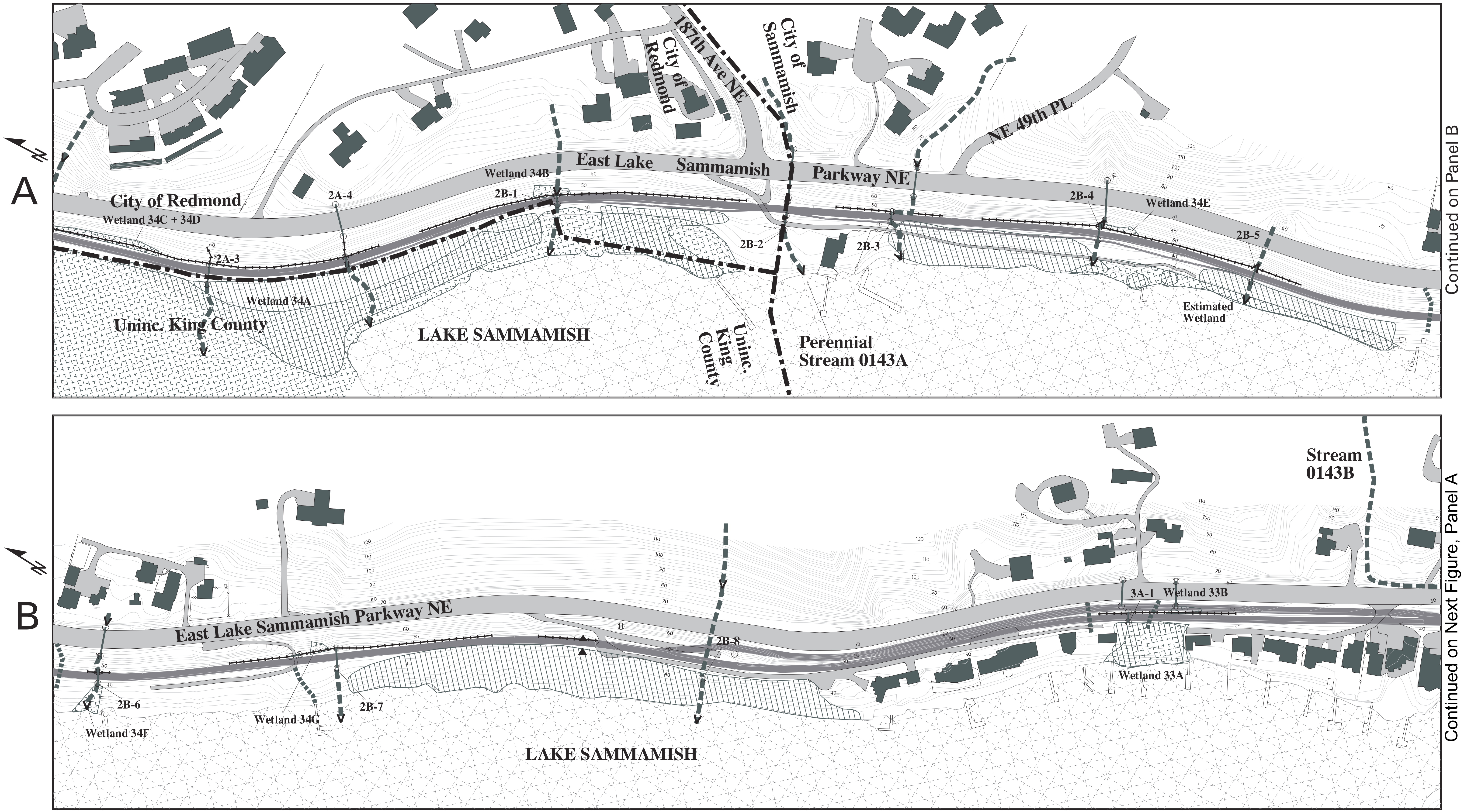
Trail Alignments
Roads
Driveways
Deciduous Trees
Coniferous Trees
Grassy Field
Wetland

Residential Path
Stream
Ditch

Unverified Culvert
Culvert Inlet or Outlet

* Areas within 30 feet of either side of the trail that are not mapped as Deciduous Trees, Coniferous Trees, or Grassy Field are classified as Urban Matrix. Urban Matrix is a mix of buildings, asphalt, ornamental gardens, and shrubby/grassy areas with scattered trees.

Attachment C-1
East Lake Sammamish Trail
Vegetation Cover Areas



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0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland
- Residential Path
- Stream
- Ditch
- ▲ Unverified Culvert
- Culvert Inlet or Outlet

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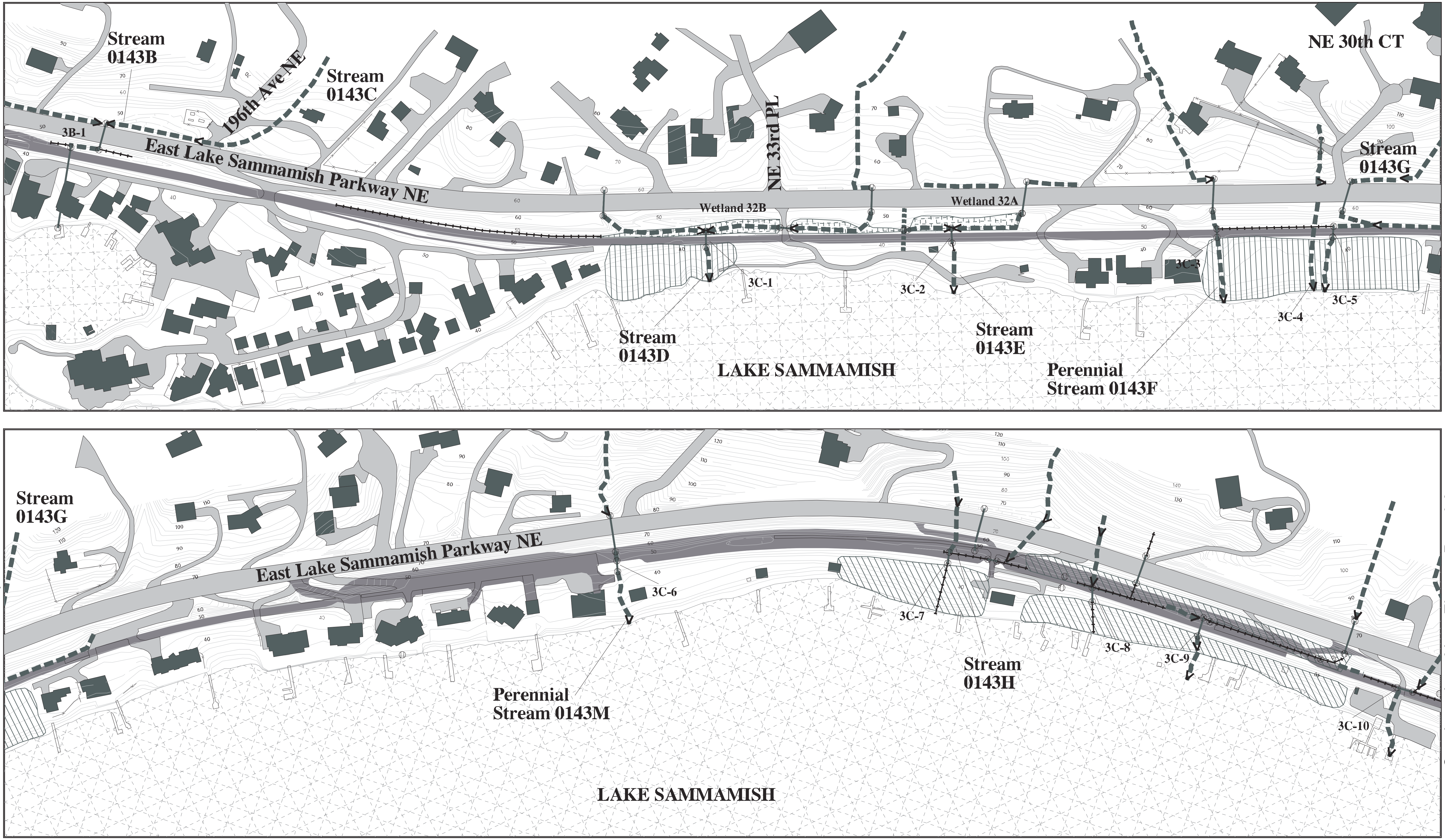
Attachment C-2
East Lake Sammamish Trail
Vegetation Cover Areas



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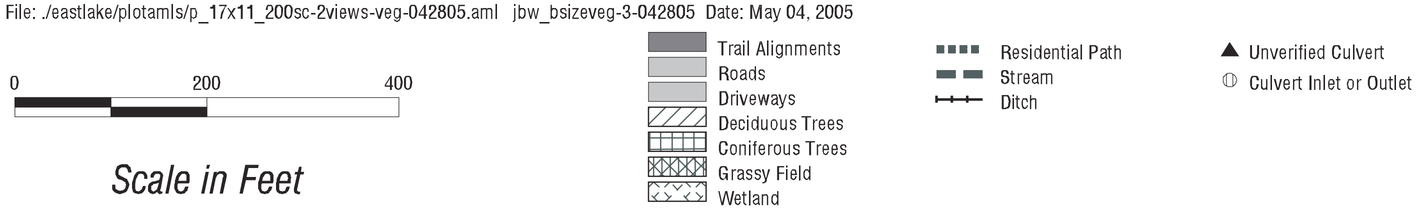

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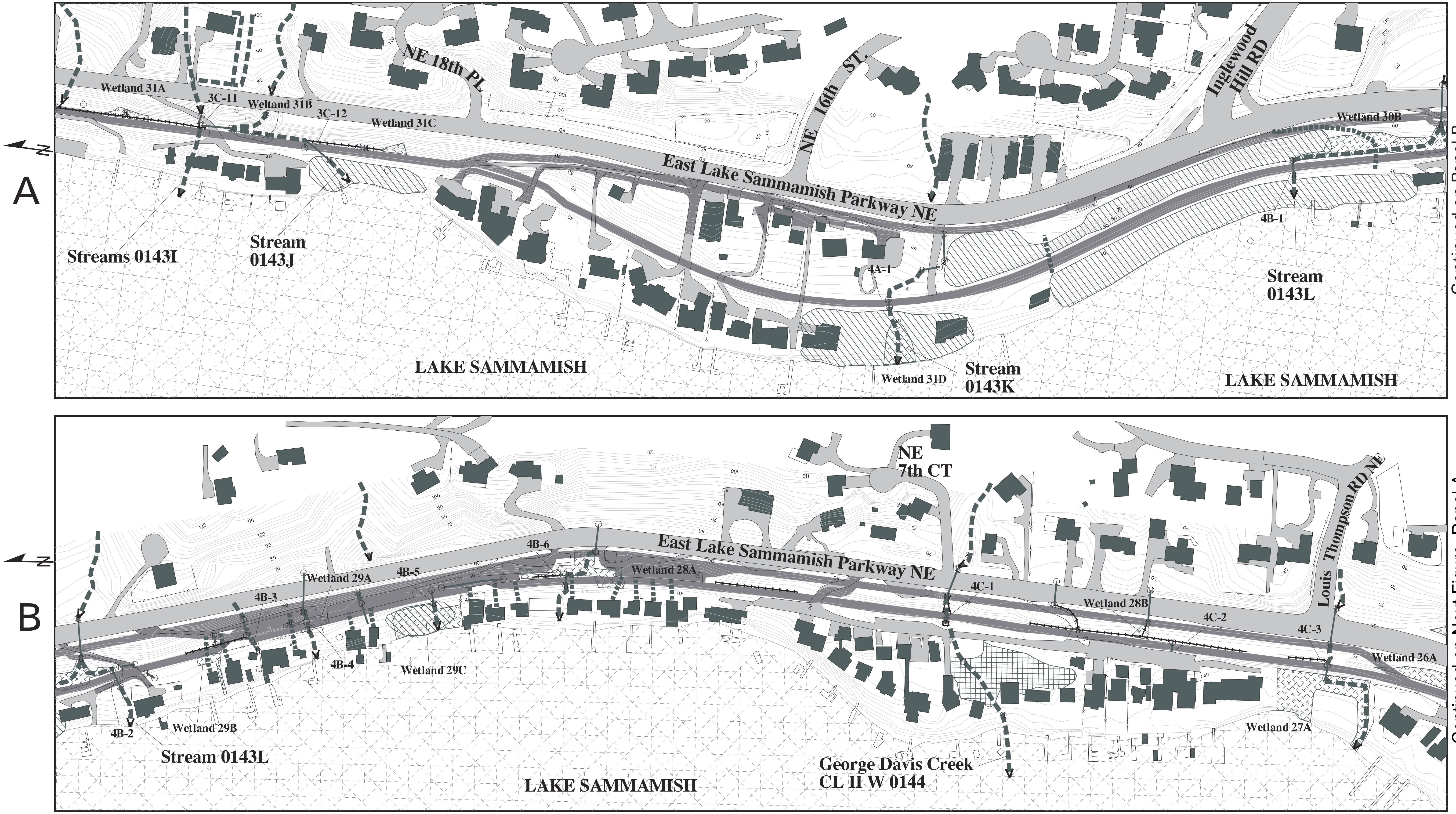
Attachment C-3
East Lake Sammamish Trail
Vegetation Cover Areas



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0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

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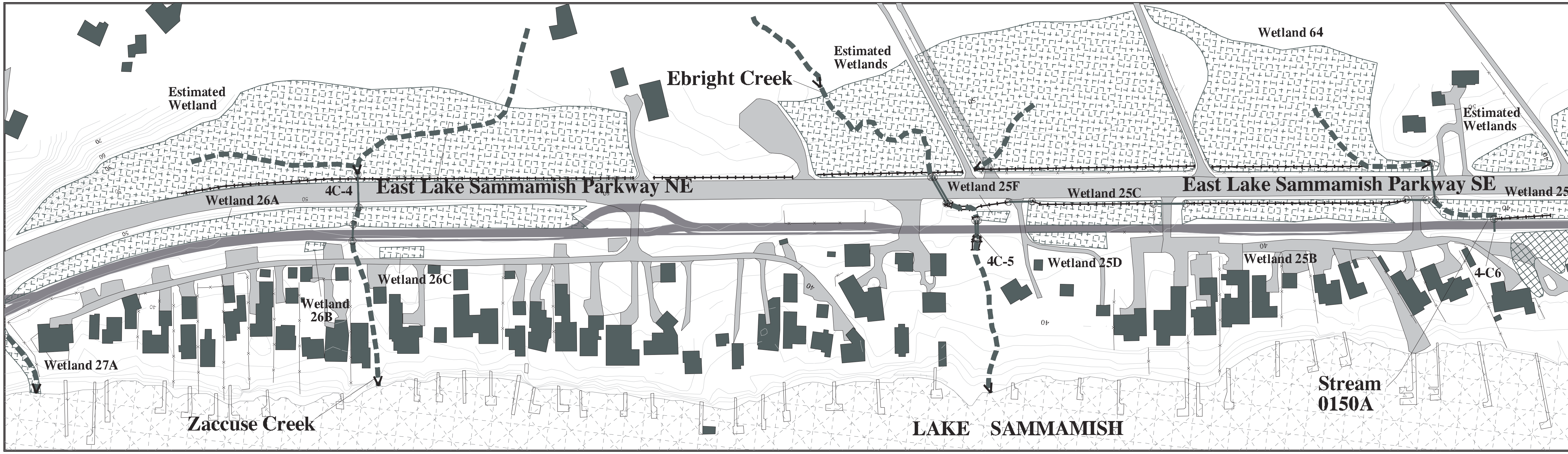
Attachment C-4
East Lake Sammamish Trail
Vegetation Cover Areas

A



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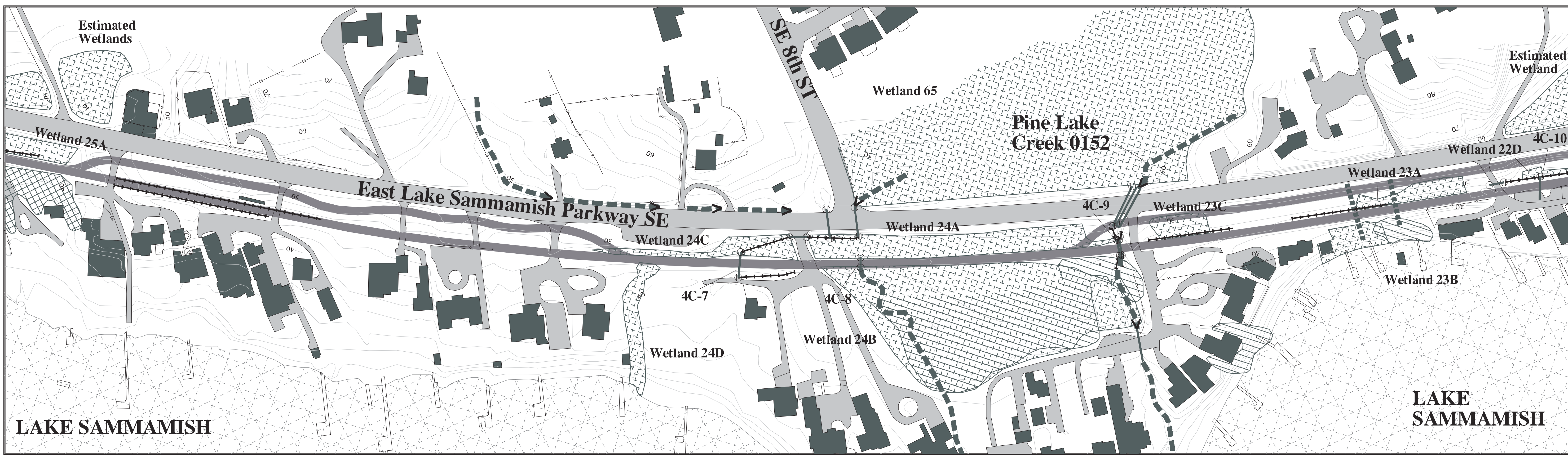

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0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland
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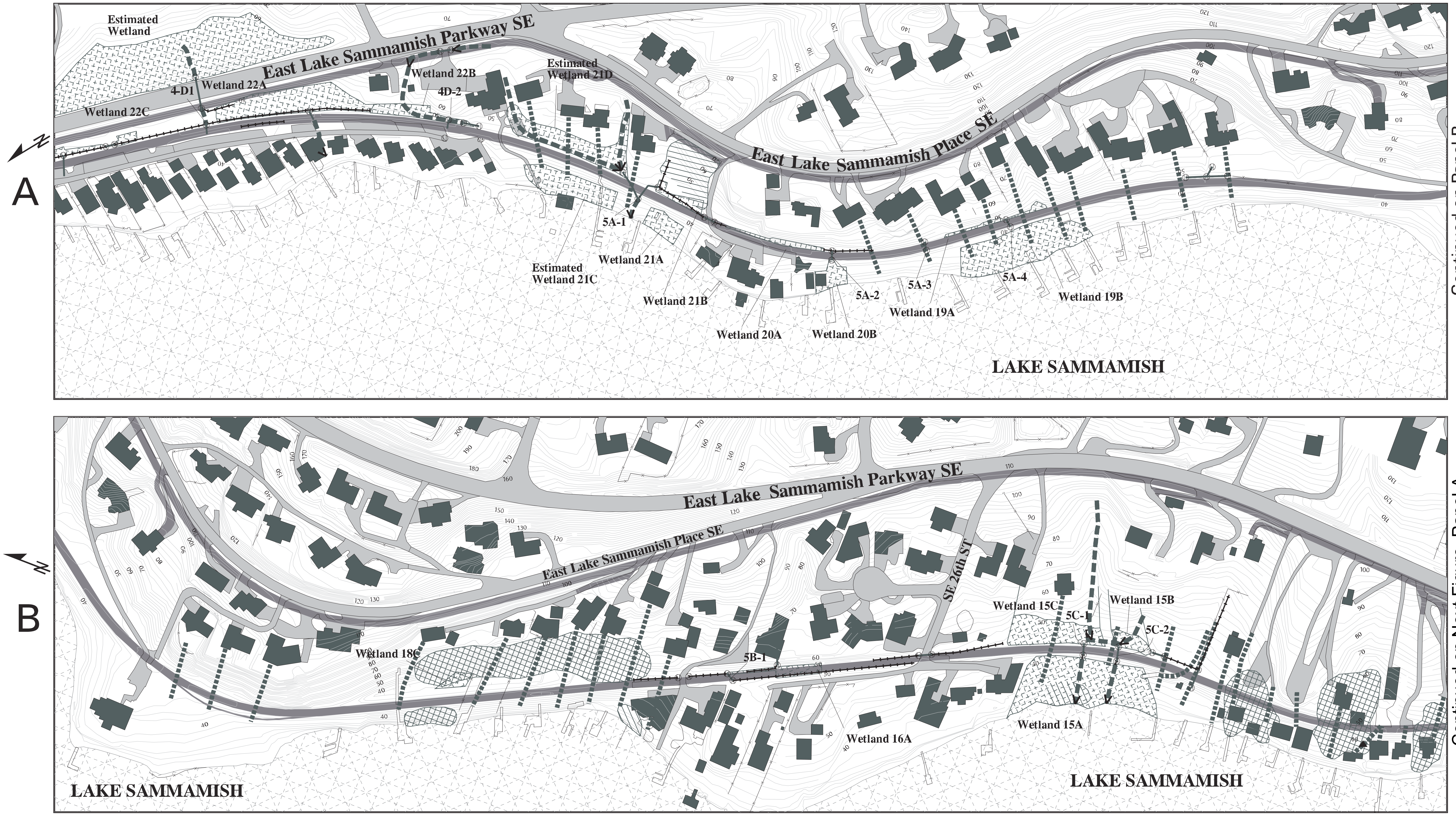
Attachment C-5
East Lake Sammamish Trail
Vegetation Cover Areas



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Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

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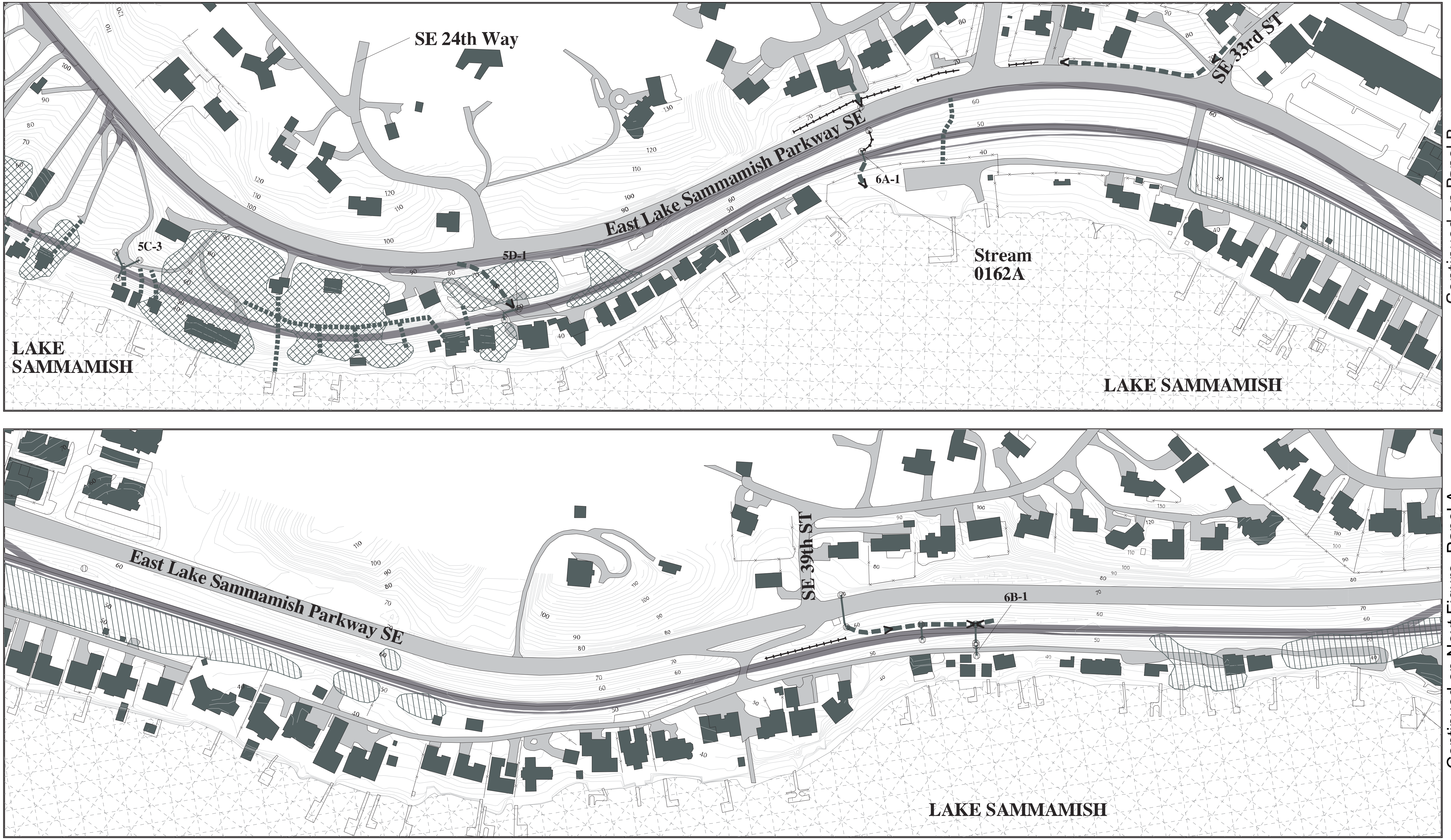
Attachment C-6
East Lake Sammamish Trail
Vegetation Cover Areas



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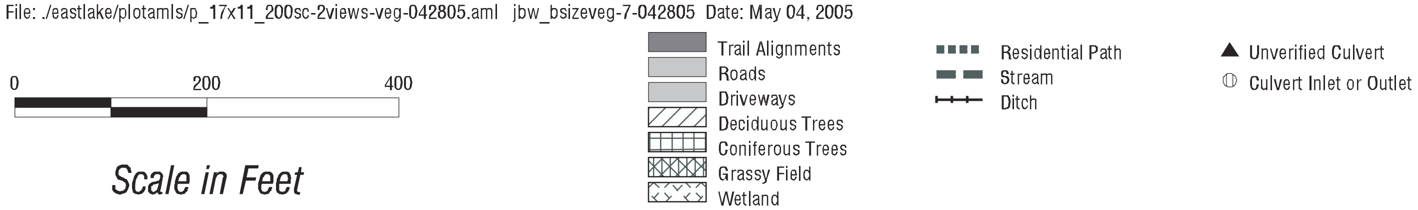

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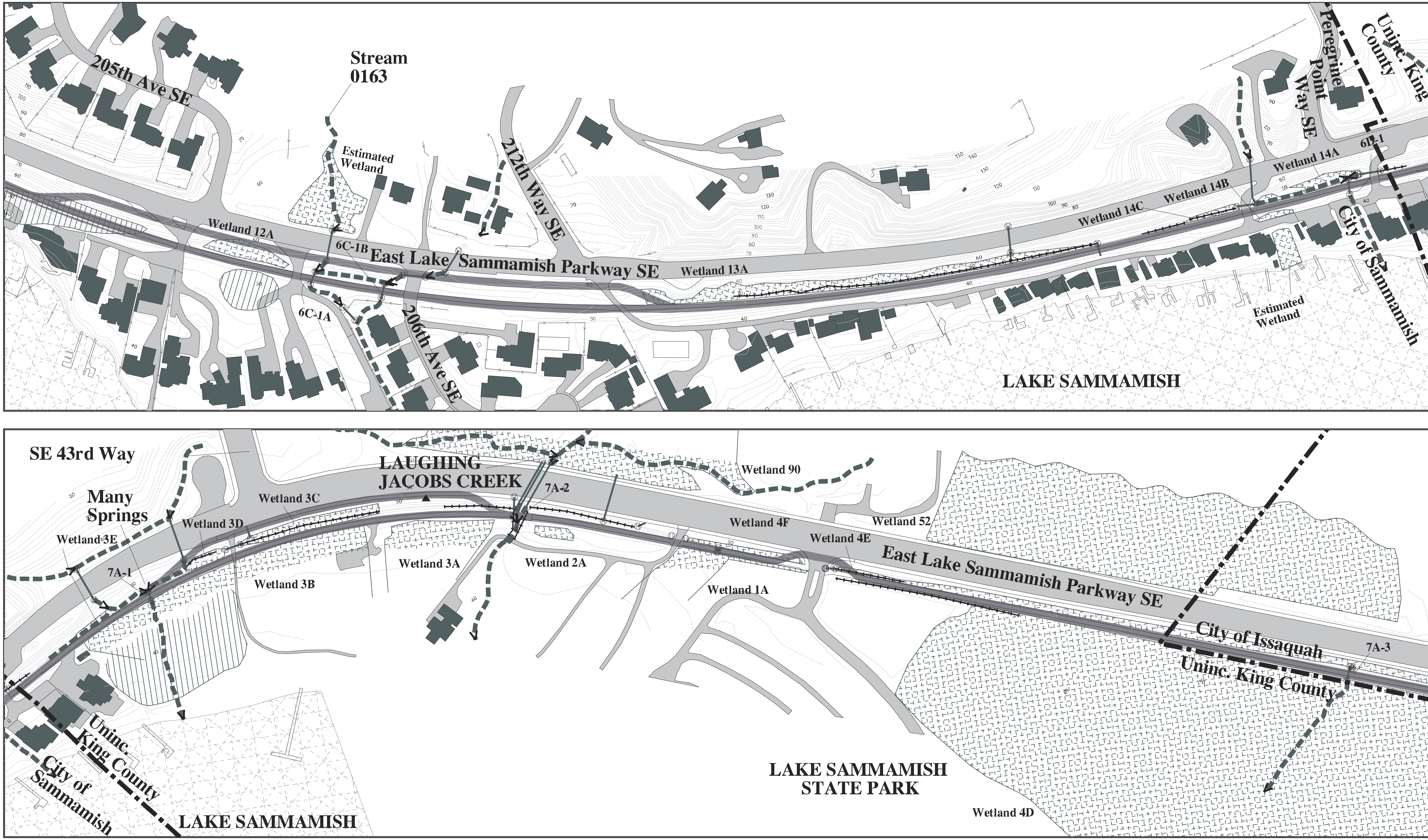
Attachment C-7
East Lake Sammamish Trail
Vegetation Cover Areas



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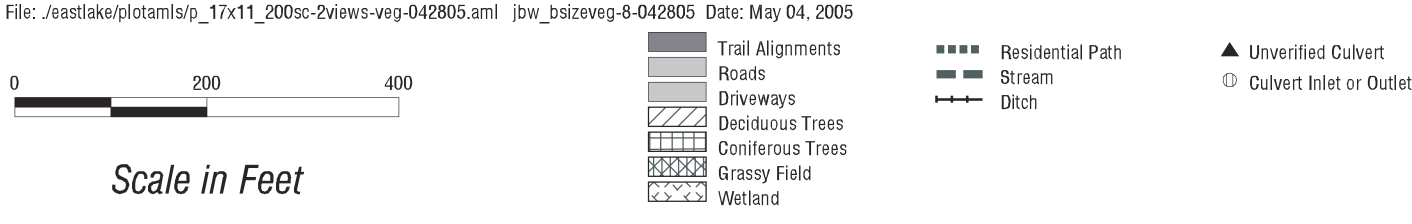

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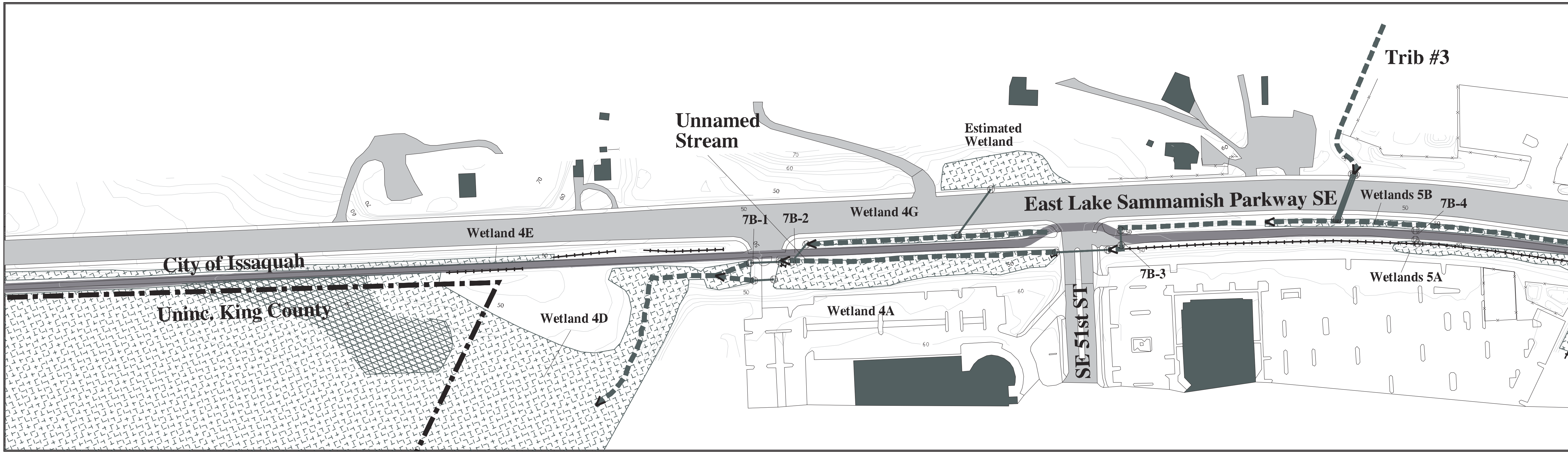
Attachment C-8
East Lake Sammamish Trail
Vegetation Cover Areas



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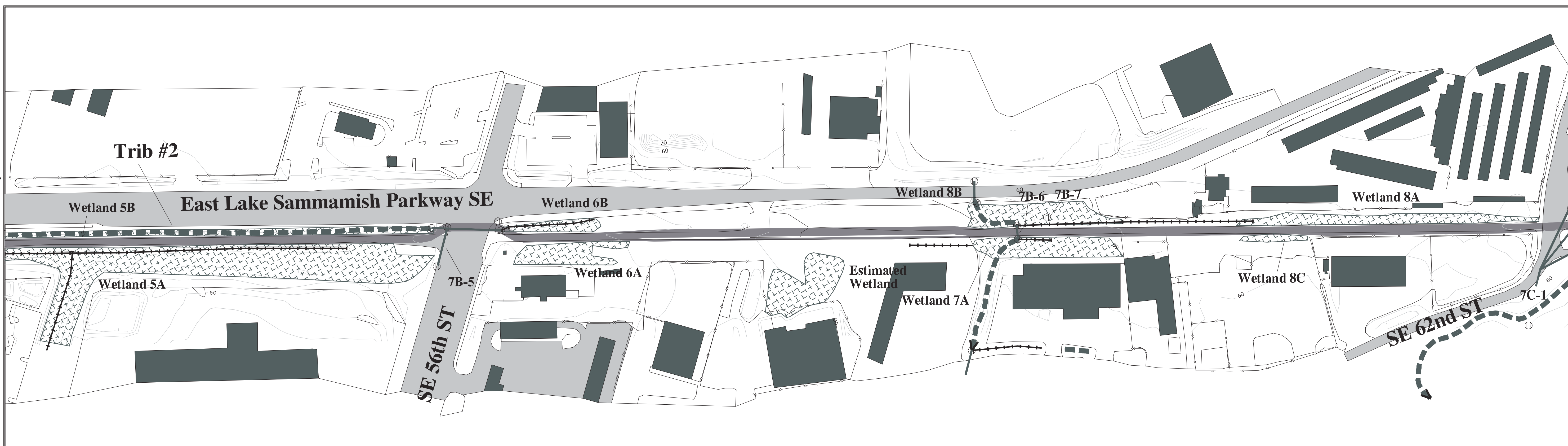

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0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland
- Residential Path
- Stream
- Ditch
- Unverified Culvert
- Culvert Inlet or Outlet

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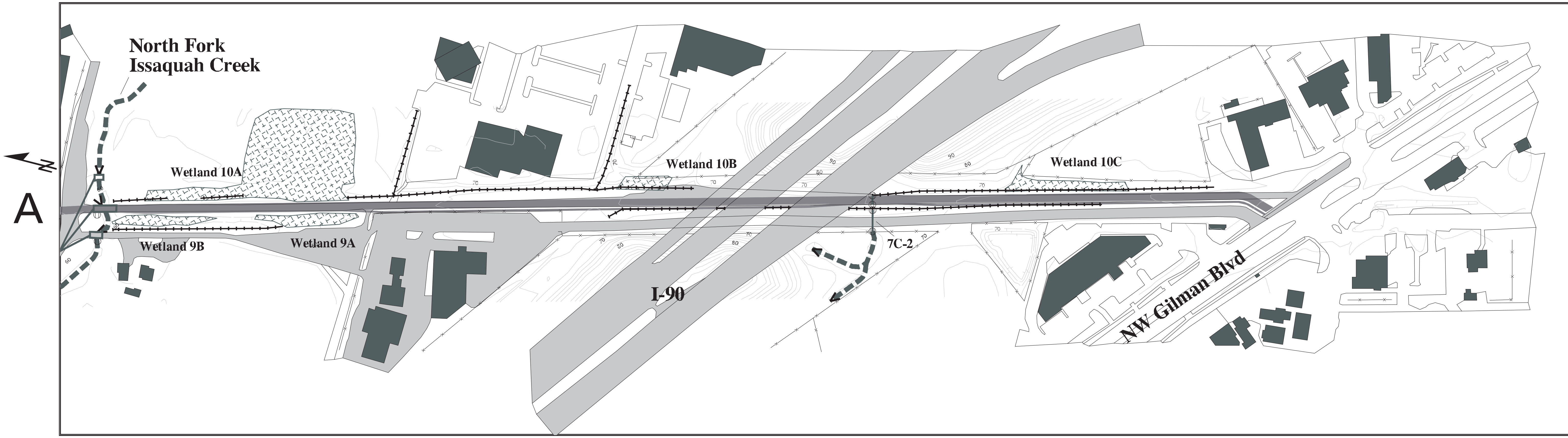
Attachment C-9
East Lake Sammamish Trail
Vegetation Cover Areas



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0 200 400

Scale in Feet

- Trail Alignments
- Roads
- Driveways
- Deciduous Trees
- Coniferous Trees
- Grassy Field
- Wetland

- Residential Path
- Stream
- Ditch

- Unverified Culvert
- Culvert Inlet or Outlet

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Attachment C-10
East Lake Sammamish Trail
Vegetation Cover Areas

Appendix D – Fish and Fish Habitat Technical Report

East Lake Sammamish Master Plan Trail Fish and Fish Habitat Technical Report

Prepared for

King County Facilities Management Division

Prepared by

Parametrix
411 – 108th Avenue NE, Suite 1800
Bellevue, WA 98004
(425) 458-6200
www.parametrix.com

October 2006

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1. INTRODUCTION

The East Lake Sammamish Master Plan Trail Fish and Fish Habitat Discipline Report is intended to provide supplemental information in support of the East Lake Sammamish Master Plan Trail EIS, and meets guidelines of the WSDOT Environmental Procedures Manual (WSDOT, 2003). This report provides additional information regarding the streams and habitat located in the study area.

Two summary tables are provided as attachments to this report. Attachment D-1 provides a comprehensive table of classified streams and unclassified water bodies within the study area, and Attachment D-2 presents a summary table of fish species known or likely to occur in the project vicinity. In addition, Attachment D-3 presents the life history of fish species in the study area and known information about fish stocking activities.

1.1 STUDIES AND COORDINATION

The evaluation of streams and fish resources located within the study area consisted of a review of available published information, consultation with local fishery agency personnel, and field reconnaissance by Parametrix biologists. Consultation with local biologists working for King County, Washington Department of Fish and Wildlife (WDFW), and area tribes, and a review of available information concerning fish use of the tributaries within the study area were used to identify potential impacts to aquatic resources. These information sources provided documentation of fish species known or expected to occur in the study area.

Existing information about fish use of the study area consisted of historic data and sightings of fish in the larger named streams that are expected to support resident and anadromous fish stocks. Due to limited property access, sampling efforts in study area streams for identifying fish presence/absence (by means of backpack electroshocking) were limited to only six stream areas where property access was established. Where reliable information on fish use was lacking, potential fish use was identified by assessing specific habitat features (e.g., spawning habitat), barriers, or other physical factors that might limit fish use.

Field evaluations occurred in December 1999; April 24 and August 9, 2000; and April 9, 2001. Field reconnaissance supplemented and, to a limited degree, updated published fishery resource information. General descriptions of the stream corridors were compiled, including descriptions of stream buffer and riparian vegetation, stream bank stability, instream habitat and cover availability, substrate composition, and fish passage obstructions. For some streams, field observations were limited to what could be viewed from public right of way because access across private property was unavailable. Specific waterways that were assessed included the nine streams known to support fish (from north to south: Bear Creek, Stream No. 0143F, George Davis Creek, Zaccuse Creek, Ebright Creek, Pine Lake Creek, perennial stream 0163, Laughing Jacobs Creek, and North Fork Issaquah Creek), and 17 other streams that potentially support fish populations. Approximately 21 small, unnamed, non-fish-bearing streams were also assessed. A map of study area streams is provided in Figure D-1.

Although information on fish use is available for some streams, it is important to recognize that substantial limitations in the data exist. Most of the fish distribution information provided in the *East Lake Sammamish Basin Conditions Report* (King County, 1990a) was obtained by visual surveys and riparian landowner interviews in 1989 (Miller, personal communication, 2000). This information is limited, however, because no physical sampling such as electrofishing was done to verify fish presence or upstream distributions.

Table D-1 summarizes existing sources of information regarding the distribution of species known to occur in the study area.

Table D-1. Sources of Existing Information Regarding the Distribution of Fish Species Known to Occur in the Study Area

Sources Reviewed for Fish Presence	Species
King County Stream Watcher Data (1998–2003)	Anadromous and resident salmonids
Ostergaard (personal communication, 1999)	Anadromous and resident salmonids
Miller (personal communication, 2000)	Anadromous and resident salmonids
Pfeifer (personal communication, 1999)	All anadromous salmonids, resident salmonids, and resident non-salmonids in Attachment D-2
Glasgow (personal communication, 1999)	Sockeye, kokanee, and coho salmon
WDF et al. (1993)	Chinook, coho, sockeye, and kokanee salmon
Myers et al. (1998)	Chinook salmon
Williams et al. (1975)	Coho, Chinook, sockeye, and kokanee salmon; coastal cutthroat and rainbow trout
WDFW (1998)	Bull trout
Bradbury and Pfeifer (1992)	Bull trout
B. Fuerstenberg, personal communication *in* FWS (1998b)	Bull trout
Berge and Higgins (2003)	Kokanee salmon
Crawford (1979)	Kokanee salmon
Pfeifer (1992)	Kokanee salmon
Ostergaard et al. (1995)	Kokanee salmon
Ostergaard (1996)	Kokanee salmon
King County (1994a)	Kokanee salmon
Gustafson et al. (1997)	Sockeye and kokanee salmon
King County (1990a)	Chinook, coho, sockeye, and kokanee salmon; coastal cutthroat and rainbow trout; largemouth bass, black crappie, brown bullhead, and yellow perch
Scott et al. (1982)	Threespine stickleback, prickly sculpin, and longnose dace
King County (1990b)	Chinook, coho, sockeye, and kokanee salmon; coastal cutthroat trout; rainbow trout/steelhead
Ecology (1994)	Kokanee salmon
King County (1991)	Coho, Chinook, sockeye, and kokanee salmon; coastal cutthroat trout
Fisher (personal communication, 2000)	Anadromous and resident salmonids
Malcom (personal communication, 2000)	Anadromous salmonids

Ecology = Washington Department of Ecology, WDF = Washington Department of Fisheries, WDFW = Washington Department of Fish and Wildlife

Information on fish in the larger streams in the study area is likely accurate. However, for the majority of the smaller perennial streams, reliable information is lacking or incomplete, and access constraints prevented verification sampling. Fish use in these systems was characterized as “unknown,” “potential,” “likely,” “unlikely,” or “none,” depending on the quantity and quality of available information.

Existing conditions or other factors that limit fish resources in the study area were identified, and this information was used in the development of specific mitigation opportunities to improve those resources. Appropriate mitigation options were identified for each project-related impact to fish resources.

1.2 WATER BODIES AND FISH USE

This section describes the water bodies that occur in the study area and associated fish use, as well as the occurrence of threatened, endangered, and other fish species of state and federal concern. Attachment D-1 lists the 46 cataloged streams and drainages that cross the King County right of way between Bear Creek and North Fork Issaquah Creek. The locations of individual stream crossings are identified by Station Number[1].

1.2.1 Lake Sammamish

Lake Sammamish has a surface area of approximately 4,900 acres and is one of the largest natural lakes in the Puget Sound Basin (King County, 1990b). Lake Sammamish receives flow primarily from Issaquah Creek and discharges through the Sammamish River to Lake Washington, Lake Union, and Puget Sound. Most of the watershed is located within the King County Urban Growth Boundary (UGB) and is (or will be) developed with high-density residential and commercial land uses (King County, 1994b).

Lake Sammamish serves as a rearing environment and migratory pathway for both resident and anadromous salmonids, with Chinook, coho, sockeye, and kokanee salmon; steelhead; and coastal cutthroat trout likely to be found in the lake and its tributaries (King County, 1990b; Pfeifer, 1992). Other than one unconfirmed anecdotal account, there is no documentation of bull trout presence in the Lake Sammamish Watershed. Tributary thermal regimes are unsuitable for reproduction by this species, and there is no known local spawning population in low-elevation tributaries of either Lake Washington or Lake Sammamish (WDFW, 1998). Lake Sammamish also contains a diverse population of resident non-salmonid species (Attachment D-2), including largemouth bass, yellow perch, brown bullhead, and black crappie (King County, 1990b).

Sub-populations of Lake Washington sockeye and kokanee salmon spawn along the shorelines of Lake Sammamish. Although actual spawner numbers are unknown, shore spawning populations have been declining in recent years (Fisher, personal communication, 2000). Historically, all of the east shore south of Weber Point supported beach-spawning sockeye salmon (Fisher, personal communication, 2000). Shore-spawning sockeye and kokanee salmon are susceptible to modification of the lakeshore, including the construction of docks, piers, bulkheads, and skirted docks and piers. These features interrupt shoreline currents and gravel movement, and modify nearshore wave action. In addition, recreational activities, particularly power boating, in the nearshore shallows can affect salmonid spawning activity and

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[1] Two sets of station numbers are used in the following discussion: the Corridor Alternative Station Numbers describe the No Action, Continuation of Interim Use Trail, and Corridor Alternatives, while the East Alternative Station Numbers describe locations for the East A and East B Alternatives.

success (Lindsay, 1992). Spawning areas can also be degraded with sediment, as scoured streambed material and fine sediment eroded from building sites and impervious surfaces are transported downstream to the lake. Vulnerable beach spawning areas include near-shore substrates that receive spring-fed upwelling, as well as alluvial fans at stream mouths.

Lake Sammamish is part of the usual and accustomed (U&A) fishing area of the Muckleshoot Indian Tribe. However, the Tribe has avoided fishing in the watershed or in Lake Sammamish to conserve salmon stocks (Malcom, personal communication, 2000). WDFW and the Tribe are co-managers of the salmon fishery within the U&A fishing area.

1.3 FISH SPECIES AND STREAM USE IN THE STUDY AREA

The approximately 11-mile project corridor crosses 46 streams and smaller drainages (i.e., those with visible surface flow). With few exceptions (e.g., Bear, Laughing Jacobs, and North Fork Issaquah Creeks), streams that flow into Lake Sammamish pass underneath East Lake Sammamish Parkway through one or more culverts (both concrete and corrugated metal pipe [CMP]) upstream of the Interim Use Trail (i.e., the former railbed). Most of the streams in the study area also pass through concrete, CMP, tile, or corrugated plastic culverts under the Interim Use Trail. Appendix B of the *East Lake Sammamish Trail Surface Water and Water Quality Discipline Report* (Parametrix, 2004) contains a complete list of the culvert specifications and current conditions. Currently, many of the smaller channels convey runoff and springs from the adjacent hillsides above East Lake Sammamish Parkway. Some of these drainages are associated with the wetlands identified along the various alternative trail alignments. The larger streams crossed by the Interim Use Trail originate at larger wetland areas or small lakes on the adjacent Sammamish Plateau. Several of these streams are currently known to provide at least some fish habitat for anadromous and/or resident salmonid species, including coho, fall Chinook, and sockeye/kokanee salmon; rainbow trout; and cutthroat trout (see Attachments C-1 and C-2). Although other streams within the study area also previously supported salmonid populations, shoreline development, road and railroad construction, and other activities destroyed fish habitat and/or created impassable barriers to upstream fish passage.

Most of the streams along the project corridor are short and steep, running through cut ravines while gathering groundwater from the adjacent slopes (King County, 1990b). Some drainages are ephemeral and flow only after rainfall (e.g., Tributaries 0143C, 0143E, 0162A), while most of the remainder are considered intermittent in the upper reaches of the plateau and are dry from July through September, which prevents them from providing juvenile salmonid rearing habitat (King County, 1990b). Only Laughing Jacobs Creek (Tributary 0166) and Pine Lake Creek (Tributary 0152) flow year-round as they cross the plateau, providing some reaches of excellent fish habitat as they descend from the plateau to Lake Sammamish (King County, 1990b). In these reaches, gradients vary from 2 to 3 percent, with gravel substrate and moderate amounts of large woody debris (LWD) forming pools and spawning riffles (King County, 1990b). Depending on stream size, kokanee, coho, and Chinook salmon may use this habitat. Where the gradient approaches 5 percent through the ravines, the streams form tiers or staircase features that result in patchy gravel and small volume pools favored by trout (King County, 1990b).

Historically, most of the streams emptying into Lake Sammamish from the east contained endemic populations of anadromous and adfluvial (lake spawning) fish in their lower reaches. However, most of this fish use has been eliminated by various human-induced changes in the watershed (King County, 1990b). Compared to Bear Creek and North Fork Issaquah Creek, which are in separate but adjacent watersheds, the streams of the East Lake Sammamish Watershed do not produce large numbers of anadromous fishes. Of approximately 27 miles of stream in the East Lake Sammamish Watershed, 4 miles are accessible to anadromous fish (perhaps 8 to 10 miles were accessible historically) (King

County, 1990b). Three of the four miles occur in only three tributaries: Pine Lake Creek, Kanim Creek (a tributary of Pine Lake Creek), and Laughing Jacobs Creek (see Figure D-1). The remaining mile of accessible habitat is divided among five other streams and tributaries: George Davis Creek, Zaccuse Creek, Ebright Creek, and Tributary 0163.

1.4 FISH-BEARING STREAMS

Anadromous and adfluvial fish production is generally restricted to the lower reaches of the area streams, typically below barriers at or downstream of the Interim Use Trail or East Lake Sammamish Parkway, where the streams flow across the alluvium that has been deposited along the Lake Sammamish shoreline (King County, 1990b). These reaches have 1 to 2 percent gradients and extensive gravel riffles for salmon spawning. Streams with culvert barriers at the East Lake Sammamish Parkway include George Davis Creek, Zaccuse Creek, and Tributary 0163 (King County, 1990b). In addition, several streams have multiple culvert barriers (George Davis Creek has a second culvert barrier at river mile [RM] 0.81, Kanim Creek at RM 0.60, and Laughing Jacobs Creek at RM 2.4) that can further isolate resident populations and may prevent upstream recolonization (King County, 1990b).

Based on multiple reconnaissance efforts and information provided by WDFW (Priority Habitats database records) and King County (Surface Water Management Division), the streams discussed in the following subsections are known to support salmonids now or in the recent past. Some of these streams (which are presented from north to south) may also support other resident fish species. Class 1 streams are those classified as Waters of Statewide Significance under the Shorelines Management Act of 1971. Class 2 streams are perennial *or* support some salmonid fish use. Class 3 streams are intermittent and have no fish use (Miller, personal communication, 2000). The following describes the nine streams in the study area with known or reported fish use.

1.4.1 North Fork Issaquah Creek (Class 2 with Salmonids)

The North Fork of Issaquah Creek lies in the North Fork Issaquah Creek Basin, which covers 2,855 acres (4.5 square miles) of mainly low-elevation terrain. The stream begins at Yellow Lake on Grand Ridge and flows 3.7 miles to its confluence with the mainstem of Issaquah Creek (RM 1.8 of Issaquah Creek, Stream No. 0178), which supports the largest population of salmon in the Lake Sammamish Watershed. Stream habitat in the North Fork Issaquah Creek Basin is of high quality and is well dispersed (King County, 1991).

Potential salmon use of Issaquah Creek by coho and sockeye salmon is in the lower 12 miles of the mainstem, 5.5 miles of the East Fork Issaquah Creek, 1 mile of the North Fork Issaquah Creek, 1.5 miles of Fifteen Mile Creek, and 2.5 miles of Carey Creek (Williams et al., 1975). Several Chinook salmon carcasses were found in the North Fork Issaquah Creek in the late 1970s (it is unknown whether these were hatchery strays or wild fish) and there have been no surveys of the North Fork since that time (King County et al., 2001). Based on the lack of data, use by Chinook salmon is conservatively classified as undetermined by WDFW (Fisher, personal communication, 2000). However, WDF et al. (1993) and Muckleshoot Indian Tribe Fisheries Department (MITFD) et al. (1999), which were prepared by local management biologists, ascribe no use by Chinook salmon to the North Fork.

Although the state salmon hatchery located on Issaquah Creek (at RM 3.1) controls the number of salmon that pass upstream to spawn naturally, all fish have access to the North Fork and East Fork when sufficient flows allow passage (Williams et al., 1975). Coho and kokanee/sockeye salmon and cutthroat trout use the lower reach of North Fork Issaquah Creek (King County, 1991). There is an impassable falls/cascade approximately 0.5 mile upstream of the Interim Use Trail crossing, with concentrated salmonid spawning areas downstream of the barrier. On the date of a previous stream survey by a Parametrix biologist (December 21, 1999), no evidence of spawning (redds) or fish were visually observed within 100 feet of the project corridor.

The upper reaches of the stream follow a prehistoric glacial meltwater channel, forming a low-gradient stream fed by four much steeper lateral tributaries. The lower portion of North Fork Issaquah Creek, in contrast, abruptly drops 200 feet at a 10 percent gradient to the valley floor (King County, 1994b).

Flooding is confined largely to the lower portion of the channel below East Lake Sammamish Parkway, where the gradient is relatively flat. The lower reaches of the North Fork of Issaquah Creek have dried up in recent summers because of the depletion of groundwater in headwater areas.

Residences are constructed close to the stream channel near its mouth, including at least nine houses and several commercial structures (storage buildings) (King County, 1994b). This is also the stream section crossed by the project corridor.

Riparian land uses near the Interim Use Trail crossing include a private residence on the southwest stream bank (accessed via a bridge 100 feet downstream of the project corridor), SE 62nd Street (which lies 30 feet to the north), and commercial storage 100 feet to the northwest of the project corridor (across SE 62nd Street). In addition, there is an abandoned wooden bridge approximately 75 feet upstream of the corridor, which is in disrepair. Southeast 62nd Street parallels the stream in the vicinity of the corridor.

A wet ditch, fed by Wetland 10 to the southeast of the project corridor, empties into the North Fork Issaquah Creek about 10 feet upstream of the Interim Use Trail. Wetland 9 lies to the southwest, near the private residence (see the plan drawings provided in Volume II, sheet number 2). Farther upstream, approximately 150 feet east along SE 62nd Street, a small seep empties into the stream from the north. An oily sheen was observed in this area in the summer of 2001.

The existing stream crossing at the Interim Use Trail consists of a low-rise wooden span supported by wood pilings set along both sides of the stream channel. The design does not appear to impede fish passage and poses no problems for fish resources (White, 1999). The bridge appears to be in good condition and would not likely require extensive retrofitting, such as additional bridge supports. Pedestrian handrails and trash guards were constructed on this bridge in conjunction with the construction of the Interim Use Trail. The stream experiences 100-year flood flows of 510 cfs. The Federal Emergency Management Administration (FEMA) flood insurance rate map indicates no overtopping of the bridge.

The channel substrate at the bridge crossing is primarily composed of 40 percent silt/sand, 40 percent gravel, 10 percent boulder, and 10 percent cobble. Directly beneath the stream crossing, the cobble is embedded. Bank stability in this reach is good except for erosion present in the clay beneath the north end of the railroad trestle. Farther downstream (approximately 100 feet) below the private residence, the stream banks show signs of substantial erosion.

The channel morphology in this reach consists of pool/glide combinations. There are two good quality pools 100 to 150 feet upstream of the project and one pool (with riprap bank stabilization) downstream of the rail bridge but upstream of the private bridge. Large woody debris includes a black cottonwood in the stream channel (and three or four more black cottonwood trees in the riparian zone for future LWD recruitment) 100 feet upstream of the rail bridge. There is a 10-foot by 10-inch log below the trestle at the project corridor. Downstream of the private bridge, the stream has abundant LWD. In addition, four creosote pilings beneath the bridge have been cut off at the low flow waterline.

Riparian vegetation in the immediate vicinity of the bridge is primarily reed canarygrass and horsetail with thick overhanging Himalayan blackberry. Black cottonwood and red alder are the primary tree species in the area.

Upstream of East Lake Sammamish Parkway are two impassible barriers. The entire stream is listed as a problem area for water quality and erosion/sedimentation (Ecology, 1994). See Section 3.2 of the EIS for information on the water quality of the stream.

1.4.2 Laughing Jacobs Creek (Class 2 with Salmonids)

Laughing Jacobs Creek lies in the Laughing Jacobs Basin of the East Lake Sammamish drainage. The stream is 4.90 miles in length, with 0.57 mile available to anadromous and adfluvial fish (see Attachment D-1). Available information indicates that Laughing Jacobs Creek supports late run kokanee salmon spawning (Berge and Higgins, 2003), as well as cutthroat trout spawning and rearing (throughout most of its length). Some coho (spawning and rearing) and sockeye salmon may also utilize the lower reach (Williams et al., 1975; King County, 1990b). A series of cascades in a steep ravine at RM 0.57 (upstream of the study area) serves as a natural barrier to upstream fish migrations (Williams et al., 1975). Below the barrier, the stream possesses characteristics that support salmonid habitat (King County, 1990b).

Laughing Jacobs Creek has excellent pool/riffle habitat just above the cascades at RM 0.57 (upstream of East Lake Sammamish Parkway). Beyond RM 0.57 the gradient drops to less than 1 percent and pools dominate the instream habitat. A second culvert barrier exists at RM 2.4 (King County, 1990b). On the dates of the stream surveys by Parametrix biologists (April 6, 2001, and December 13, 1999), no fish were visually observed in the stream within 100 feet on either side of the former railbed.

At the Interim Use Trail, the stream crossing consists of a low-rise, 45-foot wooden span supported by wood pilings set along both sides of the stream channel, with additional supports placed in the middle of the channel. The bridge appears to be in good condition and would not likely require extensive retrofitting. Handrails and trash guards were added to this bridge in conjunction with the construction of the Interim Use Trail. Just upstream from the crossing, Laughing Jacobs Creek flows underneath East Lake Sammamish Parkway through two open-bottom culverts (one box and one flattened CMP).

The stream has 25- and 100-year flood flows of 105 and 132 cfs, respectively. However, flow can be intermittent during summer months (Williams et al., 1975). The channel substrate at the site is primarily a mix of 30 percent sand and 70 percent embedded gravel and cobble. The channel does not appear to be downcutting its bed in this reach.

There are riparian buffers of greater than 100 feet on both the north and south sides of the stream. Riparian vegetation consists of red alder, Himalayan blackberry, reed canarygrass, and horsetail. Overhanging vines and branches form a thick canopy just downstream from the bridge. Bank stability is good near the project area, but the water was muddy during the survey in the summer of 2001.

Fish habitat appears adequate, with suitable flows and cover present in this reach. Channel morphology consists primarily of glides, with one pool immediately below the Interim Use Trail. Overall pool quality is adequate but could be improved. Large woody debris within the stream channel consists of a black cottonwood log (10 feet by 24 inches) approximately 10 feet downstream of the Interim Use Trail but 1 to 2 feet above the water and a second log 40 feet further downstream.

Salmonid habitat on the Sammamish Plateau has been degraded by past agricultural practices, such as ditching, clearing, and poor pasture management; only short reaches have not been straightened or dredged to drain fields more rapidly or to eliminate wetlands. Upstream of Laughing Jacobs Lake (also known as Wetland 26), the stream mainstem has undergone extensive dredging upstream of the wetland at SE 24th Street (King County, 1990b). For example, in October 1989, Tributary 0167 to Laughing Jacobs Creek was illegally dredged, which sent large amounts of sediment into the stream and eventually into Lake Sammamish (King County, 1990b).

Urbanization is another leading cause of adverse impacts to this stream. With urban development, riparian forests have been cleared and sediment production has increased dramatically. This chronic fine-sediment deposition has substantially reduced the stream's capability to support salmon spawning activity (King County, 1990b). This reduction in productivity was the result of erosion in a lateral tributary caused by excessive flows from development, combined with flows from active sloughs along the mainstem ravine below the cascades at RM 0.57 (King County, 1990b). See Section 3.2 of the EIS for information on the water quality of the stream.

1.4.3 Stream No. 0163 (Class 2 with Salmonids)

Tributary 0163 lies in the Monohon Basin and is identified as a salmonid-bearing stream. Although no current information on salmonid usage is available from the resource agencies, Tributary 0163 is believed to be suitable for coho salmon (rearing), cutthroat trout (spawning and rearing), and rainbow trout (rearing) (King County, 1990b). The stream has two forks that join a short distance downstream of East Lake Sammamish Parkway. The north fork (0163A) carries far less volume than the south fork (0163B), is not believed to support fish, and is not accessible to fish because of piping below the Interim Use Trail (i.e., the former railbed). Only trace flow was observed in this fork by Parametrix biologists on April 24 and August 9, 2000. The south fork (0163B) is 0.7 mile in length with only about 0.1 mile accessible to non-resident fish (King County, 1990a). There are no impassible barriers at or downstream of East Lake Sammamish Parkway, but an 18-inch concrete pipe just upstream of the Parkway may be a velocity barrier at times.

Prior to the creation of the fish barrier(s) near the East Lake Sammamish Parkway, this stream likely supported kokanee and/or sockeye salmon. It may still support some cutthroat and kokanee below the Parkway. The south fork passes under the Interim Use Trail in a single 24-inch-diameter clay pipe, which is in fair condition, although partially blocked with sediment and vegetation. The culvert beneath the Interim Use Trail, a large squash pipe beneath 206th Avenue SE, and a 36-inch culvert beneath the Parkway are not fish barriers. Downstream of the Interim Use Trail, the stream flows in an artificially constructed channel, passing through the backyards of three residences before emptying into Lake Sammamish. No riparian buffer is present in this reach. On the dates of the two different field evaluations by Parametrix biologists (December 13, 1999, and April 9, 2001), no fish were visually observed in the stream within 100 feet on either side of the former railbed.

Riparian vegetation in this reach of the stream consists of Himalayan blackberry, reed canarygrass, red alder, and a black cottonwood tree. There are 10 to 15 ornamental cedar trees screening the private driveway 15 feet to the west of the Interim Use Trail.

Bank stability is good downstream of the Interim Use Trail (50 percent gravel/50 percent cobble), but poor immediately downstream of East Lake Sammamish Parkway (100 percent sand and silt). No LWD is present in either reach. Pool quality in this stream is poor overall.

The lower reaches of the stream have been identified as a problem area for habitat loss and flooding (Ecology, 1994). The geology of this stream includes sand underlying much of the western slope (Ecology, 1994). As a result, stream-channel incision is ubiquitous.

1.4.4 Pine Lake Creek (Class 2 with Salmonids)

Pine Lake Creek is a 2.84-mile-long stream in the Pine Lake Basin. Records indicate that Pine Lake Creek supports late run kokanee salmon spawning (Berge and Higgins 2003) in the lower reach. In addition, sockeye salmon or stray Chinook salmon may also utilize the lower reaches of the stream.. Resident cutthroat trout (spawning and rearing) and rainbow trout (spawning and rearing) are reportedly found throughout the stream to its headwaters, with resident-only fish present above RM 1.8 (King County, 1990b). This likely refers to Kanim Creek (a tributary to Pine Lake Creek) because the outlet of Pine Lake typically dries up in the late summer and fall, leaving a dry channel at least several hundred yards to the site of a now-removed outlet screen structure (WDFW file records, Mill Creek). Excellent riffle/pool habitat remains in the lower reaches, especially where the stream descends from the plateau to Lake Sammamish. On the dates of stream surveys by Parametrix biologists (April 9, 2001, and December 1 and 9, 1999), no fish were visually observed in the stream within 100 feet on either side of the project corridor.

At the Interim Use Trail (i.e., the former railbed), the stream is diverted under the railroad ballast through two 36-inch concrete culverts. One of the culverts was partially filled with gravel at the upstream opening. The stream experiences 25- and 100-year flood flows of 64 and 78 cfs, respectively. Approximately 100 feet downstream of the Interim Use Trail, the stream passes through a 36-inch round culvert under a private driveway. Downstream of the private driveway, King County DNRP has placed eight 4-inch pieces of LWD within the stream, as part of a restoration project. The stream empties into Lake Sammamish approximately 500 feet downstream of the Interim Use Trail.

Immediately downstream of the Interim Use Trail, there are two root wads. In 1999, King County DNRP placed approximately 10 logs in and across the stream channel in this reach and planted riparian vegetation in an effort to increase habitat diversity. Riparian buffers total approximately 100 feet on the north and 10 to 20 feet on the south. Riparian vegetation consists of black cottonwood, reed canarygrass, horsetail, ferns, and Himalayan blackberry.

Channel morphology within 100 feet of the corridor consists of riffle/glide/pool combinations. Substrate composition is suitable for salmonid spawning upstream of the Interim Use Trail, with cobble and gravel the predominant substrate. However, the plunge pool immediately downstream of the Interim Use Trail culverts appears to contain only silt and sand.

Approximately 50 feet upstream of the Interim Use Trail, the stream flows under East Lake Sammamish Parkway, through a 4-foot by 3-foot concrete box culvert and a 36-inch round CMP. All of the streamflow appears to pass through the box culvert, with no flow in the CMP. In the pool located downstream of the box culvert outlet, two large root wads provide bank stabilization and instream fish habitat.

Urbanization is a leading cause of adverse impacts to this stream. With urban development, riparian forests have been cleared and sediment production has increased dramatically. Effects of urbanization upstream of the project can already be seen in this stream, and further increases in stream discharge are to be expected (King County, 1990b).

Upstream from Pine Lake, both Pine Lake Creek and Kanim Creek have been identified as problem areas for erosion/sedimentation, water quality, and habitat loss (Ecology, 1994). See Section 3.2 of the EIS for information on the water quality of the stream.

1.4.5 Ebright Creek (Class 2 with Salmonids)

Located in the Thompson Basin, Ebright Creek is known to support late run kokanee spawning (Berge and Higgins, 2003) as well as potentially supporting some coho salmon (spawning and rearing), or sockeye salmon (spawning) in the lower reaches downstream of a man-made fish barrier. Ebright Creek also supports cutthroat trout (spawning and rearing) and rainbow trout (spawning and rearing) throughout the stream (see Attachment D-1) (King County, 1990b). The stream is 2.65 miles in length. In the lower reaches, the stream has characteristics that favor spawning and rearing of coho salmon and spawning of sockeye and kokanee salmon (King County, 1990b). Farther upstream, the gradient sometimes approaches 5 percent through the ravines, forming tiered or staircase features that result in patch gravel and small volume pools that are favored by trout (King County, 1990b). On the date of a previous stream survey by a Parametrix biologist (December 1, 1999), six adult kokanee salmon (25 to 35 centimeters [cm] in length) were observed spawning within 10 feet of the former railbed and two redds were observed. An adult coho salmon carcass was also found on the stream bank, 5 feet to the east of the former railbed. On December 9, 1999, two adult coho salmon spawners were observed in the stream adjacent to the former railbed. The King County Volunteer Salmon Watcher Program reported over 100 kokanee between RM 0.2 and RM 0.9 during November and December 2001 (Vanderhoof, 2002). In addition, one coho salmon was reported at RM 0.2.

Channel morphology downstream of the Interim Use Trail (i.e., the former railbed) is a riffle/pool combination. Pool quality is excellent, with two pools directly downstream of the project corridor. The stream banks immediately below the corridor are stable, having been stabilized with the placement of three pieces of LWD (10 to 50 feet long, 18 to 24 inches in diameter) and large boulders. More LWD has been added in the stream channel downstream of the Interim Use Trail.

At the Interim Use Trail, the stream flows through two 36-inch concrete culverts, both of which are in good condition and unblocked. The stream undergoes 25- and 100-year flood flows of 39 and 45 cfs, respectively. However, the culverts beneath the Interim Use Trail may block fish migration at high flows (White, 1999).

Substrate composition consists of 20 percent cobble, 50 percent gravel, and 30 percent sand and silt, forming habitat suitable for adult salmonid spawning. However, a substantial concentration of sediment and fines (greater than 80 percent composition) was observed at the tail end of the pool immediately downstream of the culverts crossing the Interim Use Trail. Although the stream does not appear to be downcutting its bed in the area, the plunge pool below the culverts is retaining sediment, sand, and fines. Upstream of the Interim Use Trail, 10 feet to the east, the stream is semi-blocked with vegetation. The vegetation blockage may be reducing stream flows through the culverts, thus causing sediment deposition in the plunge pool.

Riparian buffers of 30 to 50 feet exist on both stream banks, downstream of the study area. Riparian vegetation consists of horsetail, red alder, Himalayan blackberry, bigleaf maple, reed canarygrass, and Scots broom.

Upstream from East Lake Sammamish Parkway, Ebright Creek was identified as having an erosion problem upstream to the impassible barrier at RM 0.45 (Ecology, 1994). Bed and bank erosion in the upper and middle reaches of the stream result in sedimentation of lower reach salmonid spawning and rearing habitat and of culverts under East Lake Sammamish Parkway (Ecology, 1994). See Section 3.2 of the EIS for information on the water quality of the stream.

1.4.6 Zaccuse Creek (Class 2 with Salmonids)

Zaccuse Creek lies in the Monohon Basin and is identified as a salmonid-bearing stream. Although no specific information on salmonid usage is provided for Zaccuse Creek by the resource agencies, it likely supports cutthroat trout (spawning and rearing) and late run kokanee salmon, and may support coho salmon near the stream mouth (see Attachment D-1). The stream is 1.18 miles in length, with only 0.05 mile accessible by anadromous or adfluvial fish (King County, 1990b). There is a culvert barrier at East Lake Sammamish Parkway (King County, 1990b). At one time, this stream may have supported coho, kokanee, and/or sockeye salmon in the lower reaches prior to the creation of fish barrier(s) near the mouth. On the date of the stream survey by a Parametrix biologist (December 9, 1999), no fish were visually observed within 100 feet of the former railbed.

Downstream of the Interim Use Trail (i.e., the former railbed), channel morphology is a riffle/glide combination. Substrate composition in this downstream reach consists of 40 percent cobble and 60 percent sand and gravel, which is suitable for salmonid spawning. The stream banks appear to be stable and lack deep erosional sides or soil sloughing.

No LWD is present in the downstream reach of Zaccuse Creek. A broken clay pipe lies across the channel approximately 50 feet downstream of the Interim Use Trail. The stream passes through a bridge under a private driveway before entering a culvert that runs underneath a residence. Eventually, the stream emerges and flows into Lake Sammamish.

The stream flows underneath the Interim Use Trail in a 36-inch concrete culvert, which is in good condition. There is no sediment in the culvert or culvert outlet blockage. The stream experiences 25- and 100-year flood flows of 28 and 43 cfs, respectively. The culvert has a capacity of 75 cfs. Flow depth in the culvert averages 2.5 inches. The culvert beneath the Interim Use Trail may act as a partial fish barrier (White, 1999). At the culvert outlet, the stream has created a plunge pool. From the culvert, the stream drops 12 to 18 inches into a 3-foot by 10-foot plunge pool. This is the only pool within 100 feet of the corridor.

Riparian vegetation consists of horsetail, Himalayan blackberry, reed canarygrass, and red alder, which are typical of a disturbed riparian zone. Bigleaf maple (*Acer macrophyllum*) and Scots broom (*Cytisus scoparius*) are also present. There is a riparian buffer of 10 feet to the south of the stream and 0 to 10 feet on the north side of the stream. Upstream from the Interim Use Trail, the stream channel is choked with Himalayan blackberry and forms a part of Wetland 26A (see project drawings in Volume II). East Lake Sammamish Parkway lies 75 feet east of the Interim Use Trail and slightly uphill. Beyond East Lake Sammamish Parkway is another large wetland. In this wetland, the stream channel is braided and choked with vegetation. The culvert beneath East Lake Sammamish Parkway is partially blocked with sediment and vegetation.

Urbanization is a leading cause of adverse impacts to this stream. With urban development, riparian forests have been cleared and sediment production has increased dramatically. Under future conditions of land use in the basin, hydrologic modeling by King County predicted a 100 percent increase in discharge for this stream (King County, 1990b). Severe incision has already occurred in this tributary as a result of road drainage (King County, 1990b). The geology of this stream includes easily erodible sand underlying much of the western slope (Ecology, 1994). As a result, stream-channel incision is ubiquitous upstream of the project corridor. See Section 3.2 of the EIS for information on the water quality of the stream.

1.4.7 George Davis Creek (Class 2 with Salmonids)

George Davis Creek lies in the Inglewood Basin and is identified as a salmonid-bearing stream. Although no current information on salmonid usage is provided for George Davis Creek by the resource agencies, it is believed to support late run kokanee salmon, coho salmon (rearing), cutthroat trout (spawning and rearing), and rainbow trout (spawning and rearing) (see Attachment D-1); (Williams et al., 1975; King County, 1990b). The King County Volunteer Salmon Watcher Program reported no fish during September and October of 2001 (Vanderhoof, 2002).

The stream is 3.46 miles in length, with only about 30 feet accessible by anadromous or adfluvial fish (King County, 1990b). At one time, this stream likely supported coho, kokanee, and/or sockeye salmon in the lower reaches prior to the creation of fish barriers near its mouth. Sedimentation and the stream culvert under the residence severely limit the amount of usable salmonid habitat in the portion downstream of the Interim Use Trail (i.e., the former railbed).

A section of the stream downstream of the Interim Use Trail has been piped under a private driveway and a house. This culvert also acts as a partial barrier to fish passage (Ecology, 1994). Underneath the Interim Use Trail, there are two concrete culverts, 24 and 36 inches in diameter, which are 50 percent blocked by sediment. Pool quality and quantity are poor. Due to restricted access, no survey was performed in the reach downstream of King County right of way. However, lakeshore spawning by kokanee salmon may occur near the outlet of the stream (Ecology, 1994).

Upstream of the Interim Use Trail, a culvert under East Lake Sammamish Parkway also creates a barrier to salmonid migration, as does a second culvert at RM 0.81 (King County, 1990b). Upstream of the Parkway, between RMs 0.2 and 0.8, the stream channel contains sufficient amounts of LWD and habitat conditions that are generally favorable for salmonids (Ecology, 1994). In general, the upper tributary streams in the Inglewood Basin all have some rearing habitat available for resident cutthroat trout and some limited spawning areas (Ecology, 1994).

The stream reach upstream of East Lake Sammamish Parkway (beyond the impassable barriers) has been identified as a problem area for erosion/sedimentation and water quality (Ecology, 1994). See Section 3.2, Surface Water and Water Quality, in Chapter 3 of the EIS for more detailed information on the water quality of the stream. Salmonid habitat on the Sammamish Plateau has been degraded by past agricultural practices, such as ditching, clearing, and poor pasture management; only short reaches have not been straightened or dredged to drain fields more rapidly or to eliminate wetlands. The stream above RM 2.0 has been grossly modified through channelization and dredging (King County, 1990b).

The 25- and 100-year flood flows for this stream are 35 and 42 cfs, respectively. Near the Interim Use Trail, the channel has been deeply eroded (greater than 10 feet), exposing tree roots on the bank. Riparian vegetation consists of horsetail (*Equisetum* sp.), Himalayan blackberry, reed canarygrass, and red alder, all of which are typical of a disturbed riparian zone. The stream has downcut its channel and exposed a gravel/cobble substrate in the streambed near the Interim Use Trail. During the December 20, 1999, stream survey, benthic invertebrates found in the pool substrate included midge larvae (*Diptera* spp.) and caddis larvae (*Trichoptera* spp.), but neither was abundant (less than one per square foot).

Urbanization is already a leading cause of adverse impacts to this stream. As land has been cleared for development, riparian forests have been lost and sediment production has increased dramatically. Effects of urbanization upstream of the study area can already be seen in this stream, and further increases in stream discharge are to be expected (King County, 1990b). Under future conditions of land use in the basin, hydrologic modeling by King County predicted a 315 percent increase in discharge for this stream

(King County, 1990b). Compared to the hydrologic impact from such an increase, any impacts to the stream's hydrology from stormwater runoff generated by the proposed Master Plan Trail alternatives would be relatively minor. This conclusion also applies to the other fish-bearing streams that are either currently subject to, or are predicted to be subject to, heightened runoff resulting from development.

1.4.8 Stream No. 0143F (Class 2 with Salmonids)

Stream No. 0143F lies in the Panhandle Basin. It is classified as a salmonid-bearing stream, although salmonid use has not been documented in any streams in this basin (Ecology, 1994). This stream is notable because of the presence of a coho salmon egg incubator located downstream of the trail crossing. The incubator box, capable of hatching 50,000 coho salmon fry, is funded by the Mid-Sound Regional Fisheries Enhancement Group.

1.4.9 Bear Creek (Class 1 with Salmonids)

Bear Creek, a tributary of the Sammamish River, provides the main drainage for the Bear and Evans Creek watershed. It originates in an extensive network of wetlands in southern Snohomish County near Paradise and Echo Lakes and flows southerly for over 12 miles before joining the Sammamish River near the City of Redmond (King County, 1990a). Its main tributaries are Struve (1.8 miles long), Mackey (2.6 miles long), Seidel (2.8 miles long), and Cottage Lake (6.7 miles long) Creeks (Williams et al., 1975). Bear Creek supports populations of fall Chinook, coho, kokanee, and sockeye salmon; winter steelhead; rainbow trout; and cutthroat trout (see Attachment D-1) (Williams et al., 1975; King County, 1990a). Salmon and trout spawn and rear throughout all accessible reaches of the stream, with kokanee and other salmon spawning from September through February (King County, 1990a; Egan, 1978). Steelhead and cutthroat trout spawn from late November into May (King County, 1990a).

Non-salmonid species that inhabit the Bear Creek system include threespine stickleback (*Gasterosteus aculeatus*), prickly sculpin (*Cottus asper*), and longnose dace (*Rhinichthys cataractae*) (Scott et al., 1982). Although other species are likely to exist, documentation is limited (King County, 1990a).

While generally good, stream habitat has been degraded or eliminated in many reaches of the system through channelization, scouring flows (which remove much of the instream habitat), riparian corridor clearing, and LWD removal (King County, 1990a). Large riparian vegetation removal along the riparian corridor has reduced the amount and type of LWD reaching the stream and increased the solar radiation to the stream, which has resulted in fish habitat loss and summer water temperature increases (King County, 1990a). The stream experiences 100-year flood flows of 1,535 cubic feet per second (cfs). High flow bank erosion has been a problem in the lower mainstem of Bear Creek (King County, 1990a).

The existing railbed stream crossing consists of a low-rise wooden span supported by wood pilings along both sides of the stream channel and an additional row of supports placed in the middle of the channel. There are no fish passage problems that would require bridge replacement or modification. A relatively new outfall (consisting of twin CMP culverts) from an adjacent stormwater detention pond is located on the left bank a short distance upstream from the crossing. The stream banks in this segment of Bear Creek are primarily riprap and covered with grasses such as reed canarygrass (*Phalaris arundinacea*) and quackgrass (*Agropyron repens*) and overhanging vines (Himalayan blackberry [*Rubus armeniacus*, formerly *R. discolor*]). The floodplain is interspersed with shrubs and small trees such as red alder (*Alnus rubra*) and large trees such as black cottonwood (*Populus trichocarpa*). Many smaller trees have been recently planted in the floodplain as part of stream restoration work, which also includes hydroseeding and erosion control.

The channel substrate at the crossing is primarily cobble. Channel morphology in the vicinity of the trail is a glide/pool combination. Pool quality is good. Fifteen to twenty rootwads have been added to the channel 100 to 200 feet downstream of the project corridor.

A King County water quality sampling station is located immediately below the bridge crossing. Although Bear Creek has excellent water quality, within the project corridor, Ecology has listed it in the Category 5: Polluted Waters/303(d) List of Threatened and Impaired Water Bodies for temperature and fecal coliform, and in the Category 2: Waters of Concern for dissolved oxygen and pH (Ecology 2004).

1.4.10 Potential Fish-Bearing Streams and Non-Fish-Bearing Streams

Because there is not much information about the many smaller, often intermittent streams along the project corridor, detailed descriptions are not provided here. Generally, these are short streams with silt or sand substrates that flow through culverts or conduits, which are barriers to fish passage.

For the majority of these streams, information is lacking on fish presence/absence. Field reconnaissance was used to determine the quality and quantity of available salmonid habitat (where access was allowed); therefore, the likelihood of fish use was assessed by professional judgment. This approach was conservative, as it is extremely unlikely that all streams that contain fish habitat features are currently occupied. These evaluations were combined with stream classification codes from the appropriate municipal and County jurisdictions (if available) to classify these remaining streams as either (potentially) fish-bearing or non-fish-bearing.

A total of 26 streams were classified as either having known or potential fish use, while 20 other streams were classified as non-fish-bearing. Other non-stream drainageways, such as wet ditches and seeps, were not included in the analysis.

1.5 FISH SPECIES

The subsections below provide a brief overview of the various fish species potentially found in study area waters. For the purpose of this discussion, the study area is defined as Lake Sammamish and the 46 classified streams that cross the alternative alignments. For a more detailed description of the life histories, stock status, and distribution, and the individual fish species, see Attachment D-3.

1.5.1 Threatened, Endangered, and Sensitive Species

1.5.1.1 Species with Federal Status

Chinook Salmon

Subsequent to its status review (Myers et al., 1998), National Marine Fisheries Service (NMFS) designated Puget Sound Chinook salmon as threatened in March 1999 (NMFS, 1999a). Summer/fall Chinook salmon in the project vicinity are managed as part of the Lake Washington summer/fall Chinook salmon stock, which includes the Lake Washington-Issaquah and Lake Washington-North Lake Washington Tributaries summer/fall Chinook salmon stocks (WDF et al., 1993). Spawn timing begins in late September and peaks in October, similar to other Chinook salmon stocks in south Puget Sound (WDF et al., 1993).

No genetic stock identification data are available for the Lake Washington-North Lake Washington Tributaries stock (WDF et al., 1993). However, the Lake Washington-Issaquah stock was defined as distinct based upon geographic distribution in Issaquah Creek and its forks (WDF et al., 1993), as well as by more recent genetic information (Busack and Shaklee, 1995; MITFD et al., 1999). Two independent populations of Chinook salmon have been identified in WRIA 8: the Cedar River and Sammamish River Chinook (PSTRT, 2001). The Sammamish River populations include North Lake Washington and Issaquah sub-populations. However, based on recent genetic information and a conservative approach, the WRIA 8 Technical Committee has classified three populations, the Cedar River, the North Lake Washington, and the Issaquah populations (LWCSWSC, 2004). A study is in progress to collect genetic information on the Chinook salmon stocks in WRIA 8 to clarify the number of Chinook populations within WRIA 8 and their relationship to one another. The results of this study should be available in the spring of 2005 (Hans Berge, personal communication, 2004).

The stock origin is believed to be non-native because of Green River stock transfers to the Lake Sammamish Watershed since the 1930s (WDF et al., 1993), and in fact, the stock is genetically very similar to Green River fall Chinook salmon (Busack and Shaklee, 1995; MITFD et al., 1999). Other non-local stocks may have also influenced stock composition (WDF et al., 1993). Based on adipose fin clips, a substantial portion of the 2003 returning spawners to the Cedar River mainstem and Bear/Cottage Creeks have been identified as hatchery strays, likely from the Issaquah Hatchery (LWCSWSC, 2004). Based upon carcass counts in the watershed from 1986 through 1991, the status of this stock is healthy, with counts ranging from 844 to 3,337 carcasses, for an average of 1,993 carcasses per year (WDF et al., 1993; Big Eagle and LGL, 1995).

The natural spawning population of the Lake Washington-Issaquah stock is located primarily below the Issaquah Hatchery rack and is dependent on hatchery production (WDF et al., 1993). Water flows and temperatures affect the ability of Chinook salmon to reach the hatchery rack, which in turn influences the amount of natural spawning below the hatchery (WDF et al., 1993). Because this stock is not representative of the historical stocks in the Lake Sammamish system (Myers et al., 1998), it was not originally listed under the Endangered Species Act (ESA), nor was it essential for recovery of the Puget Sound Evolutionarily Significant Unit (ESU). However, the Issaquah Hatchery stock is considered part of the ESU (NMFS, 1999a).

Watershed entry for adults of this stock ranges from June 12 through October 2, with peak counts in July and the first half of August (MITFD et al., 1999). Chinook salmon normally begin to enter Issaquah Creek in mid-September. In Lake Sammamish, the overwhelming majority of Chinook salmon come from the releases made throughout the month of May at the Issaquah Hatchery (Fresh, personal communication, 2000).

The project corridor occurs in an area currently used by the Lake Washington-Issaquah and Lake Washington-North Lake Washington Tributaries stocks of Chinook salmon, and the project corridor contains suitable Chinook salmon habitat. The Issaquah population of Chinook salmon spawns in tributaries to Lake Sammamish, including the Issaquah Creek system and Lewis and Laughing Jacobs Creeks. The only identified core area for this population within the project area is the North Fork Issaquah Creek (LWCSWSC, 2004). Migratory areas include Lake Sammamish and episodic use areas include Laughing Jacobs Creek. Bear Creek is considered a core area for the North Lake Washington Chinook population (LWCSWSC, 2004). These streams provide important habitat for Chinook salmon, which could be directly affected by the proposed project. No other stream in the study area has habitat suitable for supporting spawning populations of Chinook salmon, although a few individual hatchery strays may occasionally utilize other project area streams for some portion of their life cycle.

Coho Salmon

Despite recent stable trends and population abundances near historic levels in some systems, Puget Sound coho salmon remains a candidate species for listing because of concerns over current genetic, environmental, and habitat conditions (NMFS, 1995). Coho salmon inhabiting the tributaries that flow into Lake Sammamish are managed as part of the Lake Washington/Sammamish Tributaries stock. Coho salmon are distributed throughout the accessible reaches of these tributaries, with very limited straying into this drainage from surrounding systems (WDF et al., 1993).

Adults enter fresh water from mid-September to mid-November, and spawning occurs mostly from mid- to late October to mid-December (Williams et al., 1975; WDF et al., 1993). This stock is considered to be a mixture of native and introduced non-native stocks (WDF et al., 1993). Escapement trends of coho salmon throughout the Lake Washington Basin decreased severely through the 1980s, and the stock is currently considered depressed (WDF et al., 1993).

Coho salmon have been documented in seven of the larger streams listed in Attachment D-1. These seven streams provide important, albeit degraded, habitat for coho salmon. Coho use may occur in short reaches of some of the other perennial streams, but documentation on fish use in these streams is generally absent.

Bull Trout

The United Stated Fish and Wildlife Service USFWS) has issued a final ruling determining threatened status for bull trout (USFWS, 1999). The Coastal-Puget Sound population segment of bull trout, which includes the Lake Washington Basin, is unique because it is thought to contain the only anadromous forms of bull trout within the coterminous United States (USFWS, 1998a).

The biological similarities of bull trout and Dolly Varden make them virtually indistinguishable in the field. Therefore, WDFW has combined information on their status and distribution into a common inventory (WDFW, 1998). Bull trout were historically distributed throughout the central Puget Sound region, including a portion of the current upper Lake Washington Basin (Goetz, 1994). However, information regarding the current distribution of bull trout in the lower Lake Washington Basin is meager.

A relatively healthy reproducing population of bull trout exists in Chester Morse Lake in the upper Cedar River Basin, but no reproduction has been confirmed in the lower Cedar River, Lake Washington, Lake Sammamish, or their tributaries (WDFW, 1998). This is not surprising because the thermal regimes of streams in the lower basin are unsuitably warm for bull trout/Dolly Varden.

There have been only a few reports of bull trout/Dolly Varden (native char) in the lower Lake Washington Basin. Several large native char (approximately 410 millimeters [mm] long) have been observed passing through the viewing chamber at the Chittenden Locks, but in a two-year creel survey of Lake Washington in which thousands of angled trout were checked, only one char was identified (Bradbury and Pfeifer, 1992; USFWS, 1998b).

Little is known about historical distribution and abundance of bull trout in the Sammamish River/Issaquah Creek system. A one-year creel survey of Lake Sammamish in 1982-–83 reported no char (WDFW, 1998). However, there have been a few anecdotal reports of native char in the Lake Washington Basin (FWS, 1998b). The lack of evidence of spawning populations in the Lake Washington/Lake Sammamish Basins suggests that these fish may have originated in other basins and may have been on a foraging foray in the basins. Although their exact abundance and distribution in the two lake basins is uncertain, it appears adults have an irregular and minor presence in the lower basin.

Bull trout use of streams within the study area is unknown but highly unlikely. Although there are no known documented occurrences of bull trout in the immediate area, anadromous adult char may occasionally stray into the Lake Washington/Lake Sammamish system. Mid-winter water temperatures in the subject streams are too high to support successful egg and alevin incubation by native char. Habitat for bull trout in the study area, if any, is limited to possible foraging and is probably limited to lower Bear Creek. Currently, culverts, low stream flows, unsuitable water quality, and degraded stream environments would obstruct or deter bull trout movement into most, if not all, of the streams within the study area.

River Lamprey

River lamprey is a federal species of concern. These fish are anadromous and parasitic in both fresh and marine waters, and little is known about the freshwater life of river lamprey. River lampreys have been identified in Lake Sammamish adjacent to the study area (WDFW file records, Mill Creek); however, the spawning and ammocoete (larval lamprey) rearing areas for this species in Lake Sammamish are unknown. Tributaries with cobbles for oral sucker attachment, and nearby streambed composed of fine sand or silt, would provide suitable spawning and rearing habitat, respectively. Many of the perennial streams crossed by the Interim Use Trail (i.e., the former railbed) contain this habitat, and it is abundant in Bear and North Fork Issaquah Creeks.

Pacific Lamprey

Pacific lamprey is also a federal species of concern. No population-specific information for Pacific lamprey is available within the Lake Washington or Lake Sammamish Basin. Pacific lamprey are generally seen in area rivers and larger tributaries in May or June (WDFW file records, Mill Creek) and are unlikely to occur in the study area due to the small, higher gradient streams that dominate the area.

1.5.1.2 State Priority Species

Priority fish species include all state endangered, threatened, sensitive, and candidate species and species of recreational, commercial, or tribal importance that are considered vulnerable. All fish species with state candidate status that occur in the study area also hold a federal designation and were discussed in the preceding paragraphs. No state sensitive, threatened, or endangered fish species occur within the study area. Other fish species that are designated as Priority Species (WDFW, 2000) may occur within the study area. These include chum, sockeye, and kokanee salmon; rainbow trout/steelhead; coastal cutthroat trout; white sturgeon; largemouth bass; smallmouth bass; and longfin smelt. These species are briefly discussed in the concluding paragraphs of this section.

Resident (non-anadromous) fish inhabit some of the streams crossed by the alternatives; their known occurrence is summarized in Attachment D-1. Most resident fish (rainbow and cutthroat trout, kokanee salmon) are members of the salmonid family. These species are widely distributed throughout the Lake Sammamish Basin and contribute to a recreational fishery, primarily in Lake Sammamish. Non-salmonid species (sculpins, dace, and lamprey) may be found within the study area, but none were seen in the streams by County staff as indicated in the literature review. Salmonids rely on high-quality water and abundant habitat. Information and data on presence, distribution, and population densities of resident species are very sparse and, in some cases, unreliable. Thus, it is possible that some of these resident species may be present even if not observed in the surveys.

Rainbow Trout/Steelhead

Resident rainbow trout are the non-migratory form of steelhead and have a similar life cycle to steelhead, except that rainbow trout do not spend a portion of their lives in the marine environment. Rainbow trout are native to the Lake Sammamish Basin but are not abundant in Lake Sammamish (Bradbury and Pfeifer, 1992). The resident, non-migratory form of the species occurs in both lakes and streams upstream of natural and man-made migratory blockages. Their origins in headwater areas above migratory barriers are obscure but are likely the result of past access or historical stocking. Pine Lake has been stocked with rainbow trout by WDFW for many years.

Winter-run steelhead are native to the larger tributaries of the Sammamish River and Lake Sammamish, notably Issaquah Creek, but have been greatly reduced in abundance in recent years. Adfluvial or resident rainbow trout spawn and rear in Bear and Laughing Jacobs Creeks. They are reported from, but are unconfirmed in, George Davis, Ebright, and Pine Lake Creeks and Stream No. 0163 (Alexander's Creek).

Coastal Cutthroat Trout

Resident cutthroat trout exhibit several life histories, even within the Lake Sammamish/Lake Washington system. These include strict stream-resident forms, adfluvial forms, and anadromous forms.

Cutthroat trout occur in the lower reaches of nine or more of the study area streams (see Attachment D-1). Small, resident cutthroat trout are nearly ubiquitous in the streams that drain to Lake Sammamish (Muto and Shefler, 1983). Where there is no blockage to upstream migration, it is common to see a mixture of resident and adfluvial life history forms, with residents typically being found in the upper, or headwater reaches (e.g., Issaquah Creek). Adfluvial cutthroat trout have been a popular game fish in Lake Sammamish for many years.

Kokanee Salmon

Kokanee salmon, which remain in fresh water their entire life, are the non-anadromous form of sockeye salmon (Ricker, 1938). In the state of Washington, Lake Washington, Lake Sammamish, and Lake Whatcom contain native kokanee salmon populations and no native sockeye salmon runs (Burgner, 1991). Sockeye salmon are usually anadromous. They migrate to sea, usually in the spring of their second year after one or two years in a nursery lake, and grow to maturity in the Pacific Ocean, followed by spawning in their natal stream (Foerster, 1968).

Kokanee salmon were present in the Lake Washington/Lake Sammamish Basin historically and are known to be native (Seeb and Wishard, 1977; Crawford, 1979; Hendry, 1995; King County DNR, 2000). Currently, kokanee salmon in the Sammamish River/Lake Sammamish Basin can be separated into three races based on different spawn timing and location (Berge and Higgins, 2003): (1) a group of early-run kokanee salmon spawning from August through September in Issaquah Creek (at the southern end of Lake Sammamish), (2) a group of middle-run kokanee spawning from late September through November in the larger Sammamish River tributaries, and (3) late-entry kokanee salmon that spawn from October through January in the Sammamish River and Lake Sammamish tributaries that spawn in late Fall (October through January) in tributaries of Lake Sammamish. Early-run kokanee salmon in Issaquah Creek are native, while middle-run kokanee are believed to be either non-native (Ostergaard et al., 1995) or residualized sockeye salmon (Young et al., 2001). Ostergaard (1996) described eight streams along the east and south shores of Lake Sammamish that historically supported native early-run kokanee salmon.

King County DNRP has recently conducted spawning surveys in the Lake Sammamish tributaries (Berge and Higgins, 2003). From 1996 to 2001, Ebright Creek had an average of several hundred kokanee spawning from the middle of November to the end of December. In the same period, Laughing Jacobs

Creek had from 25 to about 400 spawners from late October through November, while Pine Lake Creek averaged less than 20 spawners per year from the middle of November through December.

The project corridor occurs in an area currently used by the Bear Creek sockeye and kokanee salmon runs. Ebright, Pine Lake, Laughing Jacobs, and North Fork Issaquah Creeks within the project corridor are accessible to kokanee and sockeye salmon, and spawning by one or both species occurs in most of these streams (see Attachment D-1). These streams represent important habitat for kokanee and sockeye salmon, which are species that could be directly affected by the proposed project.

Chum Salmon

No known reproducing populations of chum salmon occur within the study area. Small numbers of chum salmon are typically seen in mid-winter ascending the Chittenden Locks fishway at the west end of the Lake Washington Ship Canal, but their ultimate fate within the basin is unknown.

White Sturgeon

White sturgeon are designated a Priority Species (WDFW, 2000). White sturgeon are the largest fish in the fresh waters of North America. These anadromous fish can grow to 20 feet in length (Wydoski and Whitney, 1979). White sturgeon are a native species but are probably rare in the project vicinity. Very infrequent catches of large sturgeon in tribal gill nets in north Lake Washington in the 1970s were thought to reflect incidental captures of rare individuals that were trapped in Lake Washington when it was lowered in August 1916. A breeding population in the Lake Washington system has not been verified.

Largemouth Bass

The non-native largemouth bass are important to the recreational fishery. Consequently, largemouth bass are a Priority Species (WDFW, 2000). The species was introduced to Washington by the U.S. Bureau of Fisheries in the 1890s (Wydoski and Whitney, 1979). Largemouth bass in Lake Washington mature at about age 3 and spawn from mid-May until the end of June. While largemouth bass potentially occur in the project corridor, most largemouth bass in Lake Sammamish are located near the lake's north and south ends (Pflug, 1981).

Smallmouth Bass

Smallmouth bass are also non-native but are designated a Priority Species because of their importance to the recreational fishery (WDFW, 2000). This species is far more abundant in the Lake Washington/Lake Sammamish Basin than largemouth bass. Smallmouth bass prefer rocky substrates, mature at age 3 or 4, and spawn in the spring. They spawn and rear along much of the Lake Sammamish shoreline parallel to the project corridor (Pflug, 1981).

Longfin Smelt

Longfin smelt are a native fish that exhibits anadromy, but populations in Lake Washington complete their life cycle in fresh water. This species has been given a Priority Species designation (WDFW, 2000). Longfin smelt occupy the limnetic zone and are typically found at night in water 36 to 72 feet below the surface from July to December. During the day, adult longfin smelt move to depths 60 to 120 feet below the surface. Longfin smelt are short-lived spring spawners and rarely live to age 3. While exceedingly abundant in Lake Washington, their status in Lake Sammamish is poorly understood.

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ATTACHMENT D-1
FISH SUMMARY DATA FOR STREAMS CROSSING THE EAST LAKE SAMMAMISH MASTER PLAN TRAIL.

In the following table, current knowledge of fish use is noted for each stream, as well as the location of any known fish passage barriers. In some cases, resident fish exist in stream reaches that are above barriers to upstream movement of fish from the lake. Fish species presence is not noted with a "Yes" unless there is a relatively high degree of confidence in its occurrence based on a review of the available literature and/or professional judgment of stream habitat conditions.

Summary Data for Streams Crossing the East Lake Sammamish Master Plan Trail Project Corridor

Stream Name/ Number	Corridor Alternative Station Number	East Alternative Station Number	Jurisdiction	Stream Classification for Jurisdiction	Appropriate Buffer for Jurisdiction (feet)	Permanent WDFW Stream Type	1st Fish Passage Barrier	2nd Fish Passage Barrier	3rd Fish Passage Barrier	Habitat Rating Downstream of Railbed[3]	Habitat Rating Upstream of Railbed[3]	Fish Use	Known or Potential Species[1]	Known or Potential Use (Spawning/ Rearing)[2]
Classified Streams														
North Fork Issaquah Creek	122+90	122+80	Issaquah	Class 2S	100	Type 2				Good	Good	Yes	SE/KO/CO/CT/CH	SE/KO: S CO/CT: S, R CH: R
Unnamed Stream	134+10	133+90	Issaquah	Class 3	25	Type 4 or 5				None	None	Unlikely		
Unnamed Stream	169+20 to 169+80, 168+80, 162+40, and 144+30 to 145+70	169+20 to 169+80, 168+80, 162+40, and 144+30 to 145+71	Issaquah	Class 2S	100	Type 3				Fair	Fair	Yes	CT	R
Laughing Jacobs Creek	203+60	203+60	Issaquah	Class 2S	100	Type 3				Good	Good	Yes	SE/KO/CO/CT/RB	SE/KO: S Rest: S, R
Many Springs	211+90	212+20 211+50	Issaquah	Class 2S	100	Type 3	Underground flow below RB			Low	Poor	Potential		
Unnamed Stream	216+30	216+60	Sammamish	Class 2	50	Type 4 or 5	Culvert below RB	RB culvert	ELSP culvert	Poor	Fair	Unlikely		

Stream Name/ Number	Corridor Alternative Station Number	East Alternative Station Number	Jurisdiction	Stream Classification for Jurisdiction	Appropriate Buffer for Jurisdiction (feet)	Permanent WDFW Stream Type	1st Fish Passage Barrier	2nd Fish Passage Barrier	3rd Fish Passage Barrier	Habitat Rating Downstream of Railbed[3]	Habitat Rating Upstream of Railbed[3]	Fish Use	Known or Potential Species[1]	Known or Potential Use (Spawning/ Rearing)[2]
0163	237+45	236+60	Sammamish	Class 2S	150	Type 3				Fair	Fair	Yes	CO/CT/RB	All: S, R
Tributary to 0163	239+00	239+10	Sammamish	Class 2S	150	Type 3	RB culvert	ELSP culvert		Fair	Poor	Likely		
Unnamed Stream	254+20	254+50	Sammamish	Class 3	25	Type 4 or 5	RB culvert	ELSP culvert		Unknown	Poor	Unlikely		
0162A	287+90	288+60	Sammamish	Class 3	25	Type 4 or 5				None	None	No		
Unnamed Stream	314+50 313+70	N.A.	Sammamish	Class 2S	150 feet	Type 3	RB culvert			Fair/Good	Unknown	Probable	Too small for coho or Chinook	
Unnamed Stream	354+50	N.A.	Sammamish	Class 2S (DS of RB) Class 2 (US of RB)	150 (DS of RB) 50 (US of RB)	Type 3 (DS of RB) Class 4 or 5 (US of RB)	RB culvert			Fair	Fair/Poor	Potential	Too small for Chinook	
Unnamed Stream	359+10	N.A.	Sammamish	Class 2	24	Type 4 or 5	Culverts below railbed	RB culvert (uncertain if passable)		Unknown	Fair	Potential		
Unnamed Stream	364+50	363+95	Sammamish	Class 3	25	Type 4 or 5	Culvert under property	RB culvert (uncertain if passable)		Unknown	Fair	Unlikely		
Pine Lake Creek	376+15 376+10	375+50	Sammamish	Class 2S	150	Type 3				Good	Good	Yes	SE/KO/CO/CT/RB	SE/KO: S Rest: S, R
155	381+20	380+60	Sammamish	Class 2S	150	Type 3				Good	Fair	Potential		
0150A	398+70	398+30	Sammamish	Class 3	25	Type 4 or 5				None	None	Unlikely		

Stream Name/ Number	Corridor Alternative Station Number	East Alternative Station Number	Jurisdiction	Stream Classification for Jurisdiction	Appropriate Buffer for Jurisdiction (feet)	Permanent WDFW Stream Type	1st Fish Passage Barrier	2nd Fish Passage Barrier	3rd Fish Passage Barrier	Habitat Rating Downstream of Railbed[3]	Habitat Rating Upstream of Railbed[3]	Fish Use	Known or Potential Species[1]	Known or Potential Use (Spawning/ Rearing)[2]
Ebright Creek	408+82 and 408+86	408+49 and 408+45	Sammamish	Class 2S	150	Type 3				Good	Good	Yes	CO/KO/CT/RB	KO: S; Others: S, R
Zaccuse Creek	421+10	420+90	Sammamish	Class 2S	150	Type 3	Culvert below RB	RB Culvert		Fair/Good in patches	Good	Yes	CT/KO	R / S
Unnamed Stream	429+40	429+30	Sammamish	Class 3	25	Type 4 or 5				None	None	Unlikely		
George Davis	437+94 and 437+90	437+90	Sammamish	Class 2S	150	Type 3	Culvert with racked vault below RB	Trash rack on ELSP culvert		Fair/Good	Fair/Good	Yes (Upstream per King County)	CO/CT/RB/KO	KO: S Others: S,R
Unnamed Stream	446+45	445+75	Sammamish	Class 2S	150	Type 3	Below RB culvert	RB culvert	ELSP culvert	Poor	Poor	Potential		
Unnamed Stream	449+50	449+50	Sammamish	Class 2S (DS of RB)	150	Type 3 (DS of RB)		RB culvert		Fair	None	Potential (DS of RB)		
Unnamed Stream	452+40	452+40	Sammamish	Class 2S	150	Type 3	Below RB culvert	ELSP culvert		Unknown, appears fair from what was seen	None	Potential (DS of RB)		
0143L (south branch)	456+90	N.A.	Sammamish	Class 2S	150	Type 3	RB culvert	ELSP culvert		Fair	Fair	Potential	Too small for coho or Chinook	
0143L (north branch)	460+95	457+40	Sammamish	Class 2S	150	Type 3	ELSP culvert			Fair	Fair	Potential		
0143K	470+50	469+00	Sammamish	Class 3	25	Type 4 or 5				None	None	Unlikely		
0143J	484+10	483+10	Sammamish	Class 2S	150	Type 3	RB culvert	Slope above RB culvert		Fair	Poor	Potential	Too small for coho or Chinook	

Stream Name/ Number	Corridor Alternative Station Number	East Alternative Station Number	Jurisdiction	Stream Classification for Jurisdiction	Appropriate Buffer for Jurisdiction (feet)	Permanent WDFW Stream Type	1st Fish Passage Barrier	2nd Fish Passage Barrier	3rd Fish Passage Barrier	Habitat Rating Downstream of Railbed[3]	Habitat Rating Upstream of Railbed[3]	Fish Use	Known or Potential Species[1]	Known or Potential Use (Spawning/ Rearing)[2]
0143I	486+65	485+65	Sammamish	Class 3	25	Type 4 or 5	RB culvert	ELSP culvert		None	None	No		
Unnamed Stream	489+70	488+90	Sammamish	Class 2	50	Type 4 or 5	RB culvert			None	None	No		
0143H	500+35, 499+50, 497+10, 494+60, and 496+20	499+50, 498+70,496+30, 493+70, and 495+40	Sammamish	Class 2S	150	Type 3	Slope downstream of RB culvert	ELSP culvert		Poor	Fair/Poor	Potential		
0143M	507+55	506+65	Sammamish	Class 2	50	Type 4 or 5	ELSP culvert			Poor	None	Unlikely		
0143G	522+60	521+75	Sammamish	Class 2S	150	Type 3				N/A	None	Potential		
0143F	525+10	524+25	Sammamish	Class 2S	150	Type 3	ELSP culvert			Fair	Fair	Potential	KO	S
0143E	530+80	530+00	Sammamish	Class 3	25	Type 4 or 5	Unknown			None	None	No		
0143D	536+10	535+30	Sammamish	Class 2S	150	Type 3	RB culvert	ELSP culvert		Fair	None	Potential		
0143B	550+05	549+20	Sammamish	Class 3	25	Type 4 or 5	Pipe under residence	RB culvert	ELSP Culvert	None	None	No		
Unnamed Stream	567+10	NA	Sammamish	Class 3	25	Type 4 or 5	RB culvert			None	None	No		
Unnamed Stream	575+40	574+60	Sammamish	Class 3	25	Type 4 or 5	RB culvert			None	None	No		
Unnamed Stream	580+60	579+90	Sammamish	Class 3	25	Type 4 or 5				None	None	Unlikely		
Unnamed Stream	593+90	593+10	Sammamish	Class 3	25	Type 4 or 5	RB culvert			None	None	Unlikely		
0143A	596+20	595+40	Sammamish	Class 3	25	Type 4 or 5	Driveway culvert	RB culvert	ELSP culvert (likely)	None	None	Unlikely		

Stream Name/ Number	Corridor Alternative Station Number	East Alternative Station Number	Jurisdiction	Stream Classification for Jurisdiction	Appropriate Buffer for Jurisdiction (feet)	Permanent WDFW Stream Type	1st Fish Passage Barrier	2nd Fish Passage Barrier	3rd Fish Passage Barrier	Habitat Rating Downstream of Railbed[3]	Habitat Rating Upstream of Railbed[3]	Fish Use	Known or Potential Species[1]	Known or Potential Use (Spawning/ Rearing)[2]
Unnamed Stream	610+80	610+80	Redmond	Class 3	26	Type 4 or 5	RB culvert			None	None	Unlikely		
Unnamed Stream	613+80	613+20	Redmond	Class 3	25	Type 4 or 5				None	None	Unlikely		
Unnamed Stream	615+40	615+40	Redmond	Class 3	26	Type 4 or 5				None	None	Unlikely		
Bear Creek	617+00	617+00	Redmond	Class 1	150	Type 2				Good	Good	Yes	SE/CO/CT/CH	All; S/R
Unclassified Water Bodies														
Unidentified water feature	313+70	N.A.	Sammamish	Unable to classify	Unable to classify	Unable to classify	RB culvert			Unable to classify	Unable to classify	Unable to classify		
Unidentified water feature	383+60	3+83	Sammamish	Unable to classify	Unable to classify	Unable to classify	RB culvert			Unable to classify	Unable to classify	Unable to classify		

[1]**Species Codes** [2]**Spawning/Rearing Codes** [3]**Interim Use Trail alignment**

Other Abbreviations in Table

CH = Chinook salmon
CO = Coho salmon
CT = Cutthroat trout
KO = Kokanee salmon
RB = Rainbow trout/steelhead
SE = Sockeye salmon

S = Spawning
R = Rearing

DS = Downstream
ELSP = East Lake Sammamish Parkway
RB = Railbed (Interim Use Trail)
US = Upstream

ATTACHMENT D-2 FISH SPECIES KNOWN OR LIKELY TO OCCUR IN LAKE SAMMAMISH AND THE PROJECT VICINITY

Scientific Name	Common Name	Occurrence
ANADROMOUS SALMONIDS		
Oncorhynchus tschawytcha	Chinook salmon	L (T), S (T); C
Oncorhynchus nerka	sockeye salmon	L, S (T); A
Oncorhynchus kitsutch	coho salmon	L (T), S: A
RESIDENT SALMONIDS		
Oncorhynchus mykiss	rainbow trout	L, S; C
Oncorhynchus clarki clarki	coastal cutthroat trout	L, S; A
Oncorhynchus nerka	kokanee	L, S (T); C
Prosopium williamsoni	mountain whitefish	L, S; C
RESIDENT NON-SALMONIDS		
Lampetra richardsoni	western brook lamprey	S; O
Lampetra ayresi	river lamprey	L (T), S; O
Gasteroteus aculeatus	threespine stickleback	L, S; C
Cottus asper	prickly sculpin	L, S; A
Cottus aleuticus	coastrange sculpin	L, S; O
Cottus rhotheus	torrent sculpin	S; O
Micropterus salmoides	largemouth bass	L, S (T); C[1]
Micropterus dolomieui	smallmouth bass	L; C[1]
Perca flavescens	yellow perch	L; A[1]
Poxomis nigromaculatus	black crappie	L; C[1]
Rhinichthys osculus	speckled dace	S; O
Rhinichthys cataractae	longnose dace	n/a
Ameiurus nebulosus	brown bullhead	L; C[1]
Ptychochelilus oregonensis	northern pikeminnow	L; C
Spirinchus thaleichthys	longfin smelt	L, S (T); O
Catostomus macrocheilus	largescale sucker	L, S (T); C
Lepomis gibbosus	pumpkinseed	L; C[1]
Lepomis macrochirus	bluegill	L; O[1]
Mylocheilus caurinus	peamouth	L, S (T); C
Tinca tinca	tench	L; O[1]
Richardsonius baleatus	redside shiner	S; O
Cyprinus carpio	common carp	L; C[1]

Source: Wydoski. (1972); updated by B. Pfeifer (1992) WDFW unpub. Manuscript

Note:
L = Resident of lakes
S = Resident of streams
L (T) = Transient of lakes
S (T) = Transient of streams
n/a not available

A = Abundant
C = Common
O = Occasional
R = Rare

[1] Introduced; has become established in the drainage.

ATTACHMENT D-3 FISH SPECIES LIFE HISTORY AND STOCK INFORMATION.

For this discussion, the study area is defined as Lake Sammamish and the 46 classified streams that cross the proposed project corridor.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Species with Federal Status

Chinook Salmon

Subsequent to its status review (Myers et al., 1998), NMFS designated Puget Sound Chinook salmon as threatened in March 1999 (NMFS, 1999a). Summer/fall Chinook salmon in the area of the project are managed as part of the Lake Washington summer/fall Chinook salmon stock, which includes the Lake Washington-Issaquah and Lake Washington-North Lake Washington Tributaries summer/fall Chinook salmon stocks (WDF et al., 1993). In general, summer/fall Chinook salmon migrate into freshwater in August and September (Wydoski and Whitney, 1979). Spawn timing begins in late September and peaks in October, which is similar to other Chinook salmon stocks in south Puget Sound (WDF et al., 1993). All adult Chinook salmon are semelparous; that is, they die after spawning (Wydoski and Whitney, 1979).

Following spawning, Chinook salmon eggs hatch in about two months, though the amount of time required for incubation depends primarily upon water temperatures (Wydoski and Whitney, 1979; Healy, 1991). After emergence, juvenile Chinook salmon rear in fresh water for time durations ranging from a few days to three years (Wydoski and Whitney, 1979). Newly emerged Chinook salmon fry readily select territories along stream margins with abundant rush and woody debris for cover. Low-velocity non-turbulent habitats are important for initial rearing of Chinook salmon fry; as they grow, they tend to select faster and deeper water, using brush cover when it is available (Hillman and Chapman, 1989).

Typically, juvenile Chinook salmon in Puget Sound region rivers migrate to the marine environment during their first year of life (Myers et al., 1998). These Chinook salmon are called ocean-type due to their short freshwater residence and because the majority of their rearing occurs in the nearshore marine environment. Ocean-type Chinook salmon generally migrate downstream in the spring, just months after emerging from the gravel, or during the summer and autumn after a brief period of rearing in fresh water (Healy, 1991; Myers et al., 1998).

In lake systems such as Lake Sammamish and Lake Washington, some individuals may rear in fresh water for longer periods (Wydoski and Whitney, 1979). Some Chinook salmon residualize in Lake Washington (Buckley, 1962) and are seen in low numbers in the recreational troll fishery on that lake (Bradbury and Pfeifer, 1992). Juvenile Chinook salmon that remain in fresh water after emergence may migrate to the ocean any time of year, though most Chinook salmon within a population tend to migrate at similar times and ages (Healy, 1991). Migration commonly occurs during the night under the cover of darkness, although some fish may migrate during the day (Healy, 1991).

The majority of the diet of juvenile Chinook salmon while in fresh water consists of invertebrates. Chinook salmon generally feed on insects in the water column or drifting at the surface (Healy, 1991). After emigrating from fresh water, these ocean-type Chinook salmon tend to use estuaries and coastal areas for rearing, where they feed on small crustaceans and insects (Wydoski and Whitney, 1979; Healy, 1991). As juvenile Chinook salmon grow, they tend to eat more larval and juvenile fishes, including herring (*Clupea harengus pollasi*), anchovies (*Engraulis mordax*), sardines (*Sardinopus sagax*), and rockfish (*Sebastes* spp.).

Stream habitat characteristics important to ocean-type Chinook salmon include large accumulations of gravel for spawning and estuarine habitats for marine growth and survival. In addition, stable stream flows are required for egg incubation, which occurs throughout the winter and into March (Healy, 1991).

No genetic stock identification data are available for the Lake Washington-North Lake Washington Tributaries stock (WDF et al., 1993). However, the Lake Washington-Issaquah stock was defined as distinct based upon geographic distribution in Issaquah Creek and its forks (WDF et al., 1993), as well as by more recent genetic information (Busack and Shaklee, 1995; MITFD et al., 1999). The stock origin is believed to be non-native due to Green River stock transfers to the Lake Sammamish Basin since the 1930s (WDF et al., 1993), and in fact, the stock is genetically very similar to Green River fall Chinook (Busack and Shaklee, 1995; MITFD et al., 1999). Other non-local stocks may have also influenced stock composition (WDF et al., 1993). Based upon carcass counts in the basin from 1986 through 1991, the status of this stock is healthy, with counts ranging from 844 to 3,337 carcasses, for an average of 1,993 carcasses per year (WDF et al., 1993; Big Eagle and LGL, 1995).

The natural spawning population is located primarily below the Issaquah Hatchery rack and is dependent on hatchery production (WDF et al., 1993). Water flows and temperatures affect the ability of Chinook salmon to reach the hatchery rack, which in turn, influences the amount of natural spawning below the hatchery (WDF et al., 1993). This stock was not considered an Endangered Species Act (ESA) issue by the National Marine Fisheries Service (NMFS) Biological Review Team during the Chinook salmon status review because this stock is not representative of the historical stocks in the Lake Sammamish system (Myers et al., 1998). Although it is not listed under ESA nor is it essential for recovery of the Puget Sound Evolutionarily Significant Unit (ESU), the Issaquah Hatchery stock is considered part of the ESU (NMFS, 1999a).

The Lake Washington-North Lake Washington Tributaries stock, which includes Bear Creek at the north end of the project corridor, is also thought to be distinct based upon geographic isolation (WDF et al., 1993). No genetic stock identification data have been summarized and published for Chinook salmon that spawn in tributaries of the Sammamish River. The Bear/Cottage Lake Creek stock is native and maintained through wild production but may be influenced by Issaquah Hatchery strays (WDF et al., 1993; Myers et al., 1998). WDFW recently listed the status of the North Lake Washington Tributaries summer/fall Chinook salmon population as "Unknown" due to inconsistent spawner survey data (WDF et al., 1993). However, total estimated escapement from 1983 to 1996 yielded a five-year geometric mean of 145 adults (Big Eagle and LGL, 1995; Myers et al., 1998). The Bear Creek stock was included in the petition to list Chinook salmon under ESA (ONRC and Nawa, 1995).

The most recent timing of basin entry for adults of this stock is provided by MITFD et al. (1999). Average daily counts of adult Chinook passing through the Howard S. Chittenden (Ballard) Locks in 1995-1997 showed a range from June 12 through October 2, with peak counts in July and the first half of August (MITFD et al., 1999). Excessive temperatures in the Sammamish River delay Chinook salmon upstream passage; adults are known to mill in the Kenmore area of Lake Washington in some warmer years. Chinook salmon normally begin to enter Issaquah Creek in mid-September.

On-going studies indicate that Chinook salmon fry emergence in the Cedar River begins in early January and extends to mid-March. Fry begin to enter Lake Washington in mid-May, with most migrating through Lake Washington and out of the Ship Canal in May and June. In Lake Sammamish, the overwhelming majority of Chinook salmon are from the releases made between May 5 and 10 at the Issaquah Hatchery (Fresh, personal communication, 2000).

The project corridor occurs in an area currently used by the Lake Washington-Issaquah and Lake Washington-North Lake Washington Tributaries stocks of Chinook salmon, and the corridor contains suitable Chinook salmon habitat. Both North Fork Issaquah Creek and Bear Creek within the study area are considered accessible to Chinook salmon, and spawning has been documented in the area. These creeks provide important habitat for Chinook salmon, which could be directly affected by the proposed project. No other stream in the study area has habitat suitable for Chinook salmon.

Coho Salmon

A status review of coho salmon was recently completed by NMFS in response to petitions seeking to list several Pacific Northwest populations as threatened or endangered (Weitkamp et al., 1995). Despite recent stable trends and population abundance near historic levels in some systems, the Puget Sound Chinook salmon remains a candidate species for listing because of concerns over current genetic, environmental, and habitat conditions (NMFS, 1995). Risk factors identified as potentially deleterious to Puget Sound coho salmon stocks included high harvest rates, extensive habitat degradation, unfavorable ocean conditions, and declines in adult size (Weitkamp et al., 1995). The genetic fitness of Puget Sound coho salmon stocks has been altered by widespread and intensive artificial propagation, which includes interbasin transfers of broodstock and natural spawning between wild and hatchery fish. Hatchery supplementation in Puget Sound, including Lake Washington, has been particularly extensive (Weitkamp et al., 1995).

Coho salmon inhabiting the tributaries that flow into Lake Sammamish are managed as part of the Lake Washington/Sammamish Tributaries stock. This stock is defined by its distinct geographic spawning distribution (WDF et al., 1993). Coho salmon are distributed throughout the accessible reaches of these tributaries. There is very limited straying into this drainage from surrounding systems (WDF et al., 1993).

Adults enter fresh water from mid-September to mid-November, and spawning occurs mostly from mid- to late October to mid-December (Williams et al., 1975; WDF et al., 1993). This stock is considered to be a mixture of native and introduced non-native stocks (WDF et al., 1993). Supplementation of the Lake Washington/Sammamish Tributaries coho salmon stock has involved various sources, including Issaquah Creek, Green River, Samish River, Skykomish River, Baker River, and Toutle River/Chambers Creek hybrid broodstocks (WDF et al., 1993). Escapement trends of coho salmon throughout the Lake Washington Basin decreased severely through the 1980s, and the stock is considered depressed (WDF et al., 1993). Average run size in Lake Washington from 1965 through 1993 was 25,310, but reflected an annual percent change of -2.74 percent (Weitkamp et al., 1995).

Coho salmon typically return to spawn at age 3, though sexually mature two-year-old males are not unusual. These jacks return to fresh water to spawn after only five to seven months at sea. The proportion of jacks within a population is highly variable and is influenced by genetic and environmental factors (Weitkamp et al., 1995). All coho salmon are semelparous; they die after spawning. Coho salmon usually spend two weeks or less on the spawning grounds from the time of their arrival to the time of their death (Sandercock, 1991).

Coho salmon typically hatch after six to eight weeks and emerge from the gravel two to three weeks later (Wydoski and Whitney, 1979). The length of time required for incubation depends largely on water temperatures, as it does for other salmonids. After emergence, coho salmon feed voraciously on terrestrial and aquatic insects, often selecting prey that drifts on the surface or in the water column (Sandercock, 1991). Coho salmon generally rear in fresh water from one to two years then migrate to salt water, where they remain for about 18 months prior to returning to fresh water to spawn (Wydoski and Whitney, 1979; Sandercock, 1991). Typically, coho salmon smolts outmigrate with increased spring flows between mid-April and mid-July, with peak migration in May.

The most productive rearing areas for coho salmon tend to be small streams with abundant slack water habitats (Wydoski and Whitney, 1979; Sandercock, 1991). Rearing juvenile coho salmon tend to prefer pools (Bisson et al., 1988); woody debris is an important structural element that creates this type of habitat (Bustard and Narver, 1975; Bisson et al., 1987). Woody debris also provides areas of cover and provides food to many aquatic insects that are in turn prey for rearing coho salmon juveniles and other salmonids. As winter nears and flows increase, coho salmon commonly seek refuge in ponds and small tributaries where they can avoid being flushed downstream during extreme high flow events (Peterson, 1982; Cederholm and Scarlett, 1982). Diking, dredging, ditching, and various methods of bank protection often vastly reduce the amount of complex low-gradient side channels available for coho salmon summer and winter rearing habitat (Beechie et al., 1994).

Coho salmon have been documented in seven of the larger streams listed in Attachment D-1. These seven creeks provide important, albeit degraded habitat for coho salmon. Coho use may occur in short reaches of some of the other perennial streams but is not documented, and professional judgments could not be made due to a lack of access to the streams.

Bull Trout

Four life history forms are recognized for bull trout, which include resident (non-migratory), adfluvial (lake dwelling), fluvial (migratory stream and river dwelling), and anadromous (saltwater migratory) fish. The status of the migratory (fluvial, adfluvial, and anadromous) forms are of greatest concern throughout most of their range. The majority of the remaining populations in some areas may be composed of resident bull trout (Leary et al., 1991; Williams and Mullan, 1992). The USFWS has issued a final ruling determining threatened status for bull trout (USFWS, 1999). The Coastal-Puget Sound population segment of bull trout, which includes the Lake Washington Basin, is unique because it is thought to contain the only anadromous forms of bull trout within the coterminous United States (USFWS, 1998a).

Bull trout are found in a variety of habitats, including lakes, reservoirs, large rivers, and small streams, but primarily inhabit colder streams (Rieman and McIntyre, 1993). Habitat components that influence bull trout distribution and abundance include temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Rieman and McIntyre, 1993; USFWS, 1998b). Migratory bull trout move between multiple habitats during their life cycle, while the non-migratory form maintains a relatively small home range, typically completing their life cycle in small headwater streams. Bull trout are widely distributed across their range, but that distribution tends to be very patchy, even in pristine environments (Rieman and McIntyre, 1993). Bull trout have been extirpated from many of the large rivers within their historic range and exist primarily in isolated headwater populations. The decline of bull trout has been attributed to habitat degradation, blockage of migratory corridors by dams, poor water quality, the introduction of non-native species, and the effects of past fisheries management practices (USFWS, 1998a).

Bull trout spawn in late summer and early fall (Bjornn, 1991). Puget Sound stocks typically initiate spawning in late October or early November as water temperature falls below 7° to 8° Celsius (C). Spawning habitat almost invariably consists of very clean gravel, often in areas of groundwater upwelling or cold spring inflow (Goetz, 1994). Egg incubation temperatures needed for survival have been shown to range from 2° to 4° C (Willamette National Forest, 1989). Bull trout eggs require approximately 100 to 145 days to hatch, followed by an additional 65 to 90 days of yolk sac absorption during alevin incubation. Thus, in-gravel incubation spans more than six months. Hatching occurs in winter or late spring, and fry emergence occurs from early April through May (Rieman and McIntyre, 1993).

Generally, for their first one to two years, bull trout juveniles rear near or in their natal tributaries (Bjornn, 1991) and exhibit a preference for cool water temperatures, although they appear less restricted by temperature than are spawners. Bull trout fry are often found in shallow, backwater areas of streams that contain woody debris. Fry are bottom dwellers and may occupy interstitial spaces in the streambed (Brown, 1994).

Resident forms of bull trout spend their entire lives in small streams, while migratory forms live in tributary streams for several years before migrating to larger rivers (fluvial form) or lakes (adfluvial form). Migratory bull trout typically move downstream in the summer and often congregate in large slow pools to feed (Bjornn, 1991). Anadromous bull trout usually remain in freshwater two or three years before migrating to salt water in spring (Wydoski and Whitney, 1979). As bull trout grow, they tend to rely less on invertebrates as their primary prey and may feed exclusively on fish (Bjornn, 1991). After entering marine waters, anadromous char[1] in Puget Sound feed mainly on fish, including smelt (*Hypomesus pretiosus pretiosus*), herring, and juvenile salmonids (Brown, 1994). Bull trout are not necessarily relegated to the life history strategy of their parents, and shifting between resident and migratory life forms may occur, depending on environmental conditions. For example, resident forms may increase within a population when survival of migratory forms is low (Rieman and McIntyre, 1993).

The biological similarities of bull trout and Dolly Varden make them virtually indistinguishable in the field. Therefore, WDFW has combined information on their status and distribution into a common inventory (WDFW, 1998). Bull trout were historically distributed throughout the central Puget Sound region, including a portion of the current upper Lake Washington Basin (Goetz, 1994). However, information regarding the current distribution of bull trout in the lower Lake Washington Basin is meager.

A relatively healthy reproducing population of bull trout exists in Chester Morse Lake in the upper Cedar River Basin, but no reproduction has been confirmed in the lower Cedar River, Lake Washington, Lake Sammamish, or their tributaries (WDFW, 1998). This is not surprising because the thermal regimes of streams in the lower basin are unsuitably warm for native char.

There have been only a few reports of bull trout/Dolly Varden (native char) in the lower Lake Washington Basin. Several large native char (approximately 410 mm long) have been observed passing through the viewing chamber at the Ballard Locks, but in a two-year creel survey of Lake Washington in which thousands of angled trout were checked, only one char was identified (Bradbury and Pfeifer, 1992; USFWS, 1998b).

Little is known about historical distribution and abundance in the Sammamish River/Issaquah Creek system. A one-year creel survey of Lake Sammamish in 1982-83 reported no char (WDFW, 1998). B. Fuerstenberg (personal communication *in* USFWS, 1998b) believes he observed two native char in upper Issaquah Creek in 1993, and there have been a few other anecdotal reports of native char in the Lake Washington Basin (USFWS, 1998b). The lack of evidence of spawning populations in the Lake

[1] For purposes of fisheries management, the WDFW does not differentiate between Dolly Varden and bull trout, and where necessary for the purposes of ESA, considers the state's native char populations to be predominantly bull trout.

Washington/Lake Sammamish Basins suggests that these fish may have originated in other basins, and may have been on a foraging foray in the basin. Although their exact abundance and distribution in the two lake basins is uncertain, it appears adults have an irregular presence in the lower basin, and in minor numbers.

The Sammamish River, Lake Sammamish, and Issaquah Creek drainages have been negatively affected by extensive urbanization and road building, which produces predictable periodic poor water quality (Williams et al., 1975; Ecology, 1997). Urbanization in Puget Sound has generally led to decreased habitat complexity (such as uniform stream channels, simple non-functional riparian areas, and severe flooding), and decreased water quality and quantity in many streams (USFWS, 1998a). Impacts from urbanization are concentrated in the lower reaches of rivers within Puget Sound, which affects bull trout migratory corridors, spawning habitat, and rearing habitat (USFWS, 1998a).

Water temperatures in excess of about 15°C are thought to limit bull trout distribution (Rieman and McIntyre, 1993). The Sammamish River and Issaquah Creek are on the 303(d) list (under Section 303 (d) of the Federal Clean Water Act) because of temperature exceedances. Although no dissolved oxygen (DO) standards have been developed for bull trout, the Sammamish River and Issaquah Creek do not meet 303(d) standards for DO (Ecology, 1997).

Bull trout use of streams in the study area is unknown but highly unlikely. Although there are no known documented occurrences of bull trout in the immediate area, anadromous adult char may occasionally stray into the Lake Washington/Lake Sammamish system. Mid-winter water temperatures in the subject creeks are too high to support successful egg and alevin incubation by native char. Habitat for bull trout in the study area, if any, is limited to possible foraging and is probably limited to lower Bear Creek. Currently, culverts, low stream flows, unsuitable water quality, and degraded stream environments would obstruct or deter bull trout movement into most, if not all, of the streams within the study area.

River Lamprey

River lamprey is a federal species of concern. These fish are anadromous and parasitic in both fresh and marine waters. Little is known about the freshwater life of river lamprey. River lamprey spawning occurs in the spring (late April though May). When the young (ammocoetes) hatch, they bury themselves in the mud and sand, where they remain for an unknown period (Wydoski and Whitney, 1979; Scott and Crossman, 1973). The affected stream environment for river lamprey is the same as described above for Chinook and coho salmon. River lampreys have been identified in Lake Sammamish adjacent to the study area (WDFW file records, Mill Creek); however, the spawning and ammocoete rearing areas for this species in Lake Sammamish are unknown. Tributaries offering a mixture of cobble for oral sucker attachment and nearby streambed composed of fine sand or silt would provide suitable spawning and rearing habitat, respectively. Many of the perennial streams crossed by the Interim Use Trail (i.e., the former railbed) contain this habitat, and it is abundant in Bear and North Fork Issaquah Creeks.

Pacific Lamprey

Pacific lamprey is also a federal species of concern. Similar to river lamprey, Pacific lamprey are anadromous and parasitic while in marine waters, and very little is known about the freshwater life of these fish. Pacific lamprey spawning occurs in spring or summer (May through September, depending on latitude), and ammocoetes rear in freshwater for up to six years before migrating to the Pacific Ocean (Wydoski and Whitney, 1979; Scott and Crossman, 1973). Pacific lamprey may occur in the project vicinity; however, no population-specific information is available within the Lake Washington/Lake

Sammamish Basin. Pacific lamprey are seen in rivers and larger tributaries in May or June (WDFW file records, Mill Creek) and are unlikely to occur in the study area.

State Priority Species

Priority fish species include all state endangered, threatened, sensitive, and candidate species and species of recreational, commercial, or tribal importance that are considered vulnerable. All fish species with state candidate status that occur in the study area also hold a federal designation and were discussed in the preceding paragraphs. No state sensitive, threatened, or endangered fish species occur within the study area. Other fish species that are designated as Priority Species (WDFW, 2000) may occur within the study area. These include chum, sockeye, and kokanee salmon; rainbow trout/steelhead; coastal cutthroat trout; white sturgeon; largemouth bass; smallmouth bass; and longfin smelt. These species are briefly discussed in the concluding paragraphs of this section.

Resident (non-anadromous) fish inhabit some of the streams crossed by the proposed Build Alternatives; their known occurrence is summarized in Attachment D-1. Most resident fish (rainbow and cutthroat trout; kokanee salmon) are members of the salmonid family. These species are widely distributed throughout the project vicinity and contribute to a recreational fishery, primarily in Lake Sammamish. Other species of non-salmonids (sculpins, dace, lamprey) may be found within the project vicinity, but none were seen in the streams by County staff as indicated in the literature review. Salmonids rely on high-quality water and abundant habitat. Information and data on presence, distribution, and population densities of resident species are very sparse and, in some cases, unreliable. Thus, it is possible that some of these resident species may be present even if not observed in the surveys.

Rainbow Trout/Steelhead

Resident rainbow trout are the non-migratory form of steelhead and have a similar life cycle to steelhead, with the exception of not spending a portion of their lives in the marine environment. Spawning occurs primarily at gravel riffles in tributary streams in early spring after adults move upstream from a lake or larger stream. Egg and alevin incubation extends from early spring to early summer, with fry emergence occurring into mid-summer. Fry gradually disperse in the rearing stream, often with a net movement downstream to a larger river or lake, although some larger juveniles and adults remain in larger tributaries such as Issaquah or Bear Creeks. Rainbow trout reach maturity after two to three years.

Rainbow trout are native to the Lake Sammamish Basin but are not abundant in Lake Sammamish (Bradbury and Pfeifer, 1992). The resident, non-migratory form of the species occurs in both lakes and streams upstream of natural and man-made migratory blockages. Their origins in headwater above migratory barriers are obscure but are likely the result of past access or historical stocking. Rainbow trout have been stocked by WDFW into Pine Lake for many years.

Winter-run steelhead are native to the larger tributaries of the Sammamish River and Lake Sammamish (notably Issaquah Creek) but have been greatly reduced in abundance in recent years. Adfluvial or resident rainbow trout spawn and rear in Bear and Laughing Jacobs Creeks. They are reported from, but are unconfirmed in, George Davis, Ebright, and Pine Lake Creeks and Stream No. 0163 (Alexander's Creek).

Coastal Cutthroat Trout

Resident cutthroat trout exhibit several life histories, even within the Lake Sammamish/Lake Washington system. Strict stream-resident forms live their entire lives within a short distance of stream. A second adfluvial group spawn and rear for one to two years in tributaries of the lakes, but drop to the lakes to mature, returning to spawn in the early spring at a far larger size than their strictly resident cousins. A third group is anadromous, spending portions of the year in estuarine areas, but not making extensive migrations in the marine environment. These fish benefit from accelerated growth similar to the adfluvial group, and return to their natal streams to spawn in the late fall or mid-winter. These fish are spring spawners, and once they reach maturity, will spawn annually thereafter.

Cutthroat trout occur in the lower reaches of nine or more of the project streams (see Attachment D-1). Small, resident cutthroat trout are nearly ubiquitous in the streams that drain to Lake Sammamish (Muto and Shefler). Where there is no blockage to upstream migration, it is common to see a mixture of resident and adfluvial life history forms, with residents typically being found in the upper, or headwater reaches (e.g., Issaquah Creek).

Information on the status of Lake Washington/Lake Sammamish cutthroat trout populations is lacking; however, in a recent review of their coastwide status, NMFS declared the Puget Sound ESU not warranted for listing (NMFS, 1999b). Indirect indices of their abundance in the two-lake system indicate a healthy and possibly expanding population (Pfeifer, 1992; WDFW file data, Mill Creek).

Adfluvial cutthroat trout have been a popular game fish in Lake Sammamish for many years. The putative increase in cutthroat trout abundance seen indirectly in Lake Washington angler success, and tributary cutthroat trout redd abundance (Pfeifer, 1992) may be due to a competitive advantage over coho salmon in tributaries that have been urbanized (Lucchetti and Fuerstenberg, 1992).

Kokanee Salmon

Sockeye salmon are usually anadromous. They migrate to sea, usually in the spring of their second year after one or two years in a nursery lake, and grow to maturity in the Pacific Ocean, followed by spawning in their natal stream (Foerster, 1968). There is a non-anadromous form of *O. nerka*, called kokanee salmon, which remains in fresh water its entire life (Ricker, 1938). Kokanee salmon remain in the nursery lake until maturity, when they also return to their natal stream to spawn (Vernon, 1957; McCart, 1970).

Tremendous differences exist between the two environments that sockeye and kokanee salmon inhabit (Ricker, 1940). Kokanee salmon have fully adapted to a freshwater existence and presumably diverged from a common anadromous stock in recent geologic times (Ricker, 1940); however, the process of evolution in not clear (Burgner, 1991). It seems likely that many of the morphological and developmental differences between sockeye and kokanee salmon represent adaptations to anadromous versus non-anadromous life histories (Ricker, 1940; Wood and Foote, 1996).

Largely because of differences in productivity between the marine and lacustrine environments (Foerster, 1968), sockeye salmon parents are typically twice as long as kokanee salmon parents (Wood and Foote, 1990; 1996). Size at maturity for kokanee salmon varies considerably, with mean lengths ranging from 18 to 30 cm (Burgner, 1991). Except for their small size, kokanee salmon generally resemble anadromous sockeye salmon in general appearance and bright spawning coloration (Burgner, 1991).

During spawning, the size difference between sockeye and kokanee salmon becomes critical, leading to mating according to size (Hanson and Smith, 1967; Foote, 1988) and hence by morph (Foote and Larkin, 1988). In other words, size selection corresponding with the differences in size at maturity facilitates positive assortative mating of anadromous (sockeye salmon) versus non-anadromous (kokanee salmon) life-history types (Foote and Larkin, 1988; Wood and Foote, 1996).

The selection pressures imposed by the marine and freshwater environments differ for sockeye salmon versus kokanee salmon. Selection has led to genetic divergence between forms, in addition to the size difference discussed above, and includes characteristics such as age at maturity, gill raker number (Foote et al., 1999), allozyme and DNA allele frequencies (Foote et al., 1989; Wood and Foote, 1996; Taylor et al., 1996), early growth and development (Wood and Foote, 1990), swimming performance (Taylor and Foote, 1991), and seawater adaptability (Foote et al., 1992).

Kokanee salmon may exist in lakes with or without anadromous sockeye salmon runs. On the Columbia River drainage in Washington, Oregon, Idaho, and British Columbia, many lakes without anadromous sockeye salmon in recent history contain kokanee salmon (Nelson, 1968). On Vancouver Island, kokanee salmon are also present in lakes with and without anadromous runs (Dymond, 1936; Ricker, 1940). In the state of Washington, Lake Washington, Lake Sammamish, and Lake Whatcom contain native kokanee salmon populations and no native sockeye salmon runs (Burgner, 1991).

Kokanee salmon spawning may occur both in streams and in lakeshore areas. It is generally segregated in time and area from sockeye salmon spawning. The principal food of kokanee salmon is similar to that of young sockeye salmon (i.e., pelagic zooplankton and insects). Therefore, the potential exists for competition in lakes where both sockeye and kokanee salmon are present. Distinct sub-populations of kokanee salmon may develop within a single lake (Vernon, 1957; Chernenko and Kurenkov, 1980).

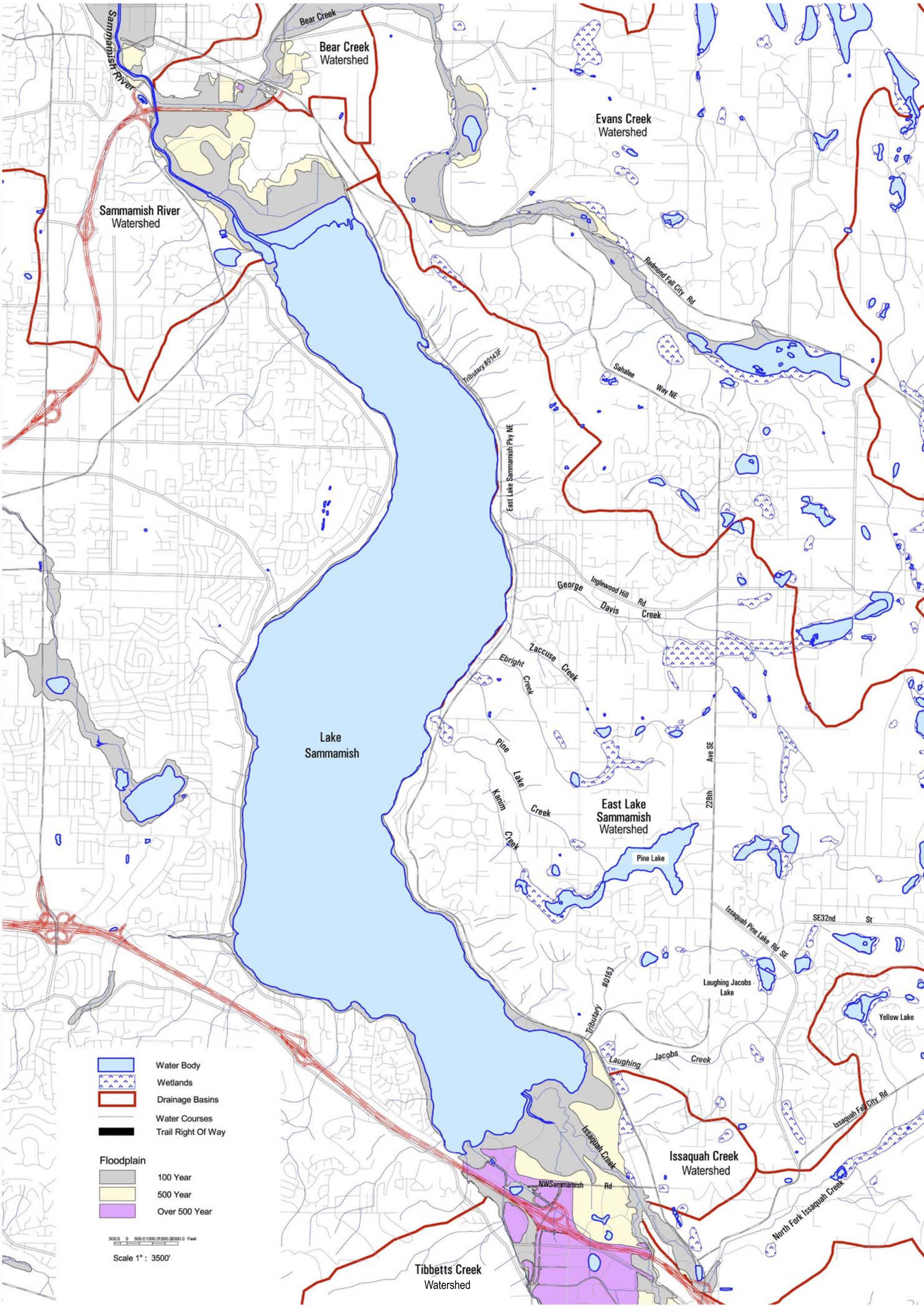
Kokanee salmon were present in the Lake Washington/Lake Sammamish drainage historically and are known to be native (Seeb and Wishard, 1977; Crawford, 1979; Hendry, 1995; King County DNR, 2000). However, over 34 million Lake Whatcom kokanee salmon fry were stocked in Bear and Evans Creeks between 1917 and 1969 (Pfeifer, 1992), and over 177,000 kokanee salmon fry were stocked from unknown source populations (Pfeifer, 1992). Currently, kokanee salmon in the Sammamish River/Lake Sammamish Basin can be separated into two groups based on very different spawning timing: (1) a group of early-entry kokanee salmon in Issaquah Creek (at the southern end of Lake Sammamish), and (2) late-entry kokanee salmon in the Sammamish River and Lake Sammamish tributaries that spawn in late September/October in Bear Creek; October/November in Issaquah Creek; and late November/December in Ebright, Laughing Jacobs, and Lewis Creeks (Pfeifer, 1992; Ostergaard et al., 1995). Early-run kokanee salmon in Issaquah Creek are native, while kokanee salmon in other tributaries to Lake Sammamish and Sammamish River are believed to be non-native, based on their later run timing (Ostergaard et al., 1995). Ostergaard (1996) described eight creeks along the east and south shores of Lake Sammamish that historically supported native early-run kokanee salmon.

The estimated spawning population for early-entry kokanee salmon in Issaquah Creek during the four-year period from 1992 to 1995 was 81 fish (Ostergaard, 1996). The estimated population of kokanee salmon in Bear Creek in 1992, 1993, and 1994 was 242, 23, and 9 kokanee salmon, respectively (Ostergaard et al., 1995). However, Ostergaard (1996) stated that nine fish counted in 1994 may have been residual sockeye or sockeye x kokanee salmon hybrids. Spawning sockeye salmon are known to intermingle with spawning Cedar River, Bear Creek, and late-run Issaquah Creek kokanee salmon (Pfeifer, 1992), as well as with kokanee salmon spawning in Lewis Creek and Laughing Jacobs Creek (Ostergaard et al., 1995). Nonetheless, because the number of kokanee salmon visually observed is usually a small fraction of the actual number of fish present in Bear Creek (WDFW, 1996), kokanee escapement to Bear Creek in 1996 was estimated at 317 by Ostergaard (1996).

Since 1992, the King County Surface Water Management Division, in cooperation with WDFW, has surveyed spawning salmon in the Lake Sammamish Basin. In 1993, only one creek, Laughing Jacobs Creek, was surveyed. No kokanee salmon were observed in the system until November 8, 1993, and the Laughing Jacobs Creek kokanee salmon run peaked at 65 fish (130 fish per mile) on December 2, 1993

(King County, 1994a). Laughing Jacobs Creek had the highest number of fish per mile of all the creeks surveyed (reaches of Issaquah, Bear, Evans, and Cottage Lake Creeks) (King County, 1994a).

The project corridor is in an area currently used by the Bear Creek sockeye and kokanee salmon runs. Ebright, Pine Lake, Laughing Jacobs, and North Fork Issaquah Creeks within the project corridor are accessible to kokanee and sockeye salmon, and spawning by one or both species occurs in most of them (see Attachment D-1). These creeks are critical habitat for kokanee and sockeye salmon, species that could be directly affected by the project.



King County
Department of
Natural Resources and Parks
Facilities Management Division

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SOURCES:

FIGURE D-1
PROJECT AREA STREAMS
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Appendix E – Commercial Businesses in Vicinity of Master Plan Trail

East Lake Sammamish Master Plan Trail Commercial Businesses in Vicinity of Master Plan Trail

Prepared for

King County Facilities Management Division

Prepared by

Adolfson Associates, Inc.
5309 Shilshole Avenue NW, Suite 200
Seattle, WA 98107

October 2006

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Table E- 1. Commercial Businesses in Vicinity of Redmond Segment

Within 50 Feet of Trail Corridor	Within 50-100 Feet of Trail Corridor	Within 100-200 Feet of Trail Corridor
Classic Cleaners Les Schwab Tire Center Brown Bear Car Wash Pacific Topsoils, Inc. Redmond Inn and Pancake House American Mini-storage 76 Gas Station Bio O Tires Lumberman's Bed, Bath & Beyond Red Robin Starbucks Sprint Pasta & Co. Bartell Drugs	OakRidge Park Complex Umm Tae Kwon Do Gotta Dance Emerald City Gymnastics Velocity Sports Performances Pan Pacific Electronics, Inc. New Impressions Label Masters Puget Sound Envelope 3 Little Bears LLC Doctor Injector Eastside Import Car Specialists Emel Designs Jim's Automotive Import Auto Tech The Tasting Room Marymoor Commerce Center Overlake Heating, Air Conditioning, and Sheet Metal, Co. Acrylic Concepts Comsoft Systems, Inc. Lanoga Corp. Bookkeeping and Beyond Eagle Windows and Doors Colarplak Delta Environmental	Subway Classic Tailoring Bamboo Kitchen Shell Station Chalet Grocery and Deli Sunbelt Rentals Marymoor Realty Salon de Charissa AllState Dairy Queen Pier 1 Imports Aaron Brothers Furniture Zany Brainy (Toys) Cost Plus Watermark Credit Union Larry's Market North Sammamish Center Encore Ceramics Loder Instrument Co. N.W. Erosion Control, Inc. Park 520 Park 520 Deli Child Care Information Exchange MC Industries. Inc Class Act Stanford Signs Ennco Environmental Roof Systems Sign Associates, Inc. Protocam, Inc. PlantStand, Inc. White Knuckle Vehicle Monitor, Inc. Circuit Breaker, Inc.

Within 50 Feet of Trail Corridor	Within 50-100 Feet of Trail Corridor	Within 100-200 Feet of Trail Corridor
	Creekside Crossing Fatburger Confetti Junction Cingular Creekside Crossing Cleaners Yesterday's Jade Droge Cuisine Papa Murphy's Pizza Baskin Robbins Seattle's Best Coffee Blimpie Great Clips Bank of America Blockbuster Video	Bear Creek Village Taco Time Gateway Country Vaar-M Hallmark Paradise Bay Safeway Rite Aid Yummy Teriyaki Fabricare Cleaners Kids Art PetCo GNC Parouche Salon Jo-Ann Fabrics Museum Quality Discount Framing Kits Camera Las Margaritas Linens 'N Things

Table E- 2. Commercial Businesses in Vicinity of Sammamish Segment

Within 50 Feet of Trail Corridor	Within 50-100 Feet of Trail Corridor	Within 100-200 Feet of Trail Corridor
-	-	Sammamish Lakeside Plaza 7-Eleven Sammamish Vision Issaquah Family Chiropractic Edward Jones Karate West Lakeside Montesorri Andre's Cleaners Dance Connection

Table E- 3. Commercial Businesses in Vicinity of Issaquah Segment

Within 50 Feet of Trail Corridor	Within 50-100 Feet of Trail Corridor	Within 100-200 Feet of Trail Corridor
Issaquah Escrow	La Costa Mexican Restaurant	Pogacha Restaurant
Antiques, Estates and Appraisals	First Mutual Bank	Issaquah Auto Shop
Cherished Moments Photography	Gillman Village	Issaquah Muffler and Brake
Zetec Manufacturing Facility	Public Storage	Eastside Mobile Auto Glass
Work Place Choice-Financial Services	Cope Construction Co.	Issaquah Signs
	Issaquah Car and Truck Rental	Taj Collision Center
B&K's Marine Center	Issaquah Mini-Storage	Shell Station
Clark's Texaco Service and Towing	All Tech Collision	Novus
	Fed Ex	Rob's Transmission
Eastlake Auto Sales		Ultimate Detail
Mr. Concrete		Arco
	<u>Meadow Creek Office Park</u>	Front Street Deli
	Craig Johnston, DDS	Stereotomy
	Eva VanderHoeven, DDS	76 Station
	Gail Pettis Orthodontics	Issaquah Cedar and Lumber
	Patricia Cleavinger	Golden Teriyaki
	Catherine Smith	World Nails
	Eric Jorgensen	Store Cleaners
	Brent West Decker Associates	Milk Barn Too
	NJ Egger Orthodontics	Albertsons
	Mark Jensen Orthodontics	BMC West Lumber
	Del Monte Foods	Joker Pub
	Tingey Orthodontics	McDonalds
	Rosemary Warren, DDS	Hillsdale Sash and Door
	Cascade Pediatrics	
	Register Now	<u>The Sammamish Center*</u>
	Pinnacle Real Estate	Walgreens
	Michelson Agency, Inc.	Home Depot
	National Shelter Products, Inc.	Key Bank
	Langly Properties, Inc.	3 Day Blinds
	Rainier World Travel	Cingular
	Allstate Insurance	FatBurger
	R&D Marketing	Krispy Crème
	Northwest Storage Investments	Paper Zone
	Theresa Cheng, DDS	Jamba Juice
	Robert Tanner, DDS	Starbucks
	Jeffrey Aent, DDS	Pallina Restaurant
	Overlake Hospital Classroom	Perfect Look
	S. Barnickel	Montage Cleaning
	Georgia-Pacific	Gold Store Creamery
	Fleckenstein Capital	Teriyaki Bistro
	Health First Chiropractic	Fred Meyer
	M. Hammerly, John Long	Pacific Fabrics
	Bartels & Stout, Inc.	Lazyboy Furniture
	Apex Dental Care	Choc Café
	Dr. Kwok, DDS	Qdoba Mexican Grill
	Dr. MA, DDS	Quiznos
	Dan Cobb & Associates, Inc.	Kid Cuts
	Evergreen Insurance Group	In Spa
	Financial Designs, Inc.	Car Toys
	OBCO, Inc.	AT&T Wireless

Within 50 Feet of Trail Corridor	Within 50-100 Feet of Trail Corridor	Within 100-200 Feet of Trail Corridor
	Willis Gabel, DDS Evergreen Restaurant Group Fanfare Media Unilever USA Global Payments, Inc. Campbell’s/Pepperidge Farms Wells Fargo Home Mortgages Xantic, Inc. Cartools Co.	Siemans Microsoft Space Labs Medical King County District Court –Issaquah Division Fed Ex World Service

*Approximate distances, based on onsite visual estimates.

Appendix F – Visual Quality and Aesthetics Technical Report

East Lake Sammamish Master Plan Trail Visual Quality and Aesthetics Technical Report

Prepared for

King County Facilities Management Division

Prepared by

Parametrix
411 – 108th Avenue NE, Suite 1800
Bellevue, WA 98004
(425) 458-6200
www.parametrix.com

October 2006

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1. INTRODUCTION

This report presents the results of the visual quality and aesthetics assessment for the proposed East Lake Sammamish Master Plan Trail. The information presented here and summarized in the EIS (Chapter 3, Section 3.9) contributes to the decision-making process for the proposed trail project by describing potential changes to surrounding landscapes that may affect their visual quality or aesthetics. Visual quality assessment is a process for describing the visual character of the landscape as it exists before the project, assessing the potential visual impacts on that landscape due to the proposed alternatives, and identifying possible mitigation measures, if needed. The proposed mitigation actions include ways to avoid or minimize visual quality impacts and to restore or enhance visual quality.

This visual quality assessment used the Federal Highway Administration (FHWA) Visual Impact Assessment for Highway Projects (FHWA-HI-88-054). The FHWA assessment methodology was developed by FHWA on behalf of communities adjacent to proposed transportation projects as a way to adequately and objectively consider the potential visual impacts resulting from highway projects. The FHWA methodology has become an accepted framework for describing and analyzing a transportation project's subjective visual experience and for developing the social and physical contexts for visual impact analyses. This methodology was developed for roadway projects, but it is applicable to any transportation facility, such as the East Lake Sammamish Trail.

This assessment also follows the requirements of the Washington State Department of Transportation Discipline Report Environmental Checklist for Visual Quality (WSDOT, 2004) to ensure that the information gathered is adequate to contribute to the decision-making process.

2. STUDIES AND COORDINATION

2.1 ANALYSIS METHODOLOGY

The FHWA methodology is a six-step evaluation process that has its own terminology and tools. When these are understood, the FHWA methodology provides a clear and straightforward process. The terms introduced here will be defined and discussed in sections to follow. The evaluation sequence is as follows:

1. Establish the project's visual limits ("viewshed" and "landscape unit")
2. Determine who has views of and from the project ("viewer")
3. Describe and assess the visual context that exists before the project ("affected environment")
4. Assess the response of viewers looking at and from the project, before and after the project ("viewer sensitivity")
5. Determine and evaluate views of and from the project for before and after project views (Visual Quality Matrix and simulations)
6. Describe the potential changes in the visual quality that will result from the proposed alternatives

The first three steps establish baseline conditions and the extent of the project's visual context. From this baseline, we assessed the potential changes to the visible landscape due to the proposed project and estimate likely viewer responses. During the assessment, mitigation actions were identified, which are presented in the EIS.

The tools used in the FHWA method are the Landscape Unit and Viewshed analyses, Visual Quality Matrix, and simulations based on photographs. The Visual Quality Matrix is a numerical ranking of landscape categories for a particular view using accepted, descriptive parameters. The parameters encompass physical attributes and viewer response and will be discussed in greater detail below.

Light and glare are also typically evaluated for roadway projects; however, light and glare are not expected to change from existing conditions because the trail will be closed from sundown to sunrise and will not be lighted.

2.2 TERMINOLOGY

Changes to the landscape due to the project alternatives are evaluated relative to existing conditions along the Interim Use Trail and East Lake Sammamish Parkway. Existing conditions (affected environment) and visual quality impacts resulting from the project will be discussed in the sections that follow using these terms:

Views are what can be seen from the study area and what can be seen of the study area from the surroundings. Sensitive or special views are identified for the Visual Quality Matrix and for simulations.

Viewers are people who have views of or from the project. Viewers are usually discussed in terms of general categories of activities, such as resident, boater, jogger, or motorist.

Viewpoint is the position of the viewer. For example, a motorist (viewer) at the south end of Lake Sammamish (viewpoint) has a view of Lake Sammamish.

Viewer Sensitivity is a combination of the following factors for a specific view:

- How many people have that view?
- How long can they see the view? Motorists typically have short duration views, while pedestrians and residents have views of long duration.
- What is their likely level of concern about the appearance, aesthetics, and quality of the view? Level of concern is a subjective response that is affected by factors such as the visual context; the activity a viewer is engaged in; and their values, expectations, and interests.

Low viewer sensitivity results when there are few viewers that experience a defined view or the level of concern is low. High viewer sensitivity results when there are many viewers who have a view frequently or for long duration and who are very aware of and concerned about the view. Viewer sensitivity does not imply support or opposition to a proposed project; it is a neutral term that is an important parameter in assessing visual quality.

Visual Character is a bird's-eye view of the landscape and is defined by the relationships between the existing visible natural and built landscape features. These relationships are considered in terms of dominance, scale, diversity, and continuity. Visual character-defining resources and features include the following:

- Landforms: types, gradients, and scale
- Vegetation: types, size and maturity, and continuity
- Land uses: size, scale, and character of associated buildings and ancillary site uses
- Transportation facilities: types, sizes, scale, and directional orientation
- Overhead utility structures and lighting: types, sizes, and scale
- Open space: type (e.g., parks, reserves, greenbelts, and undeveloped land), extent, and continuity
- Viewpoints and views to visual resources
- Water bodies, historic structures, and downtown skylines
- Apparent grain or texture, such as the size and distribution of structures and unbuilt properties or open spaces of the landscape
- Apparent upkeep and maintenance

Visual Quality is an assessment of the composition of the character-defining features for selected views. This assessment asks: Is this particular view common or dramatic? Is it a pleasing composition (with a mix of elements that seem to belong together) or not (with a mix of elements that either do not belong together or are "eyesores" and contrast with the overall context)?

Visual quality is evaluated and discussed for three parameters: Vividness, Intactness, and Unity.

- *Vividness* is the degree of drama, memorability, or distinctiveness of the landscape components. A view of Mount Rainier can have high vividness because it is a memorable sight, for example.
- *Intactness* is the distribution of the natural and man-made features of a landscape. High intactness means that the landscape is free of "eyesores" and is not broken up by features that are out of

place. An expanse of meadow or an urban area with similar buildings would have high intactness, for example.

- *Unity* is a measure of the compositional harmony or compatibility between landscape elements of a defined view. Unity is analogous to evaluating the composition of a painting. A well-chosen view of Seattle's skyline framed by Puget Sound and wooded hillsides could have high unity, for example.

2.3 VIEWSHEDS AND LANDSCAPE UNITS

A viewshed is basically the area that can be seen from the project. A viewshed may be larger or smaller than the study area limits because the visual limits are defined by geography and built and natural features. Typically, if an area or a feature can be seen from the project, a view located in that area or near the feature can see the project.

A "landscape unit" is an analytical tool that divides the study area into smaller pieces. The criteria for differentiating between landscape units are that each landscape unit has a distinctive landscape character, has a specific geographic location, and has some degree of clear views within the unit (intervisibility). There are two basic types of landscape unit: spatially enclosed and spatially unenclosed.

Enclosed landscape units can be thought of as "outdoor rooms." Vegetation, topography, and/or buildings create barriers so there is a sense of spatial enclosure and a high degree of intervisibility. An enclosed landscape unit is perceived as a complete visual environment.

Unenclosed landscape units are visually unlimited, have a moderate degree of intervisibility, and have continuous, similar elements.

2.4 VISUAL QUALITY MATRIX

The Visual Quality Matrix is a table of numerical rankings for landscape features as they appear in specific, selected views. Each view is divided into foreground, middle ground, and background, and the visual quality parameters (vividness, intactness, unity) are assigned a value. The matrix evaluation is conducted in the field from one viewpoint for the selected view. Existing conditions and alignment alternatives are evaluated separately.

The Build Alternatives for the East Lake Sammamish Master Plan Trail would change the existing visible environment. Therefore, views were selected along the existing Interim Use Trail and from East Lake Sammamish Parkway to evaluate the various alternatives. The Continuation of the Interim Use Trail Alternative and the Corridor Alternative generally follow the existing Interim Use Trail alignment. The paved portions of the alignment common to both the East A Alternative and the East B Alternative transition to East Lake Sammamish Parkway and East Lake Sammamish Place in some locations. For this assessment, this paved common trail will hereafter be referred to simply as the East Alternatives. Each alternative is briefly described below. For greater detail about each alternative, please refer to Chapter 2 of the EIS.

- **Corridor Alternative.** The trail would be located within the existing corridor. The majority of the trail would encompass the existing Interim Use Trail, leaving this alignment only in those places where trail safety could be improved. The trail would accommodate pedestrian, wheeled, and adjacent or shared equestrian use include parking and restrooms.
- **East A Alternative** (with separated pedestrian/equestrian use on the Interim Use Trail alignment). This alternative would use the existing corridor in certain segments and transition to

the East Lake Sammamish Parkway's west shoulder at an Americans with Disabilities Act (ADA)-acceptable gradient to avoid sensitive places. Where the alignment for the paved trail would leave the Interim Use Trail alignment, equestrian use would continue on this alignment. High-speed bicycle use would remain in the bike lanes on the roadway. This alternative would include parking and restrooms, as in all Build Alternatives.

- **East B Alternative** (with no separated pedestrian/equestrian use). This alternative would be identical to East A Alternative except that there would be no equestrian or pedestrian use on the existing corridor where the trail transitions to the roadway shoulder. The existing portion of the Interim Use Trail in the corridor would be closed off, and no trail access would be permitted. Pedestrian, equestrian, and bicycle use would continue on the paved trail adjacent to the roadway.
- **Continuation of the Interim Use Trail Alternative.** The Interim Use Trail would be continued beyond 2015 as a soft-surfaced trail, 8 to 12 feet wide, without shoulders. This trail is already in place and is the existing condition for this visual assessment. Equestrian use is not permitted on the existing Interim Use Trail. This alternative includes the same parking and restrooms as in all Build Alternatives.
- **No Action Alternative**. King County would continue to operate the existing Interim Use Trail through 2015, at which time the permitted operation of the trail would expire in the absence of additional environmental review.

2.5 SIMULATIONS

In the course of site analysis and other existing conditions research, views were identified that could be used for simulations of before and after conditions. Photographs were taken of the views and used as the base for the computer-generated simulations. While the simulations are limited in their field of view because of the camera lens, the overall visual analysis considers the entire field of view. Photographs do, however, provide an accurate representation of the scale of a structure in relation to other objects seen from the viewpoint. Selection criteria for the simulations were:

- The view is similar to other landscapes and house-to-trail relationships in the study area; the viewpoint is a location where there are many viewers of moderate to high sensitivity, or
- The view is a location of potential high visual impact and has a large number of viewers with high sensitivity.

3. AFFECTED ENVIRONMENT

This section describes the existing visual context of the East Lake Sammamish Trail. The baseline existing condition is that the Interim Use Trail has been constructed in the King County right of way.

3.1 OVERALL VISUAL CHARACTER, VIEWSHED, AND LANDSCAPE UNITS

The landscape character of the study area is a glacial plateau and valley that slopes down to the shoreline of Lake Sammamish. The native vegetation was historically a Douglas fir-dominated forest; however, the area is now mostly developed with single-family homes and commercial or business establishments. Natural vegetation has been reduced to small pockets. Larger commercial centers are at either end of the study area. Scenic views across Lake Sammamish from the residences on the shoreline or hillsides and from East Lake Sammamish Parkway are memorable and vivid and are one attraction for the development.

Three characteristic landscape types exist in the study area: (1) Lake Sammamish and the shoreline between the lake and East Lake Sammamish Parkway; (2) the steep hillsides east of the Parkway; and (3) the flatter valleys at the north and south ends of the study area. Lake Sammamish State Park on the south and Marymoor Park on the north have wooded areas, lakeshore, open grassy areas, wetlands, and recreational facilities.

Viewshed. The project corridor passes through areas with markedly different visual contexts, which are illustrated in the viewshed maps (Figures F-1 through F-10). These maps are diagrammatic only. On the west side of the study area, the viewshed has occasional open views across Lake Sammamish. East Lake Sammamish Parkway is a physical and visual divider between the lake and the hillsides. In built or wooded areas, the viewshed may be limited by vegetation or structures.

Landscape Units. There are seven landscape units along the alternative alignments (Figures F-11 to F-20). The visual character for each landscape unit is summarized in Table F-1. The Resource column of Table F-1 lists views or features identified as important in community plans or other documents.

Table F-1. Summary of Existing Visual Resources and Character by Landscape Unit

Landscape Unit	Limits	Visual Character	Resource
I-90 / Industrial-commercial (Unenclosed)	NW Gilman Boulevard to SE 56th Street	Terrain: level to rolling Vegetation: street trees, meadow/wetland, buffer Buildings: low-rise and big box commercial and industrial Transportation structures: roadways, driveways, I-90 overpass, Interim Use Trail Overhead structures: signals, utilities, roadway and commercial signage Open space: clearings between buildings Visual scale: medium to coarse	
Commercial/ Business Campus (Enclosed)	SE 56th Street to just north of SE 51st Street	Terrain: level Vegetation: street trees, landscaping Buildings: office buildings Transportation structures: East Lake Sammamish Parkway, roadways, entrance driveways, Interim Use Trail Overhead structures: signals, utilities, roadway and commercial signage Open space: none Visual scale: medium to large	Views of wooded hillsides to east and south
Lake Sammamish State Park (Unenclosed)	Park boundaries	Terrain: level Vegetation: deciduous forested areas, wetlands, turf (sports fields and open areas) Buildings: public restrooms Transportation structures: roads, boat launches, East Lake Sammamish Parkway, Interim Use Trail Overhead structures: utilities, signals, roadway signage Open space: entire park Visual scale: fine	Memorable views across the lake from boat launch area

Table F-1. Summary of Existing Visual Resources and Character by Landscape Unit (continued)

Landscape Unit	Limits	Visual Character	Resource
Shoreline (Unenclosed and enclosed)	Lake Sammamish State Park north boundary to 187th Avenue NE	Terrain: gentle to steep slopes, embankments, shoreline Vegetation: patches of forested area, wetlands, yards, conifer screens Buildings: single-family residential, private docks, sheds Transportation structures: East Lake Sammamish Parkway, driveways, Interim Use Trail Overhead structures: signals, utilities, roadway signage Open space: wetlands, occasional shoreline, forested areas Visual scale: fine	Memorable views across the lake from homes and occasional views from Parkway and trail
Marymoor Park: east border (Enclosed)	187th Avenue NE to Marymoor Park border	Terrain: gentle slopes, floodplain, steep slopes at East Lake Sammamish Parkway Vegetation: native deciduous forested area, wetlands, turf Buildings: small house Transportation structures: East Lake Sammamish Parkway, a few driveways, Interim Use Trail Overhead structures: signals, utilities, roadway and commercial signage Open space: forested areas, wetlands, shoreline Visual scale: fine	Occasional views of lake, forested areas and open space
SR 520 / Industrial-commercial (Enclosed)	South of NE 65th Street / Marymoor Park border to west side of SR 520	Terrain: level, gradual downward slope to south Vegetation: street trees, conifer screen hedges, blackberry thickets Buildings: low-rise and big-box commercial Transportation structures: SR 520 overpass, signals, Redmond Way, driveways, Interim Use Trail Overhead structures: signals, utilities, roadway and commercial signage Open space: clearings between buildings and under SR 520 Visual scale: medium	
Bear Creek (Enclosed)	Bear Creek to west side of SR 520	Terrain: level Vegetation: deciduous forested area, wetlands, creek Buildings: none Transportation structures: Bear Creek Trail, SR 520 Overhead structures: none Open space: Bear Creek forested areas, wetlands Visual scale: fine	Bear Creek and open space

Visual Quality Matrix. Based on site visits, viewpoints for the visual quality evaluation matrix were selected. The locations of the viewpoints are illustrated in Figures F-21a through F-21c and are listed in Tables F-2 and F-3 for the Corridor Alternative and Tables F-4 and F-5 for the East Alternatives. Table F-2 lists the viewpoints looking outward from the Interim Use Trail. Table F-3 lists the viewpoints looking at the trail from outside the King County right of way. Table F-4 lists the evaluation viewpoints looking outward from the proposed East Alternatives, and Table F-5 lists the viewpoints looking at the East Alternative. The Viewpoint column in Tables F-2 through F-5 gives Station Number locations for each viewpoint; the Orientation column indicates which direction the viewer is looking.

Table F-2. Evaluation Viewpoints from King County Right of Way

View No.	Landscape Unit[a]	Viewpoint	Orientation
12	Gilman Boulevard	Sta_{COR} 105	To north
11	SE 56th Street	Sta_{COR} 150	To south
10	Lake Sammamish State Park entrance	Sta_{COR} 200	To south
9	SE 24th Way	Sta_{COR} 228	To south
8	Lower Sammamish Place SE	Sta_{COR} 326	To north
7	Shoreland	Sta_{COR} 417	To north
6	Inglewood Hill Road	Sta_{COR} 456	To south
5	NE 16th Street	Sta_{COR} 481	To south
4	NE 33rd Street	Sta_{COR} 520	To north
3	NE 33rd Place	Sta_{COR} 534	To south
2	Weber Point	Sta_{COR} 553	To north
1	Marymoor Park	Sta_{COR} 627	To north

[a] Figures F-21a-c show location of viewpoints.

Table F-3. Evaluation Viewpoints toward King County Right of Way

View No.	Landscape Unit[a]	Viewpoint	Orientation
20	I-90 Industrial-commercial	Sta_{COR} 102	To northeast
19	SE 33rd Street	Sta_{COR} 283	To west
18	Mint Grove	Sta_{COR} 368	To northwest
17	Shoreland	Sta_{COR} 417	To north
16	SR 520 Industrial – commercial	Sta_{COR} 688	To southeast

[a] Figures F-21a-c show location of viewpoints.

Table F-4. Evaluation Viewpoints from East Alternatives

View No.	Landscape Unit[a]	Viewpoint[b]	Orientation
3E	Mint Grove	Sta_{EASTA} 368	To south
2E	Inglewood Hill Road	Sta_{EASTA} 460	To south
1E	NE 16th Street	Sta_{EASTA} 481	To south

[a] Figures F-21a-c show location of viewpoints.

[b] These viewpoints are from the paved portion common to both the East A and East B Alternatives.

Table F-5. Evaluation Viewpoints toward East Alternatives

View No.	Landscape Unit[a]	Viewpoint	Orientation
17E	212th Way SE	Northeast corner of 212 Way SE and East Lake Sammamish Parkway	To southeast
16E	East Lake Sammamish Place SE	Sta_{EASTA} 333	To northwest

[a] Figures F-21a-c show location of viewpoints.

The completed matrixes are provided in Attachment F-1 for reference. The detailed results will not be discussed here but were considered during the analysis.

Simulations. Six simulations were selected according to the criteria provided earlier in this report. Table F-6 lists the viewpoints and views for each simulation and Figures F-21a through F-21c illustrate the location of each viewpoint. Simulations were not created for public parks or natural areas (Lake Sammamish State Park, Marymoor Park, and Bear Creek) where the proposed alternatives all fit with the existing, natural, park-like surroundings, or for the industrial-commercial areas (State Route [SR] 520 and Interstate-90 [I-90]).

Table F-6. Simulation Viewpoints and Views

Figure No.	Alternative	Viewpoint[a]	View
F-22	Corridor	Sammamish Place neighborhood (Sta_{COR} 356)	Looking north from corridor alignment in north-end Sammamish Place neighborhood
F-23	Corridor	Mint Grove entrance (Sta_{COR} 370)	Looking south from corridor alignment at Mint Grove entrance
F-24	Corridor	Shoreland entrance (Sta_{COR} 417)	Looking north from corridor alignment just south of Shoreland entrance
F-25	Corridor	NE 33rd Place (Sta_{COR} 519)	Looking northwest from corridor alignment and driveway across from NE 33rd Place
F-26	East	East Lake Sammamish Place SE (Sta_{EASTA} 332)	Looking north from about 2100 block on East Lake Sammamish Place SE
F-27	East	Inglewood Hill Road (Sta_{EASTA} 458)	Looking south from first driveway south of Inglewood Hill Road

[a] Figures F-21a-c show location of viewpoints.

Each simulation also represents other views in the study area and can be considered a typical view. The site analysis determined which areas were generally similar to each other and then grouped them according to the typical simulation (see Table F-7). The second column notes the general characteristics portrayed in the area illustrated by the simulation. The third column lists other areas that are similar to that simulation. These groupings are very general, and the simulation should be viewed only as an approximation of the potential visual effects.

Table F-7. Simulation Typical of Equivalent Landscape

Simulation	Landscape Characteristics Represented by Simulation	Similar Landscape Areas
Figure F-22: Sammamish Place	Steep terrain over long distances Houses are far from King County Right of way Corridor alignment is in front of houses	SE 26th Street
Figure F-23: Mint Grove	Variable terrain: steep slopes to level Houses are close to King County right of way Corridor alignment is behind houses	NE 16th Street
Figure F-24: Shoreland	Fairly level terrain Houses are distanced from King County right of way Corridor alignment is behind houses	SE 8th Street SE 24th Way SE 33rd Street 205th Avenue SE 212th Way SE
Figure F-25: NE 33rd Place	Steep slopes between Parkway and shoreline Houses are near King County right of way Corridor alignment is behind houses	South end of Weber Pt SE 39th Street SE 43rd Street
Figure F-26: East Lake Sammamish Place	Adjacent to East Lake Sammamish Place where fill prism is required and front yards are affected	
Figure F-27: Inglewood Hill Road	Adjacent to East Lake Sammamish Place where fill prism is required to create trail.	East Lake Sammamish Parkway

Note: Figures F-21a-c show location of viewpoints.

3.2 VISUAL QUALITY

The existing visual quality of each landscape unit is described in this section. The discussion follows the sequence of (1) physical description of the landscape unit (terrain and vegetation or open space, built structures), (2) viewers, (3) views, and (4) visual characteristics of the views (vividness, unity, intactness).

I-90/Industrial-Commercial. The terrain remains fairly level from the terminus of the project corridor at NW Gilman Boulevard to SE 56th Street. The area south of I-90 is low-density, small-scale commercial with low-rise, small-footprint buildings. The area north of I-90 is coarse-scaled, moderate-density industrial and commercial, with low-rise, large-footprint box buildings. Businesses range from small to large and include vehicle and boat lots, a lumberyard, mini-storage, construction supplies, and a shopping center with cafes, groceries, and retail outlets. The Interim Use Trail contrasts with the industrial character of the area, but near SE 62nd Street the trail is in harmony with the natural-appearing, open landscape.

Open space consists of undeveloped, occasionally untended space between the commercial buildings and under the highway. There is a sense of openness because many of the structures are set back from the proposed trail alignment. At NW Gilman Boulevard the vegetation reflects a neighborhood quality, with planted street medians and tree-lined sidewalks. From NW Gilman Boulevard to the I-90 overpass the area is open, without structures or vegetation. The trail passes beneath the I-90 overpass, then through the wetland just north of I-90, an open, natural-appearing area. Vegetation north of I-90 consists primarily of street trees, patches of blackberries, and commercial landscaping. The project corridor passes behind the buildings fronting East Lake Sammamish Parkway and has chain-link fencing on both sides.

Viewers in this area are primarily trail users because the trail is not visible from most roads and travels among back buildings. Trail users are likely to be sensitive to the visual quality of views from the trail because of its distance from high traffic volume roads and high concentrations of people, and the variety of scenery in this subarea. Motorists are likely to have low sensitivity because the proposed trail would generally not be visible in this area.

The I-90 overpass dominates the view at the south end of this subarea. Otherwise the vividness or memorability of the landscape is low to moderately low. Intactness is low because the area is developed as commercial-industrial. Unity is low to very low because industrial and commercial development of low visual quality has largely replaced the natural forested area and wetland matrix.

Commercial/Business Campus. This landscape unit lies between the southern boundary of Lake Sammamish State Park and SE 56th Street. The terrain rises gently to the west, and the buildings of the Siemens/Microsoft campus are on this western knoll. The campus unit consists of two- to six-floor building complexes that are separated by roadways and parking lots. Vegetation inside the campus consists of formal landscaping. The tree border along the Parkway and on the berms between the parkway and the buildings screen views of the proposed trail from the campus and vice versa. The gravel surfaces and split-rail fences of the Interim Use Trail are in harmony with the surroundings.

The viewer groups in this area are (from largest to smallest) motorists on East Lake Sammamish Parkway, workers of or visitors to the campus, and trail users. Viewer sensitivity is likely to be moderate for motorists and campus visitors, who will likely be focused on traffic conditions and their destination, and will therefore not be sensitive to visual quality. Sensitivity of trail users to the visual quality of the trail area is also likely to be moderate because of the high traffic levels on the Parkway. Vividness in this area is low. There are pleasant long-distance views of hilltops to the. Intactness is moderately high and Unity is low because this is an industrial area.

Lake Sammamish State Park. The Interim Use Trail travels along the eastern edge of the park paralleling East Lake Sammamish Parkway. The terrain of this landscape unit is level with stands of native deciduous forested areas, emergent wetlands, and large tracts of turf for play areas and between parking strips. The only structures are public restrooms, a pier near the parking lot, and paved boat launch beach. The formal entrance to the park is from East Lake Sammamish Parkway. At the south end of the park, views to the west are limited by forested areas. At the north end of the park, views from the proposed trail open west across the emergent wetland. The gravel surfaces and split-rail fences of the Interim Use Trail are in harmony with these surroundings.

Traffic volumes are high on the Parkway throughout the day; consequently, motorists are the primary viewers in this subarea. Park and trail users comprise a somewhat smaller group; however, because most park users drive to the park, they are also part of the motorist group. Sensitivity of trail users to the visual quality of the area is likely to be moderate for trail users due to the high traffic levels on the Parkway, and moderate to high for motorists, who are focused on traffic conditions but could enjoy the drive along the park with its views and wooded character.

Some views into the park at the north end are memorable, and overall vividness is average because the dominant view is of the forested area edge and Parkway. Intactness is average because of the Parkway, which is a dominant feature and disrupts the continuity of the woods on both sides of East Lake Sammamish Parkway. Unity is high within the right of way and park but overall is moderately low because of the Parkway.

Shoreline. This landscape unit is a repeating pattern of remnant shoreline forested areas and wetlands and enclaves of single-family homes. Shoreline terrain varies from steeply to gently sloped, with a matrix of deciduous forested areas and wetlands that were largely cleared for the houses. Small stands and hedges of conifers are intermittent throughout the landscape unit and primarily associated with residential landscaping. The width of area between the shoreline and the Parkway varies considerably.

There are frequent roads and private driveways off the Parkway, some of which traverse the very steep grades between the shore and the Parkway. The varying width of the land between the shore and the Parkway also affects the trail-to-house relationship. Approximately one-quarter of the homes been built in this subarea are inside or directly adjacent to the King County right of way and another quarter of the total homes are within 25 feet of the right of way. Approximately one-fifth of the residences in this subarea are greater than 100 feet from the right of way. The proposed trail's elevation relative to that of the houses changes throughout this landscape unit, varying from points where the trail is at the same level as the houses to points where the trail is above house level, thus allowing trail users to look over the rooftops.

The homes are of various ages and sizes. Newer homes (less than 20 years old) typically one- to three-stories high, large-footprint (typically 3,000 to 10,000 square feet), and fill the lot to the minimum permitted offsets (15 feet). Older homes are typically small-footprint (typically less than 3,000 square feet), one- or two-story structures. Additional features adjacent to or within the King County right of way throughout this landscape unit include retaining walls, wood and chain-link fences; paved parking and driveway areas; decks, patios, gardens, and other landscaping; private docks, boats, and trailers; aboveground utilities; and miscellaneous small buildings. The King County right of way is often used as storage or parking for the residences.

Residents and trail users are the primary viewers in this area. Both groups are likely to be sensitive to visual quality because of the views toward Lake Sammamish. In most cases, the Interim Use Trail is not part of the regional view from the residences because it runs behind the homes. There are residences where the trail is adjacent to the front yard and is part of some homeowners' regional views. Trail users are likely have high sensitivity because of the intermittent views available toward Lake Sammamish; however, use of the King County right of way for residential storage has reduced the visual quality of the proposed trail.

Vividness is moderately high to high throughout this landscape unit because of memorable views west across Lake Sammamish of the Bellevue hills and western shoreline. South of the East Lake Sammamish Place neighborhood, Mount Rainier is a dramatic sight on clear days from the shoreline. Intactness and unity range from low to high because of the varying pattern of landscapes.

To better understand the variations within the Shoreline landscape unit, it was divided into subunits for evaluation. These smaller subunits made it easier to understand the various relationships of houses to the proposed trail throughout the Shoreline landscape unit. Subunits for both the King County right of way and East Lake Sammamish Parkway were described because the Build Alternative alignments fall in both of these corridors (see Table F-8). Height and distance relationships between the house and proposed trail, and typical vegetation are summarized for each subunit. Where there is no alignment alternative indicated (in italics) in the left column of Table F-8, then the description applies to all alignment alternatives.

Table F-8. Landscape Subunits for Shoreline Landscape Unit

Designation	Descriptions
212th Way SE *East Lake Sammamish Parkway*	Steep slopes; East Lake Sammamish Parkway follows cut in hillside Low-density, 1- to 3-floor residential East Lake Sammamish Parkway looks over rooftops to west Remnant woods, residential landscaping Vividness: low along East Lake Sammamish Parkway, pleasing views from some locations on East Lake Sammamish Parkway Intactness: moderately high to high development Unity: moderately low to low due to East Lake Sammamish Parkway and intersection (viewpoint 17E)
212th Way SE *King County Right of Way*	Steep slopes Cannot see proposed trail due to steepness, berms, conifers Low-density, 1- to 3-floor residential Houses, proposed trail, and East Lake Sammamish Parkway adjacent to each other, houses built up to right –of way Proposed trail is above houses, below East Lake Sammamish Parkway Remnant woods, residential landscaping Vividness: low along East Lake Sammamish Parkway, pleasing views from some locations on East Lake Sammamish Parkway Intactness: moderately high to high development Unity: moderately low to low due to East Lake Sammamish Parkway and intersection (viewpoint 17E)
205th Avenue SE	Fairly level terrain Proposed trail visible from East Lake Sammamish Parkway Moderate-density, 1- to 3-floor residential Houses varying distances from proposed trail Proposed trail and East Lake Sammamish Parkway basically at same elevation Conifer screens, remnant deciduous forested areas Vividness: (not assessed) Intactness: (not assessed) Unity: (not assessed)
SE 39th Street	Steep slopes from East Lake Sammamish Parkway to proposed trail, gentle slopes to houses Glimpses of proposed trail, below level of East Lake Sammamish Parkway Dense 2- to 3-floor residential Houses built to right –of way but with driveways between house and proposed trail Proposed trail is above level of houses Residential landscape, remnant woods Vividness: (not assessed) Intactness: (not assessed) Unity: (not assessed)

Table F-8. Landscape Subunits for Shoreline Landscape Unit (continued)

Designation	Descriptions
SE 33rd Street	Rolling and fairly level terrain Glimpses of proposed trail below level of East Lake Sammamish Parkway Dense 2- to 3-floor residential Houses far from proposed trail and separated from trail by driveways Proposed trail above level of houses Remnant deciduous woods Vividness: moderate to moderately high at locations with views across lake Intactness: average, about equal development and natural environment Unity: moderately low to average (viewpoint 19)
SE 24th Way	Steep slopes Proposed trail not visible from East Lake Sammamish Parkway Medium-density, 1- to 3-floor residential Many houses built in right –of –way, but right –of way width is variable width (up to 100 feet) Proposed trail above level of houses but well below East Lake Sammamish Parkway Stands of conifers Vividness: average, pleasant views, no memorable elements Intactness: average to high level of development Unity: moderately high unity (viewpoint 9)
SE 26th Street	Steeply rolling promontory to steep slopes Proposed trail diverges from roadway, is not visible from East Lake Sammamish Parkway Low-density, large footprint 2- to 3-floor residential Proposed trail variable distance from houses Proposed trail is below level of houses; houses on both sides of trail Remnant woods, predominantly residential landscaping Vividness: (not assessed) Intactness: (not assessed) Unity: (not assessed)
East Lake Sammamish Place SE *East Lake Sammamish Parkway*	East Lake Sammamish Place SE follows moderate slope cut into hillside Low- to medium-density, large footprint 2- to 3-floor residential Houses along East Lake Sammamish Place SE are close to road Remnant woods, predominantly residential landscaping Vividness: low overall but moderately high at locations with views across lake Intactness: moderately high development relative to natural environment Unity: low to moderately low (viewpoint 16E)

Table F-8. Landscape Subunits for Shoreline Landscape Unit (continued)

Designation	Descriptions
East Lake Sammamish Place SE *King County Right of Way*	Steeply rolling promontory to steep slopes Proposed trail diverges from roadway (below East Lake Sammamish Place SE), trail not visible Low-density, large footprint 2- to 3-floor residential Proposed trail variable distance from houses, typically between Lake Sammamish and house Proposed trail considerably below level of houses Remnant deciduous forested areas, predominantly residential landscaping Vividness: high due to memorable views across lake, otherwise moderately low Intactness: moderate development with moderately high landscaping Unity: moderately high with landscaping (viewpoint 8)
Mint Grove *East Lake Sammamish Parkway*	Fairly level and open between East Lake Sammamish Parkway and proposed trail High density, 1- to 3-floor residential High-speed bicycle path is along both sides of East Lake Sammamish Parkway Remnant forested areas, residential landscaping Vividness: moderately high due to views across lake; elsewhere low Intactness: average, about equal development and natural environment Unity: moderately low due to driveways, houses, structures (viewpoint 3E)
Mint Grove *King County Right of Way*	Mostly level and open between East Lake Sammamish Parkway and proposed trail Proposed trail visible from East Lake Sammamish Parkway Very high-density, 1- to 3-floor residential Proposed trail, houses, and East Lake Sammamish Parkway close to each other Houses separated from trail by driveways (built in right of way) and houses built up to right of way Proposed trail essentially at same level as houses and East Lake Sammamish Parkway, behind houses Remnant forested areas, residential landscaping Vividness: moderately high due to views across lake; otherwise low Intactness: average, about equal development and natural environment Unity: moderately low due to driveways, houses, structures near trail (see viewpoint 18)
SE 8th Street – Pine Lake Creek	Fairly level and wooded Cannot see proposed trail from East Lake Sammamish Parkway Moderate-density, large footprint residential? Proposed trail and East Lake Sammamish Parkway close to each other Houses far from King County right of way Proposed trail about level of East Lake Sammamish Parkway, behind houses Remnant woods Vividness: (not assessed) Intactness: (not assessed) Unity: (not assessed)

Table F-8. Landscape Subunits for Shoreline Landscape Unit (continued)

Designation	Descriptions
Shoreland	Fairly level and open from East Lake Sammamish Parkway to shoreline Glimpses of proposed trail between vegetation screens High density, 1- to 2-floor residential Proposed trail and East Lake Sammamish Parkway close to each other Houses separated from King County right of way by driveways and houses mostly far from proposed trail Proposed trail at level of East Lake Sammamish Parkway, behind houses Conifer hedges along backyards so no view toward Lake Sammamish; open between East Lake Sammamish Parkway and proposed trail Vividness: moderate low to low (no memorable views or features) Intactness: average, about equal development and natural environment Unity: moderately low to low (viewpoints 7 and 17)
Thompson-Inglewood *East Lake Sammamish Parkway*	East Lake Sammamish Parkway follows moderate slope cut into hillside High-density, 1- to 3-floor residences west of East Lake Sammamish Parkway High-speed bicycle path is along both sides of East Lake Sammamish Parkway Remnant forested areas, residential landscaping Vividness: low Intactness: high level of development Unity: low due to East Lake Sammamish Parkway (viewpoint 2E)
Thompson-Inglewood *King County Right of Way*	Very steep slopes from East Lake Sammamish Parkway to proposed trail, then flattens out near Thompson Hill Road Cannot see proposed trail from East Lake Sammamish Parkway until south end, screened by deciduous trees, berms and elevation change High density, 1- to 3-floor residential Proposed trail, houses, and East Lake Sammamish Parkway relatively close to each other Houses separated from proposed trail by driveways (built in King County right of way) and houses close to right of way Proposed trail slightly higher than houses, below East Lake Sammamish Parkway, behind houses Remnant forested areas, residential landscaping Vividness: primarily moderately low to average; moderately high at locations with views of lake and opposite shoreline Intactness: moderately high level of development Unity: low due to use of trail area as storage for residences (see viewpoint 6)
NE 16th Street *East Lake Sammamish Parkway*	Steep slopes from East Lake Sammamish Parkway to proposed trail; East Lake Sammamish Parkway follows moderate slope cut into hillside Low-density, large footprint, 2- to 3-story residential High-speed bicycle path is along both sides of East Lake Sammamish Parkway Remnant forested areas, residential landscaping, stands of conifers Vividness: low except for occasional views of lake Intactness: moderately high development (East Lake Sammamish Parkway, driveways, houses) Unity: low due to East Lake Sammamish Parkway and driveways (viewpoint 1E)

Table F-8. Landscape Subunits for Shoreline Landscape Unit (continued)

Designation	Descriptions
NE 16th Street *King County Right of Way*	Steep slopes from East Lake Sammamish Parkway to proposed trail Cannot see proposed trail from East Lake Sammamish Parkway, screened by deciduous trees Low-density, large footprint, 2- to 3-story residential Proposed trail and East Lake Sammamish Parkway adjacent; houses at variable distances from trail Houses separated from proposed trail by driveways (built in King County right of way) and houses close to right of way Proposed trail slightly higher than houses and behind houses Remnant forested areas, residential landscaping Vividness: primarily moderately low to average; moderately high at locations with views of lake and opposite shoreline Intactness: average, there is a balance of development and natural environment Unity: low to moderately low (see viewpoint 5)
Woods	Similar to NE 33rd, without houses
NE 33rd Place	Very steep slopes between East Lake Sammamish Parkway and proposed trail; retaining walls used in places Cannot see proposed trail from East Lake Sammamish Parkway due to slopes and vegetation Large footprint, 2- to 3-story single family homes with paved drive/roadways Proposed trail, houses, and East Lake Sammamish Parkway close to each other Houses close to proposed trail Proposed trail at same level as houses; level and behind houses Remnant forested areas, residential landscaping Vividness: average for most; high to very high at locations with views of lake and west shoreline Intactness: little development relative to natural environment Unity: moderately high (see viewpoints 3 and 4)
Weber Point	Gentle to flat slopes between Parkway and proposed trail Can see trail from Parkway Single-family homes with paved drives and roadways Proposed trail, houses, and Parkway close to each other, trail is behind houses Houses separated from proposed trail by driveways Proposed trail is below level of houses for south portion, at house level in north portion Distinctive buffer Vividness: moderately low to low in summer due to dense tree screen along proposed trail Intactness: moderate due to development Unity: moderately high due to landscaping at homes along proposed trail (see viewpoint 2)

Table F-8. Landscape Subunits for Shoreline Landscape Unit (continued)

Designation	Descriptions
Adelaide	Very narrow shoreline; steep slope Proposed trail below roadway; not seen from East Lake Sammamish Parkway One home, some private docks, sheds, structures, driveways Views vary with season: tree border screens view to lake during summer Deciduous trees and blackberry thickets along Parkway block views from Parkway and trail Vividness: (not assessed) Intactness: (not assessed) Unity: (not assessed)

Marymoor Park. The visual character of this landscape unit is fine-scale, wooded floodplain and shoreline. The Interim Use Trail passes along the eastern edge of the park but is not visible from East Lake Sammamish Parkway because of blackberry thickets along the road and because the trail is substantially below the level of the Parkway. Vegetation consists of native deciduous forested areas and wetlands. An occasional driveway enters the park or approaches the shoreline. The gravel surfacing and split-rail fences of the Interim Use Trail are compatible with the park character of the corridor. The Interim Use Trail connects to the SE Redmond Trail by a pedestrian underpass at 187th Avenue NE.

Trail users are the largest group of viewers in this landscape unit. Sensitivity to visual quality is likely to be high for trail users because this portion of the Interim Use Trail is a very pleasant, natural wooded landscape and screened from East Lake Sammamish Parkway by virtue of being below the Parkway. Views toward Lake Sammamish from the proposed trail are screened by the deciduous trees, especially in summer when the trees are in full leaf. Vividness is low because there are no features along the proposed trail that create memorable views. Intactness and unity are moderately high to high given that the area is still predominantly natural, and the only man-made facilities are the Interim Use Trail and a parking area. Overall visual quality of views from the proposed trail is high.

SR 520/Industrial-Commercial. The visual character of this unit is medium-scale, moderate density, one- and two-story box commercial and industrial buildings. The terrain is gently rolling with an overall slope towards Lake Sammamish to the south. Vegetation consists primarily of street trees, conifer screens, patches of blackberries, and commercial ornamental landscaping. Stands or screens of conifers and buildings limit views from East Lake Sammamish Parkway and the Interim Use Trail. Businesses include a car wash, fast food purveyors, mini-storage facilities, vehicle and boat lots, a tire store, and a lumber yard. The area beneath the overpass is open, without vegetation or structures other than support piers. The Interim Use Trail is at grade through the industrial district. South of NE 65th Street, the trail runs at a grade 2 to 5 feet lower than East Lake Sammamish Parkway. There is a sense of openness through the industrial area because the structures are low and many are set back from the project corridor.

Interim Use Trail users are the largest group of viewers in this landscape unit. Patrons of the businesses and motorists along Redmond Way and East Lake Sammamish Parkway have only intermittent or partial views of the trail. In the north end of this landscape unit, the Interim Use Trail is only visible from cross streets. Viewer sensitivity for motorists and business patrons is low because they are focused on traffic conditions or the business activity and do not have clear or extensive views of the trail. Trail user sensitivity would be moderately low because of the industrial-commercial character of the area.

The available views are generally of low quality because the views are primarily of the yards and parking lots of the businesses. Most of the buildings face away from the proposed trail, so views from the trail are of the back lots and backs of the buildings. The gravel surface and split-rail fence of the Interim Use Trail maintain a rural quality through the industrial area and create visual continuity between Marymoor Park and Bear Creek. For these reasons, the quality of the view along the project corridor is higher than views outward from the project corridor.

The SR 520 overpass dominates the view at the north end of this landscape unit; otherwise the vividness or memorability of the landscape is low to moderately low. Intactness is low because the area is commercial and industrial, with little native vegetation remaining. Unity is low to very low because development that has occurred has low visual appeal (such as parking lots and storage yards).

Bear Creek. This landscape unit is a short portion of the eastern end of the Bear Creek corridor, adjacent to the SR 520 overpass. It is a remnant of natural open space, located across SR 520 from the north edge of Marymoor Park. The terrain is flat and level and consists mostly of wetland/riparian open space with stands of deciduous forested area. The only transportation structures are SR 520 and the Bear Creek Trail.

The majority of viewers in this area are Bear Creek Trail users and motorists on the on/off ramps of SR 520. Bear Creek Trail is screened from Redmond Way by the deciduous forest areas along Bear Creek. Viewer sensitivity of trail users is likely to be moderate because they are anticipating a natural-appearing, open landscape but one that is between a highway and shopping center. Viewer sensitivity of motorists is likely to be low for drivers because their attention is on traffic conditions. Viewer sensitivity for passengers, who look into the open space, is likely moderate.

Trees and structures limit views within the Bear Creek landscape unit, and the visual quality of the views is moderate given the dominance of the SR 520 highway. Vividness is low overall because there are no elements in this landscape unit that create memorable views. Intactness and unity are moderate because the creek corridor is essentially natural, without built facilities other than the Bear Creek Trail.

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ATTACHMENT F-1 VISUAL QUALITY MATRIX

East Lake Sammamish Trail

VISUAL QUALITY ASSESSMENT

Oct 2006 **Prepared by: Wessman, Epstein, Lohse-Clark**

CORRIDOR VIEWS FROM THE TRAIL : 1-12

LEVEL 2

			Landscape Unit ?										*Landscape Unit ?*								*Landscape Unit ?*						*Landscape Unit ?*					
		VIEW UNIT NUMBER (E=existing, P=proposed)	**1 E**	**1 P**	**2 E**	**2 P**	**3 E**	**3 P**	**4 E**	**4 P**	**5 E**	**5 P**	**6 E**	**6 P**	**7 E**	**7 P**	**8 E**	**8 P**	**9 E**	**9 P**	**10 E**	**10 P**	**11 E**	**11 P**	**12 E**	**12 P**	**13 E**	**13 P**	**14 E**	**14 P**	**15 E**	**15 P**
VIVIDNESS	**WITHIN R/W**	LAND	2	2	3	3	5	4	5	5	4	4	4	3	3	3	3	3	2	2	1	1	1	1	1	1						
		WATER	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1						
		VEGETATION	3	3	5	4	5	4	4	4	5	5	4	3	2	1	3	3	2	2	5	5	3	3	1	1						
		MAN-MADE	5	5	1	2	2	2	1	3	1	1	3	3	2	3	2	3	1	2	3	3	5	5	5	5						
		AVERAGE	**2.75**	**2.75**	**2.50**	**2.50**	**3.25**	**2.75**	**2.75**	**3.25**	**2.75**	**2.75**	**3.00**	**2.50**	**2.00**	**2.00**	**5.00**	**2.50**	**1.50**	**1.75**	**2.75**	**2.75**	**2.75**	**2.75**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	LAND	1	1	2	2	6	5	4	4	4	4	5	4	2	2	5	4	3	3	2	2	1	1	1	1						
		WATER	1	1	1	1	7	6	2	2	1	1	1	1	1	1	5	5	1	1	3	3	1	1	1	1						
		VEGETATION	5	5	4	4	6	5	4	4	5	5	5	4	2	2	5	4	3	2	5	5	2	2	2	2						
		MAN-MADE	1	1	2	2	5	5	2	2	5	5	3	3	3	3	6	5	2	2	2	2	4	4	5	5						
		AVERAGE	**2.00**	**2.00**	**2.25**	**2.25**	**6.00**	**5.25**	**3.00**	**3.00**	**3.75**	**3.75**	**3.50**	**3.00**	**2.00**	**2.00**	**5.25**	**4.50**	**2.25**	**2.00**	**3.00**	**3.00**	**2.00**	**2.00**	**2.25**	**2.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	LAND	5	5	1	1	6	5	5	5	5	5	6	6	4	4	6	5	6	6	6	6	7	7	3	3						
		WATER	1	1	1	1	7	6	6	6	2	2	6	6	1	1	7	6	5	5	1	1	1	1	1	1						
		VEGETATION	4	4	2	2	6	5	4	4	2	2	5	6	3	3	5	4	3	3	5	5	5	5	2	2						
		MAN-MADE	1	1	1	1	2	2	2	2	2	2	3	3	1	1	5	4	2	2	2	2	5	5	1	1						
		AVERAGE	**2.75**	**2.75**	**1.25**	**1.25**	**5.25**	**4.50**	**4.25**	**4.25**	**2.75**	**2.75**	**5.00**	**5.25**	**2.25**	**2.25**	**5.75**	**4.75**	**4.00**	**4.00**	**3.50**	**3.50**	**4.50**	**4.50**	**1.75**	**1.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
INTACTNESS	**WITHIN R/W**	MAN MADE	5	5	7	6	5	4	7	6	7	6	5	5	6	6	6	5	6	5	6	6	6	6	5	5						
		NATURAL ENVIRONMENT	6	6	5	5	5	4	4	4	6	6	3	3	3	3	5	4	3	3	6	6	5	5	3	3						
		AVERAGE	**5.50**	**5.50**	**6.00**	**5.50**	**5.00**	**4.00**	**5.50**	**5.00**	**6.50**	**6.00**	**4.00**	**4.00**	**4.50**	**4.50**	**5.50**	**4.50**	**4.50**	**4.00**	**6.00**	**6.00**	**5.50**	**5.50**	**4.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE	6	6	3	3	5	5	6	6	4	4	3	4	4	4	5	4	3	3	5	5	1	1	5	5						
		NATURAL ENVIRONMENT	6	6	4	4	**6.00**	6	6	6	4	4	3	4	4	5	6	5	5	5	6	6	2	2	5	5						
		AVERAGE	**6.00**	**6.00**	**3.50**	**3.50**	**5.50**	**5.50**	**6.00**	**6.00**	**4.00**	**4.00**	**3.00**	**4.00**	**4.00**	**4.50**	**5.50**	**4.50**	**4.00**	**4.00**	**5.50**	**5.50**	**1.50**	**1.50**	**5.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE	6	6	7	7	5	5	5	5	3	3	5	5	7	7	5	4	6	6	7	7	6	6	6	6						
		NATURAL ENVIRONMENT	6	6	2	2	6	6	6	6	3	3	6	6	6	6	6	5	6	6	7	7	6	6	6	6						
		AVERAGE	**6.00**	**6.00**	**4.50**	**4.50**	**5.50**	**5.50**	**5.50**	**5.50**	**3.00**	**3.00**	**5.50**	**5.50**	**6.50**	**6.50**	**5.50**	**4.50**	**6.00**	**6.00**	**7.00**	**7.00**	**6.00**	**6.00**	**6.00**	**6.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
UNITY	**WITHIN R/W**	MAN-MADE	5	5	5	6	5	3	4	5	1	1	3	4	2	3	4	2	2	1	6	6	6	6	4	4						
		OVERALL	6	6	5	5	5	3	5	6	3	3	3	4	3	4	5	2	3	2	6	6	5	5	3	3						
		AVERAGE	**5.50**	**5.50**	**5.00**	**5.50**	**5.00**	**3.00**	**4.50**	**5.50**	**2.00**	**2.00**	**3.00**	**4.00**	**2.50**	**3.50**	**4.50**	**2.00**	**2.50**	**1.50**	**6.00**	**6.00**	**5.50**	**5.50**	**3.50**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN-MADE	4	4	5	5	5	4	3	3	3	3	2	2	2	2	6	3	3	2	3	3	1	1	2	2						
		OVERALL	5	5	4	4	6	5	4	4	2	2	2	2	2	2	7	5	3	2	4	4	1	1	2	2						
		AVERAGE	**4.50**	**4.50**	**4.50**	**4.50**	**5.50**	**4.50**	**3.50**	**3.50**	**2.50**	**2.50**	**2.00**	**2.00**	**2.00**	**2.00**	**6.50**	**4.00**	**3.00**	**2.00**	**3.50**	**3.50**	**1.00**	**1.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN-MADE	4	4	1	1	6	5	5	5	2	2	4	4	1	1	6	5	4	3	4	4	3	3	3	3						
		OVERALL	5	5	3	3	7	6	6	6	3	3	6	6	5	5	7	5	5	4	6	6	5	5	4	4						
		AVERAGE	**4.50**	**4.50**	**2.00**	**2.00**	**6.50**	**5.50**	**5.50**	**5.50**	**2.50**	**2.50**	**5.00**	**5.00**	**3.00**	**3.00**	**6.50**	**5.00**	**4.50**	**3.50**	**5.00**	**5.00**	**4.00**	**4.00**	**3.50**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	AVERAGES	**WITHIN R/W**	**4.58**	**4.58**	**4.50**	**4.50**	**4.42**	**3.25**	**4.25**	**4.58**	**3.75**	**3.58**	**3.33**	**3.50**	**3.00**	**3.33**	**5.00**	**3.00**	**2.83**	**2.42**	**4.92**	**4.92**	**4.58**	**4.58**	**3.17**	**3.17**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		OS R/W to NATL BRK	**4.17**	**4.17**	**3.42**	**3.42**	**5.67**	**5.08**	**4.17**	**4.17**	**3.42**	**3.42**	**2.83**	**3.00**	**2.67**	**2.83**	**5.75**	**4.33**	**3.08**	**2.67**	**4.00**	**4.00**	**1.50**	**1.50**	**3.08**	**3.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		NATL BRK to INFINITY	**4.42**	**4.42**	**2.58**	**2.58**	**5.75**	**5.17**	**5.08**	**5.08**	**2.75**	**2.75**	**5.17**	**5.25**	**3.92**	**3.92**	**5.92**	**4.75**	**4.83**	**4.50**	**5.17**	**5.17**	**4.83**	**4.83**	**3.75**	**3.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		TOTAL VISUAL QUALITY	**4.39**	**4.39**	**3.50**	**3.50**	**5.28**	**4.50**	**4.50**	**4.61**	**3.31**	**3.25**	**3.78**	**3.92**	**3.19**	**3.36**	**5.56**	**4.03**	**3.58**	**3.19**	**4.69**	**4.69**	**3.64**	**3.64**	**3.33**	**3.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

EVALUATION SCALE 2-Rail Fence

Existing

VIVIDNESS

7 = VERY HIGH
6 = HIGH
5 = MODERATELY HIGH
4 = AVERAGE
3 = MODERATELY LOW
2 = LOW
1 = VERY LOW TO NON-EXISTENT

INTACTNESS

(MAN-MADE) 3.00

7 = NO DEVELOPMENT TO NON-EXI
6= LITTLE DEVELOPMENT
5 = SOME DEVELOPMENT
4 = AVERAGE LEVEL OF DEVELOPN
3 = MODERATELY HIGH DEVELOPN
2 = HIGH LEVEL OF DEVELOPMENT
1 = VERY HIGH LEVEL OF DEVELOF

(NATURAL ENVIRONMENT)

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW TO NON-EXISTENT

UNITY

7 RY HIGH
6 HIGH
5 RATELY HIGH
4 VERAGE
3 RATELY LOW
2 LOW
1 RY LOW

East Lake Sammamish Trail

VISUAL QUALITY ASSESSMENT

Oct 2006 **Prepared by: Wessman, Epstein, Lohse-Clark**

CORRIDOR VIEWS TOWARD THE TRAIL: 16-20

LEVEL 2

			Landscape Unit ?										*Landscape Unit ?*							
		VIEW UNIT NUMBER (E=existing, P=proposed)	**16 E**	**16 P**	**17 E**	**17 P**	**18 E**	**18 P**	**19 E**	**19 P**	**20 E**	**20 P**	**21 E**	**21 P**	**22 E**	**22 P**	**23 E**	**23 P**	**24 E**	**24 P**
VIVIDNESS	**WITHIN R/W**	LAND	1	1	1	1	2	2	2	2	1	1								
		WATER	1	1	1	1	1	1	1	1	1	1								
		VEGETATION	1	1	2	2	2	2	3	3	1	1								
		MAN-MADE	1	1	1	1	2	3	1	1	5	5								
		AVERAGE	**1.00**	**1.00**	**1.25**	**1.25**	**1.75**	**2.00**	**2.00**	**1.75**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	LAND	1	1	1	1	2	2	2	2	1	1								
		WATER	1	1	1	1	1	1	6	6	1	1								
		VEGETATION	2	2	1	1	2	2	4	4	2	2								
		MAN-MADE	2	2	2	2	3	3	3	3	5	5								
		AVERAGE	**1.50**	**1.50**	**1.25**	**1.25**	**2.00**	**2.00**	**3.75**	**3.75**	**2.25**	**2.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	LAND	1	1	3	3	5	5	5	5	3	3								
		WATER	1	1	1	1	5	5	6	6	1	1								
		VEGETATION	1	1	2	2	5	5	6	6	2	2								
		MAN-MADE	2	2	1	1	2	2	5	5	3	3								
		AVERAGE	**1.25**	**1.25**	**1.75**	**1.75**	**4.25**	**4.25**	**5.50**	**5.50**	**2.25**	**2.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
INTACTNESS	**WITHIN R/W**	MAN MADE	5	5	6	6	6	6	6	6	5	5								
		NATURAL ENVIRONMENT	2	2	2	2	2	2	5	5	3	3								
		AVERAGE	**3.50**	**3.50**	**4.00**	**4.00**	**4.00**	**4.00**	**5.50**	**5.50**	**4.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE	1	1	5	5	3	3	4	4	4	4								
		NATURAL ENVIRONMENT	1	1	2	2	3	3	5	5	5	5								
		AVERAGE	**1.00**	**1.00**	**3.50**	**3.50**	**3.00**	**3.00**	**4.50**	**4.50**	**4.50**	**4.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE	2	2	7	7	5	5	3	3	3	3								
		NATURAL ENVIRONMENT	2	2	6	6	5	5	5	5	4	4								
		AVERAGE	**2.00**	**2.00**	**6.50**	**6.50**	**5.00**	**5.00**	**4.00**	**4.00**	**3.50**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
UNITY	**WITHIN R/W**	MAN MADE	2	2	1	1	2	3	2	1	4	4								
		OVERALL	2	2	1	1	2	3	3	2	4	4								
		AVERAGE	**2.00**	**2.00**	**1.00**	**1.00**	**2.00**	**3.00**	**2.50**	**1.50**	**4.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE	1	1	2	2	2	2	5	4	4	4								
		OVERALL	1	1	2	2	2	2	5	4	5	5								
		AVERAGE	**1.00**	**1.00**	**2.00**	**2.00**	**2.00**	**2.00**	**5.00**	**4.00**	**4.50**	**4.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE	1	1	1	1	4	4	3	2	3	3								
		OVERALL	2	2	5	5	6	6	5	4	3	3								
		AVERAGE	**1.50**	**1.50**	**3.00**	**3.00**	**5.00**	**5.00**	**4.00**	**3.00**	**3.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	AVERAGES	**WITHIN R/W**	**2.17**	**2.17**	**2.08**	**2.08**	**2.58**	**3.00**	**3.33**	**2.92**	**3.33**	**3.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		OS R/W to NATL BRK	**1.17**	**1.17**	**2.25**	**2.25**	**2.33**	**2.33**	**4.42**	**4.08**	**3.75**	**3.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		NATL BRK to INFINITY	**1.58**	**1.58**	**3.75**	**3.75**	**4.75**	**4.75**	**4.50**	**4.17**	**2.92**	**2.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL VISUAL QUALITY		**1.64**	**1.64**	**2.69**	**2.69**	**3.22**	**3.36**	**4.08**	**3.72**	**3.33**	**3.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

			Landscape Unit ?						*Landscape Unit ?*					
		VIEW UNIT NUMBER (E=existing, P=proposed)	**25 E**	**25 P**	**26 E**	**26 P**	**27 E**	**27 P**	**28 E**	**28 P**	**29 E**	**29 P**	**30 E**	**30 P**
VIVIDNESS	**WITHIN R/W**	LAND												
		WATER												
		VEGETATION												
		MAN-MADE												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	LAND												
		WATER												
		VEGETATION												
		MAN-MADE												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	LAND												
		WATER												
		VEGETATION												
		MAN-MADE												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
INTACTNESS	**WITHIN R/W**	MAN MADE												
		NATURAL ENVIRONMENT												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE												
		NATURAL ENVIRONMENT												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE												
		NATURAL ENVIRONMENT												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
UNITY	**WITHIN R/W**	MAN MADE												
		OVERALL												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE												
		OVERALL												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE												
		OVERALL												
		AVERAGE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	AVERAGES	**WITHIN R/W**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		OS R/W to NATL BRK	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		NATL BRK to INFINITY	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL VISUAL QUALITY		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Evaluation Scale

VIVIDNESS

7 = VERY HIGH
6 = HIGH
5 = MODERATELY HIGH
4 = AVERAGE
3 = MODERATELY LOW
2 = LOW
1 = VERY LOW TO NON-EXISTENT

INTACTNESS

(MAN-MADE) 0.00
7 = NO DEVELOPMENT TO NON-EXI
6= LITTLE DEVELOPMENT
5 = SOME DEVELOPMENT
4 = AVERAGE LEVEL OF DEVELOPN
3 = MODERATELY HIGH DEVELOPM
2 = HIGH LEVEL OF DEVELOPMENT
1 = VERY HIGH LEVEL OF DEVELOF

(NATURAL ENVIRONMENT)
7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW TO NON-EXISTENT

UNITY

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW

East Lake Sammamish Trail

VISUAL QUALITY ASSESSMENT

Oct 2006 **Prepared by: Wessman, Epstein, Lohse-Clark**

EAST ALIGNMENT VIEWS FROM THE TRAIL : 1(E)-3(E)

LEVEL 2

			Landscape Unit ?										*Landscape Unit ?*								*Landscape Unit ?*						*Landscape Unit ?*					
		VIEW UNIT NUMBER	**1(E)**	**1(E)**	**2(E)**	**2(E)**	**3(E)**	**3(E)**	**4**	**4**	**5**	**5**	**6**	**6**	**7**	**7**	**8**	**8**	**9**	**9**	**10**	**10**	**11**	**11**	**12**	**12**	**13**	**13**	**14**	**14**	**15**	**15**
		(E=existing, P=proposed)	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**	**E**	**P**
VIVIDNESS	**WITHIN R/W**	LAND	1	1	2	1	1	1																								
		WATER	1	1	1	1	1	1																								
		VEGETATION	2	1	2	1	2	1																								
		MAN-MADE	1	1	2	2	2	2																								
		AVERAGE	**1.25**	**1.00**	**1.75**	**1.25**	**1.50**	**1.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	LAND	2	2	3	2	2	2																								
		WATER	1	1	1	1	1	1																								
		VEGETATION	2	1	3	2	2	2																								
		MAN-MADE	2	2	2	2	1	1																								
		AVERAGE	**1.75**	**1.50**	**2.25**	**1.75**	**1.50**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	LAND	6	5	3	2	5	4																								
		WATER	6	5	3	2	5	4																								
		VEGETATION	4	3	3	2	5	4																								
		MAN-MADE	3	2	2	1	4	3																								
		AVERAGE	**4.75**	**3.75**	**2.75**	**1.75**	**4.75**	**3.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
INTACTNESS	**WITHIN R/W**	MAN MADE	4	3	6	6	2	2																								
		NATURAL ENVIRONMENT	3	2	3	2	2	2																								
		AVERAGE	**3.50**	**2.50**	**4.50**	**4.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE	3	3	5	5	5	5																								
		NATURAL ENVIRONMENT	3	3	3	3	4	4																								
		AVERAGE	**3.00**	**3.00**	**4.00**	**4.00**	**4.50**	**4.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN MADE	5	5	6	6	5	5																								
		NATURAL ENVIRONMENT	5	5	5	5	5	5																								
		AVERAGE	**5.00**	**5.00**	**2.00**	**5.50**	**5.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
UNITY	**WITHIN R/W**	MAN-MADE	2	1	2	2	2	1																								
		OVERALL	2	1	2	2	2	2																								
		AVERAGE	**2.00**	**1.00**	**2.00**	**2.00**	**2.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	OUTSIDE R/W TO NATURAL BREAK	MAN-MADE	2	1	2	1	3	2																								
		OVERALL	2	1	3	2	3	2																								
		AVERAGE	**2.00**	**1.00**	**2.50**	**1.50**	**3.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	NATURAL BREAK TO INFINITY	MAN-MADE	5	4	3	2	5	4																								
		OVERALL	6	5	3	2	5	4																								
		AVERAGE	**5.50**	**4.50**	**3.00**	**2.00**	**5.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	AVERAGES	**WITHIN R/W**	**2.25**	**1.50**	**2.75**	**2.42**	**1.83**	**1.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		OS R/W to NATL BRK	**2.25**	**1.83**	**2.92**	**2.42**	**3.00**	**2.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		NATL BRK to INFINITY	**5.08**	**4.42**	**2.58**	**3.08**	**4.92**	**4.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL VISUAL QUALITY		**3.19**	**2.58**	**2.75**	**2.64**	**3.25**	**2.83**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Evaluation Scale

VIVIDNESS

7 = VERY HIGH
6 = HIGH
5 = MODERATELY HIGH
4 = AVERAGE
3 = MODERATELY LOW
2 = LOW
1 = VERY LOW TO NON-EXISTENT

INTACTNESS

(MAN-MADE) 0.00

7 = NO DEVELOPMENT TO NON-EXI
6= LITTLE DEVELOPMENT
5 = SOME DEVELOPMENT
4 = AVERAGE LEVEL OF DEVELOPM
3 = MODERATELY HIGH DEVELOPM
2 = HIGH LEVEL OF DEVELOPMENT
1 = VERY HIGH LEVEL OF DEVELOF

(NATURAL ENVIRONMENT)

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW TO NON-EXISTENT

UNITY

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW

East Lake Sammamish Trail

VISUAL QUALITY ASSESSMENT

Oct 2006 **Prepared by: Wessman, Epstein, Lohse-Clark**

EAST ALIGNMENT VIEWS TOWARD THE TRAIL: 16(E)-17(E)

LEVEL 2

			Landscape Unit ?				*Landscape Unit ?*	*Landscape Unit ?*	*Landscape Unit ?*
		VIEW UNIT NUMBER	16(E)	16(E)	17(E)	17(E)			
		(E=existing, P=proposed)	E	P	E	P			
VIVIDNESS	**WITHIN R/W**	LAND	1	1	2	2			
		WATER	1	1	1	1			
		VEGETATION	1	1	2	1			
		MAN-MADE	2	2	1	2			
		AVERAGE	**1.25**	**1.25**	**1.50**	**1.50**			
	OUTSIDE R/W TO NATURAL BREAK	LAND	4	4	2	2			
		WATER	1	1	2	2			
		VEGETATION	2	2	1	1			
		MAN-MADE	2	2	2	2			
		AVERAGE	**2.25**	**2.25**	**1.75**	**1.75**			
	NATURAL BREAK TO INFINITY	LAND	5	5	6	6			
		WATER	5	5	5	5			
		VEGETATION	5	5	5	5			
		MAN-MADE	3	3	1	1			
		AVERAGE	**4.50**	**4.50**	**4.25**	**4.25**			
INTACTNESS	**WITHIN R/W**	MAN MADE	3	3	5	4			
		NATURAL ENVIRONMENT	2	2	3	3			
		AVERAGE	**2.50**	**2.50**	**4.00**	**3.50**			
	OUTSIDE R/W TO NATURAL BREAK	MAN MADE	4	4	4	4			
		NATURAL ENVIRONMENT	5	5	4	4			
		AVERAGE	**4.50**	**4.50**	**4.00**	**4.00**			
	NATURAL BREAK TO INFINITY	MAN MADE	6	6	6	6			
		NATURAL ENVIRONMENT	5	5	6	6			
		AVERAGE	**5.50**	**5.50**	**6.00**	**6.00**			
UNITY	**WITHIN R/W**	MAN-MADE	2	1	2	1			
		OVERALL	3	2	3	2			
		AVERAGE	**2.50**	**1.50**	**2.50**	**1.50**			
	OUTSIDE R/W TO NATURAL BREAK	MAN-MADE	2	1	3	2			
		OVERALL	2	2	3	2			
		AVERAGE	**2.00**	**1.50**	**3.00**	**2.00**			
	NATURAL BREAK TO INFINITY	MAN-MADE	5	4	5	3			
		OVERALL	6	5	6	4			
		AVERAGE	**5.50**	**4.50**	**5.50**	**3.50**			
	AVERAGES	**WITHIN R/W**	**2.08**	**1.75**	**2.67**	**2.17**			
		OS R/W to NATL BRK	**2.92**	**2.75**	**2.92**	**2.58**			
		NATL BRK to INFINITY	**5.17**	**4.83**	**5.25**	**4.58**			
	TOTAL VISUAL QUALITY		**3.39**	**3.11**	**3.61**	**3.11**			

Evaluation Scale

VIVIDNESS

7 = VERY HIGH
6 = HIGH
5 = MODERATELY HIGH
4 = AVERAGE
3 = MODERATELY LOW
2 = LOW
1 = VERY LOW TO NON-EXISTENT

INTACTNESS

(MAN-MADE) 0.00

7 = NO DEVELOPMENT TO NON-EXI
6= LITTLE DEVELOPMENT
5 = SOME DEVELOPMENT
4 = AVERAGE LEVEL OF DEVELOPM
3 = MODERATELY HIGH DEVELOPM
2 = HIGH LEVEL OF DEVELOPMENT
1 = VERY HIGH LEVEL OF DEVELOF

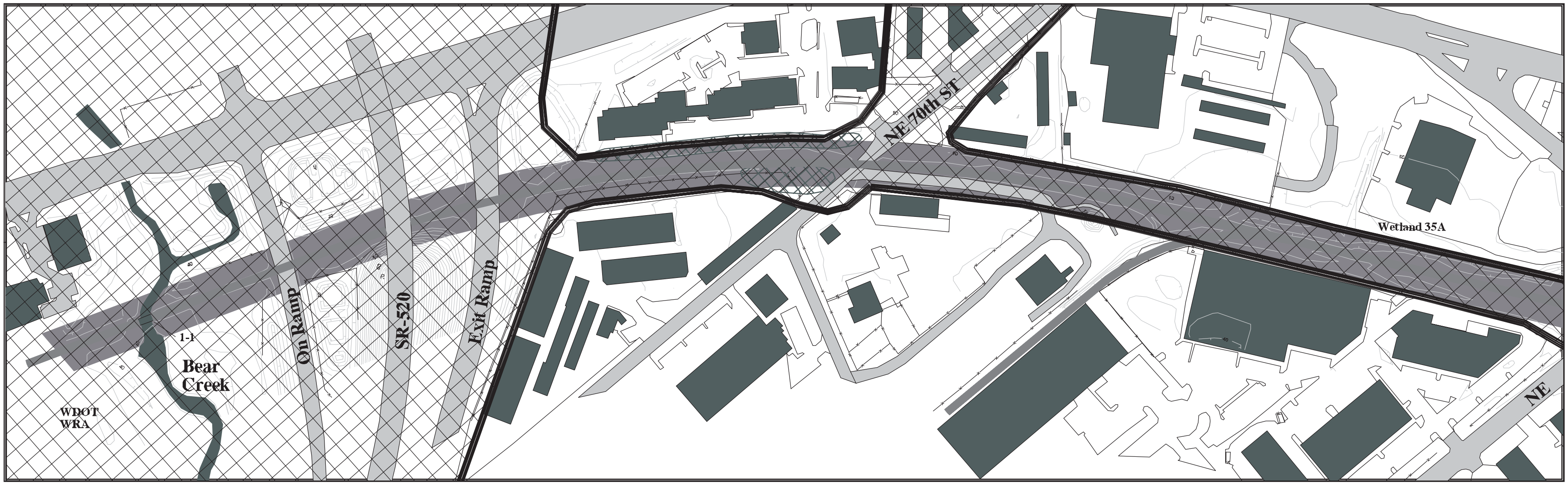
(NATURAL ENVIRONMENT)

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW TO NON-EXISTENT

UNITY

7 VERY HIGH
6 HIGH
5 MODERATELY HIGH
4 AVERAGE
3 MODERATELY LOW
2 LOW
1 VERY LOW

A



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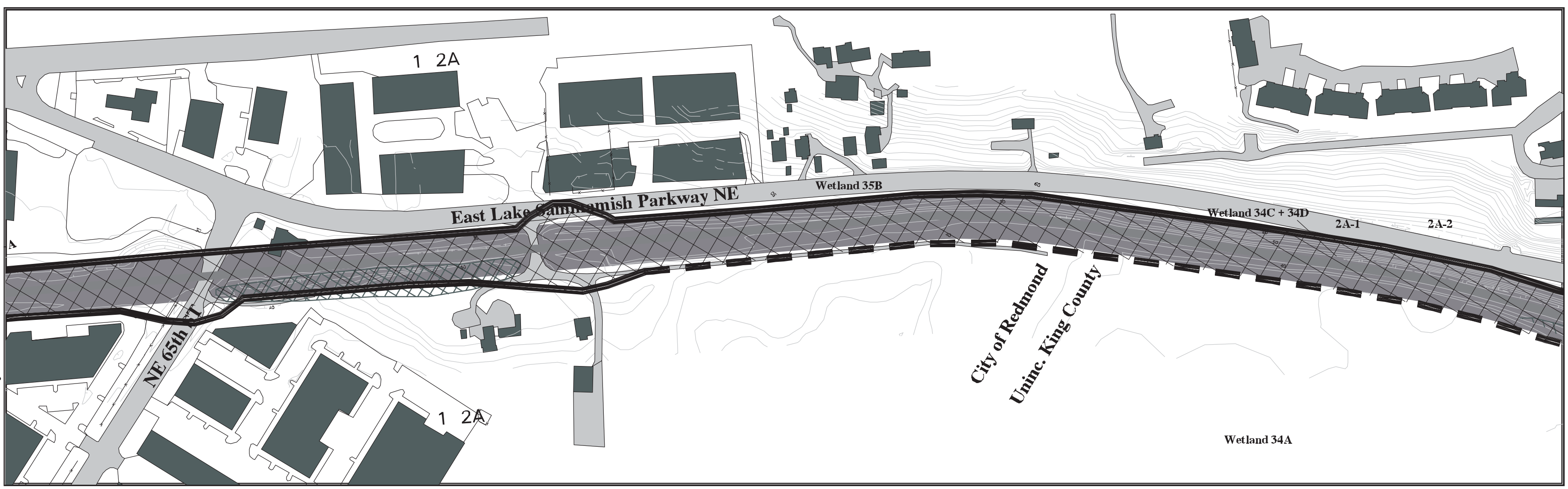

King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

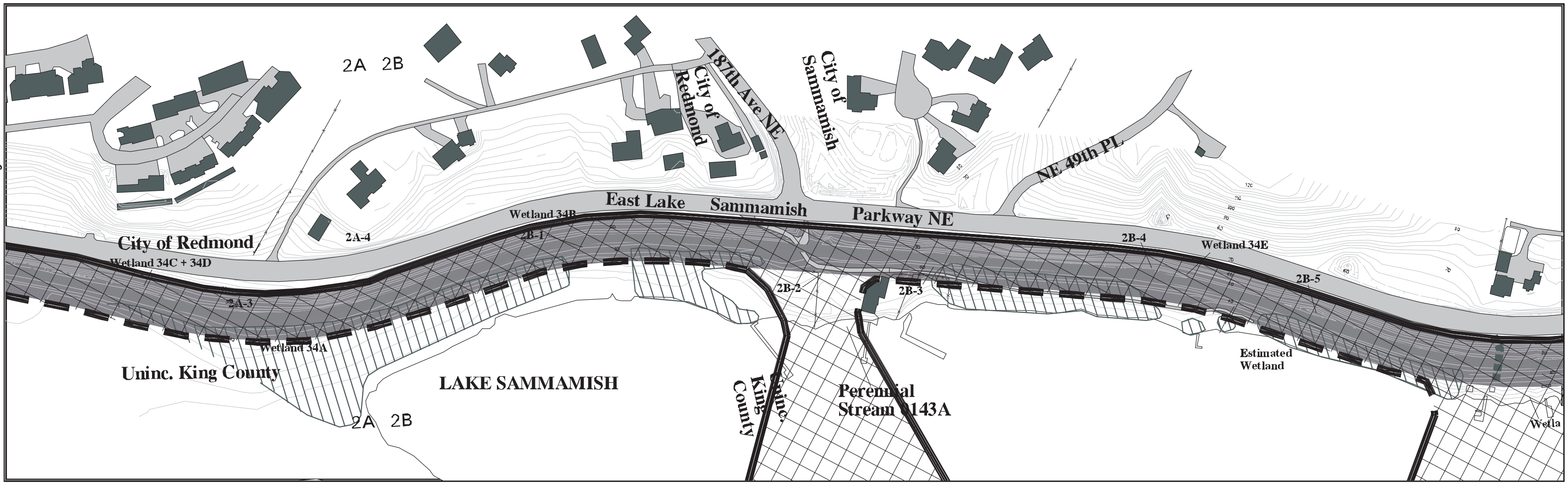
Prepared by Parametrix

Right of Way
Roads
Driveways
Coniferous Trees
Viewshed

Rail Bed
Blocked View
Seasonal View

FIGURE F-1
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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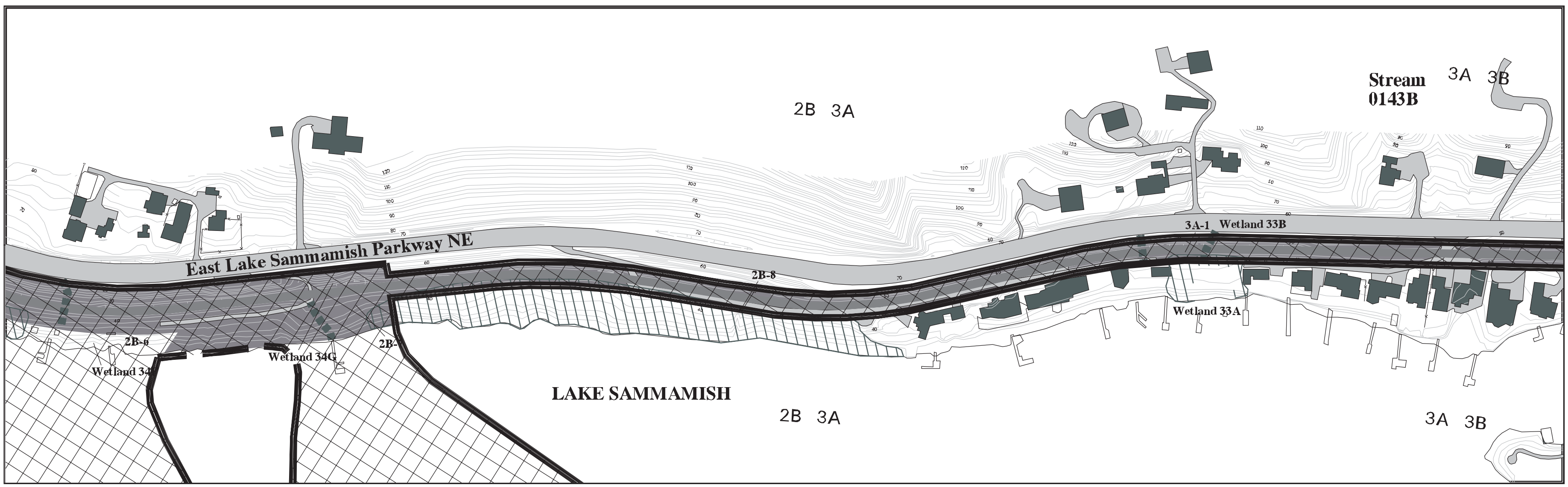

King County
Capital Improvement Projects
Facilities Management Division, DES

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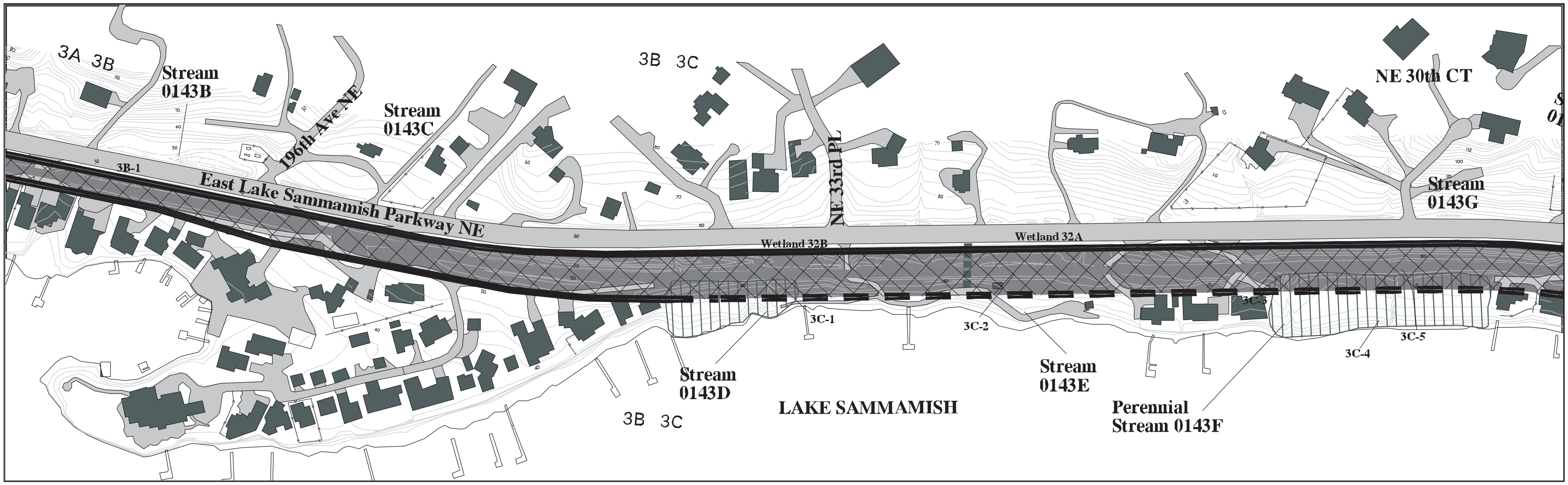
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

- Right of Way
- Driveways
- Deciduous Trees
- Viewshed
- Rail Bed
- Residential Path
- Blocked View
- Seasonal View

FIGURE F-2
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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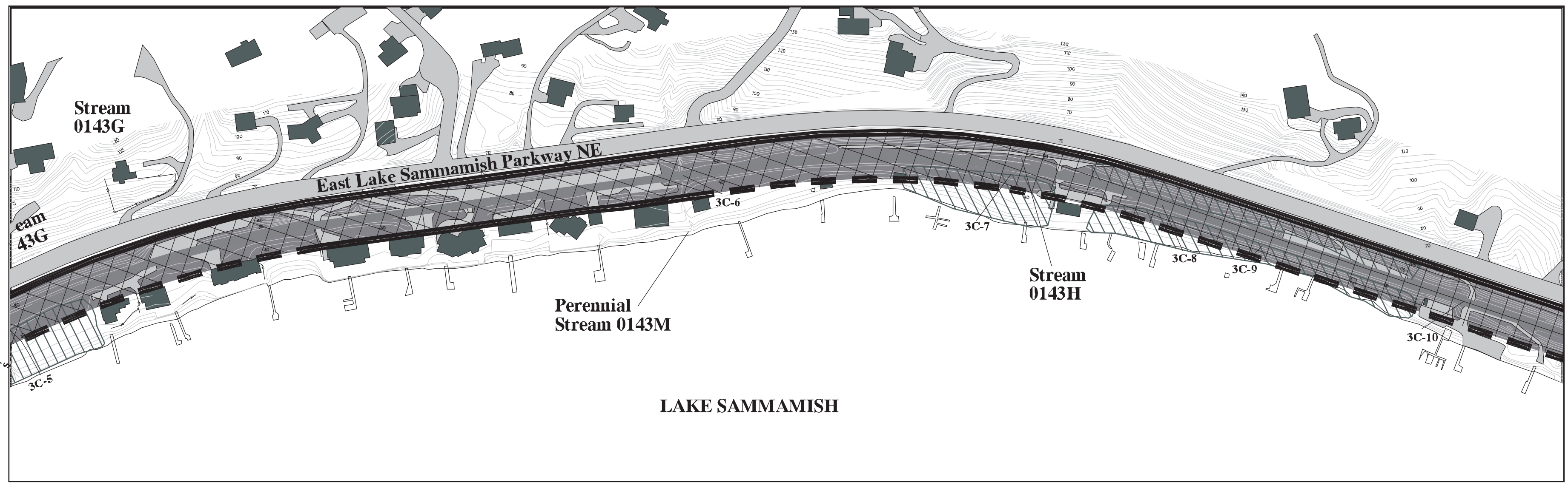

King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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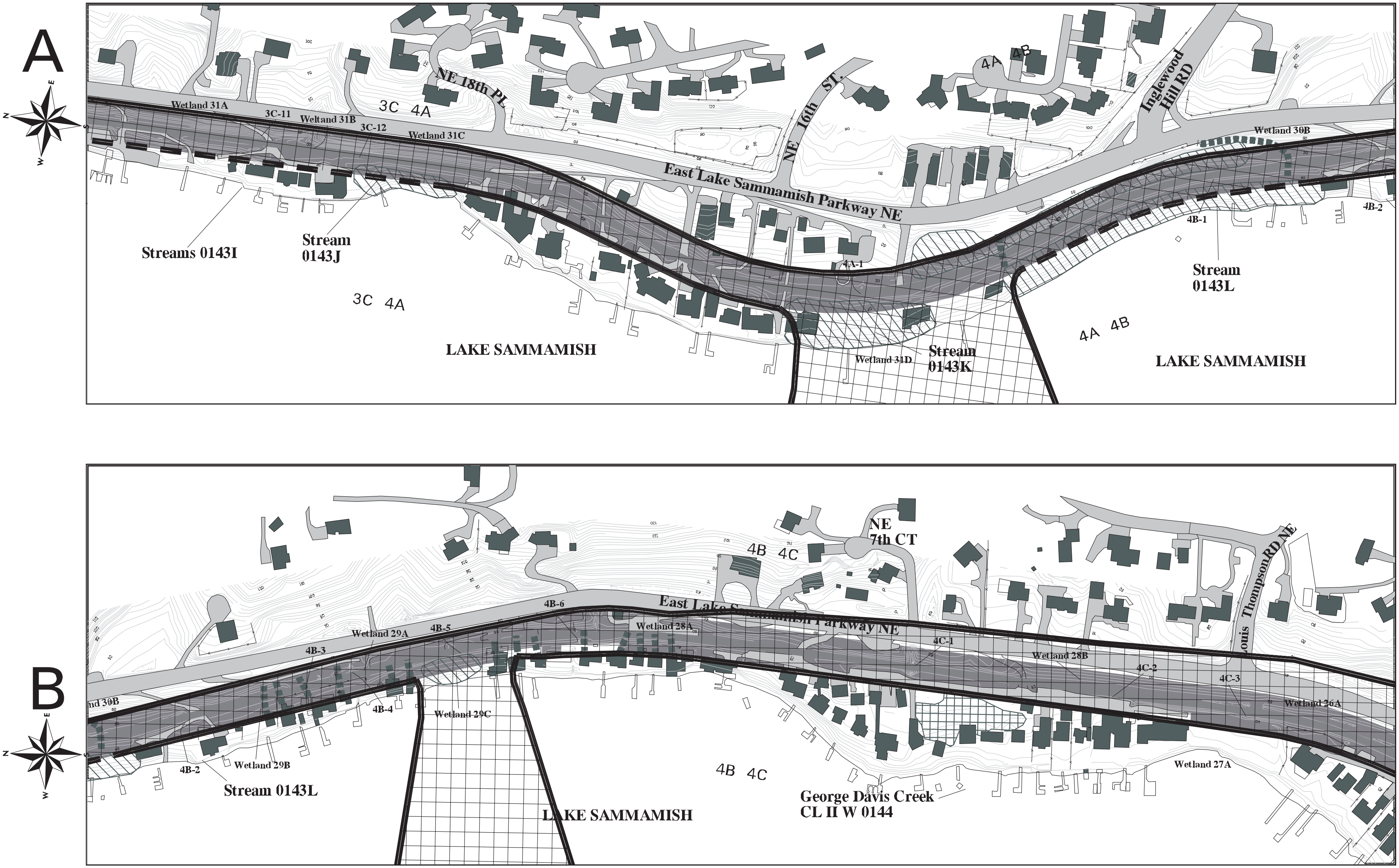
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

- Right of Way
- Driveways
- Deciduous Trees
- Viewshed
- Rail Bed
- Residential Path
- Blocked View
- Seasonal View

FIGURE F-3
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Capital Improvement Projects
Facilities Management Division, DES

0 Feet 350

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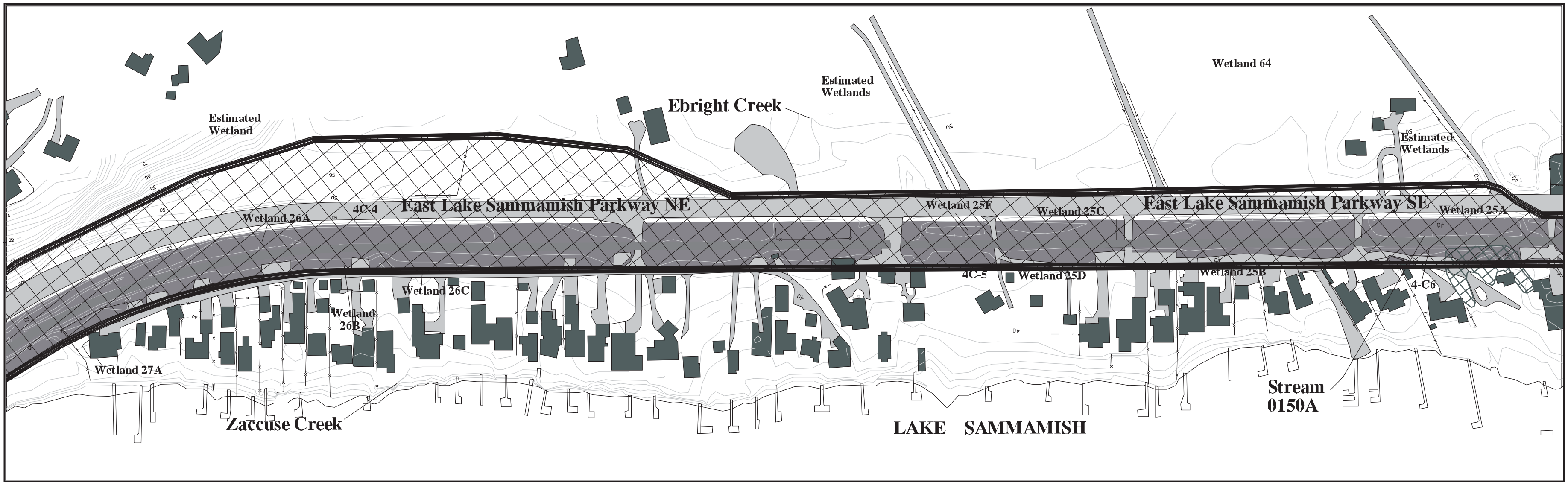
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Viewshed
Rail Bed
Residential Path
Blocked View
Seasonal View

FIGURE F-4
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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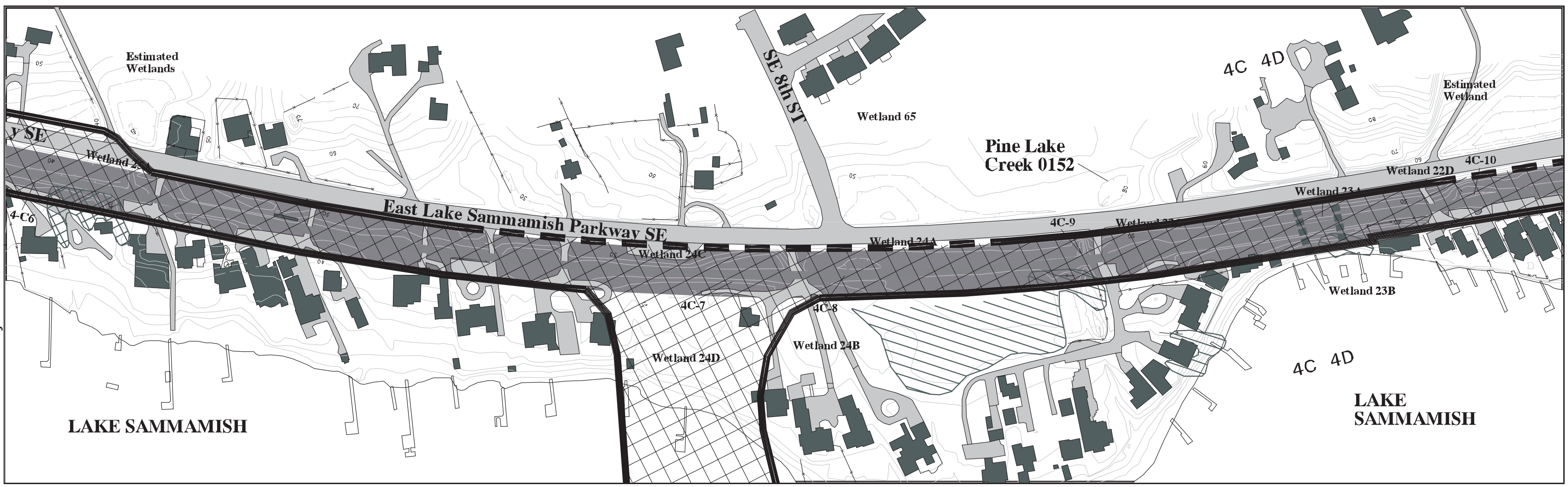

King County
Capital Improvement Projects
Facilities Management Division, DES

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SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

- Right of Way
- Driveways
- Deciduous Trees
- Coniferous Trees
- Viewshed
- Rail Bed
- Residential Path
- Blocked View
- Seasonal View

FIGURE F-5
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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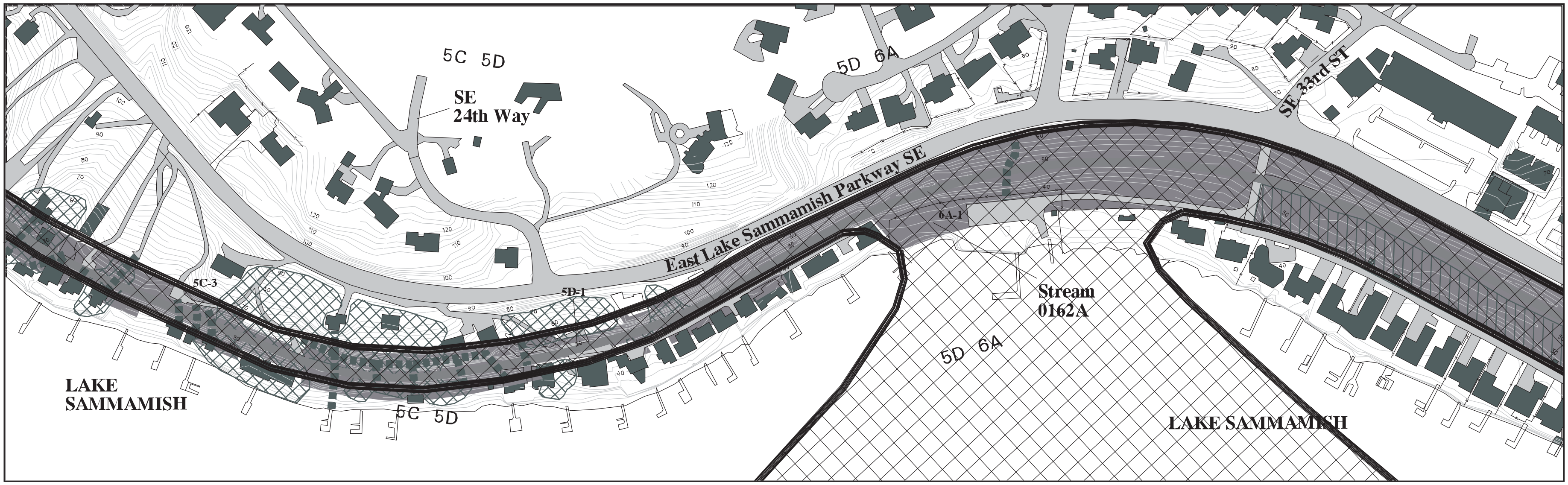
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Viewshed
Rail Bed
Residential Path
Blocked View
Seasonal View

FIGURE F-6
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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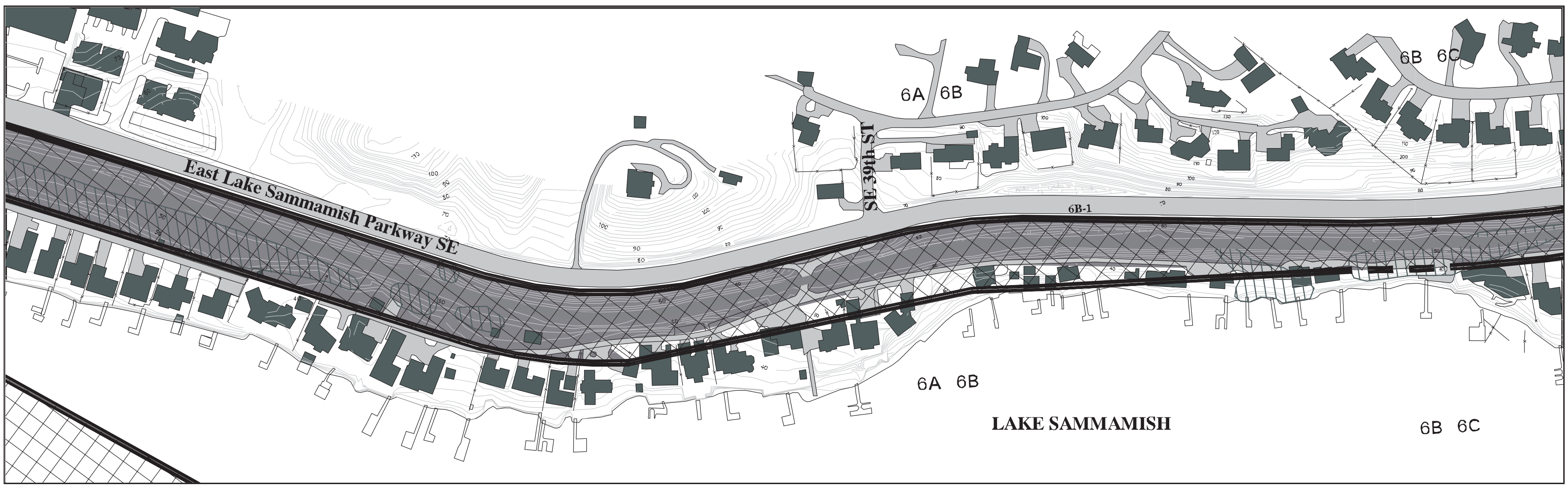


King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

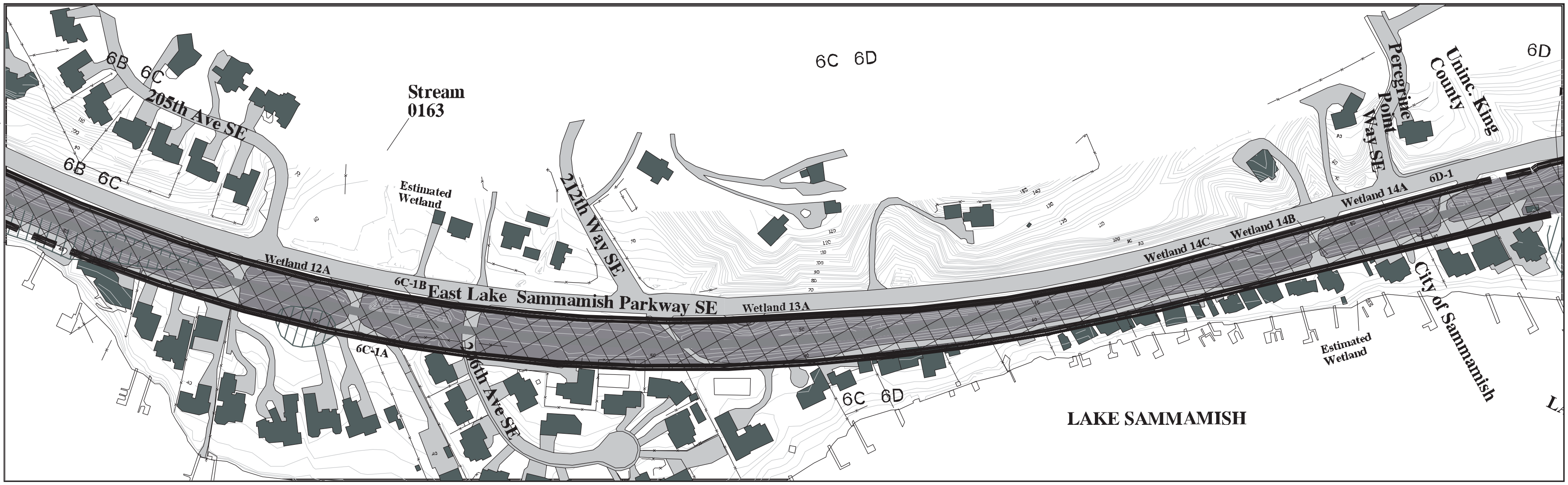
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Viewshed
Rail Bed
Residential Path
Blocked View
Seasonal View

FIGURE F-7
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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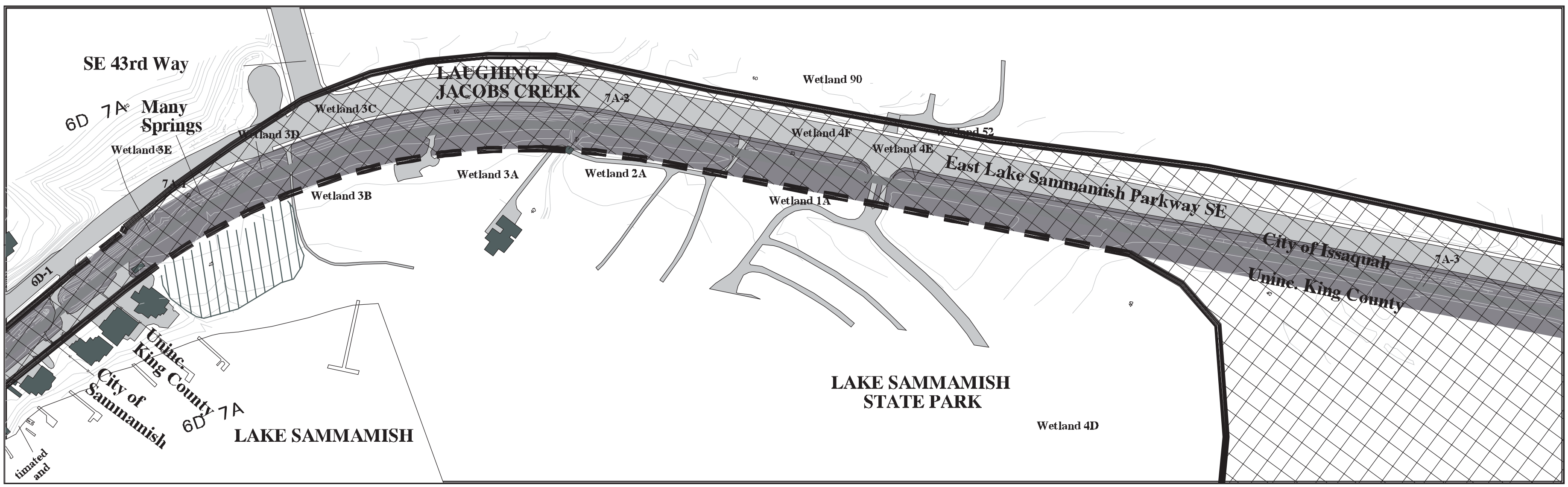


King County
Capital Improvement Projects
Facilities Management Division, DES

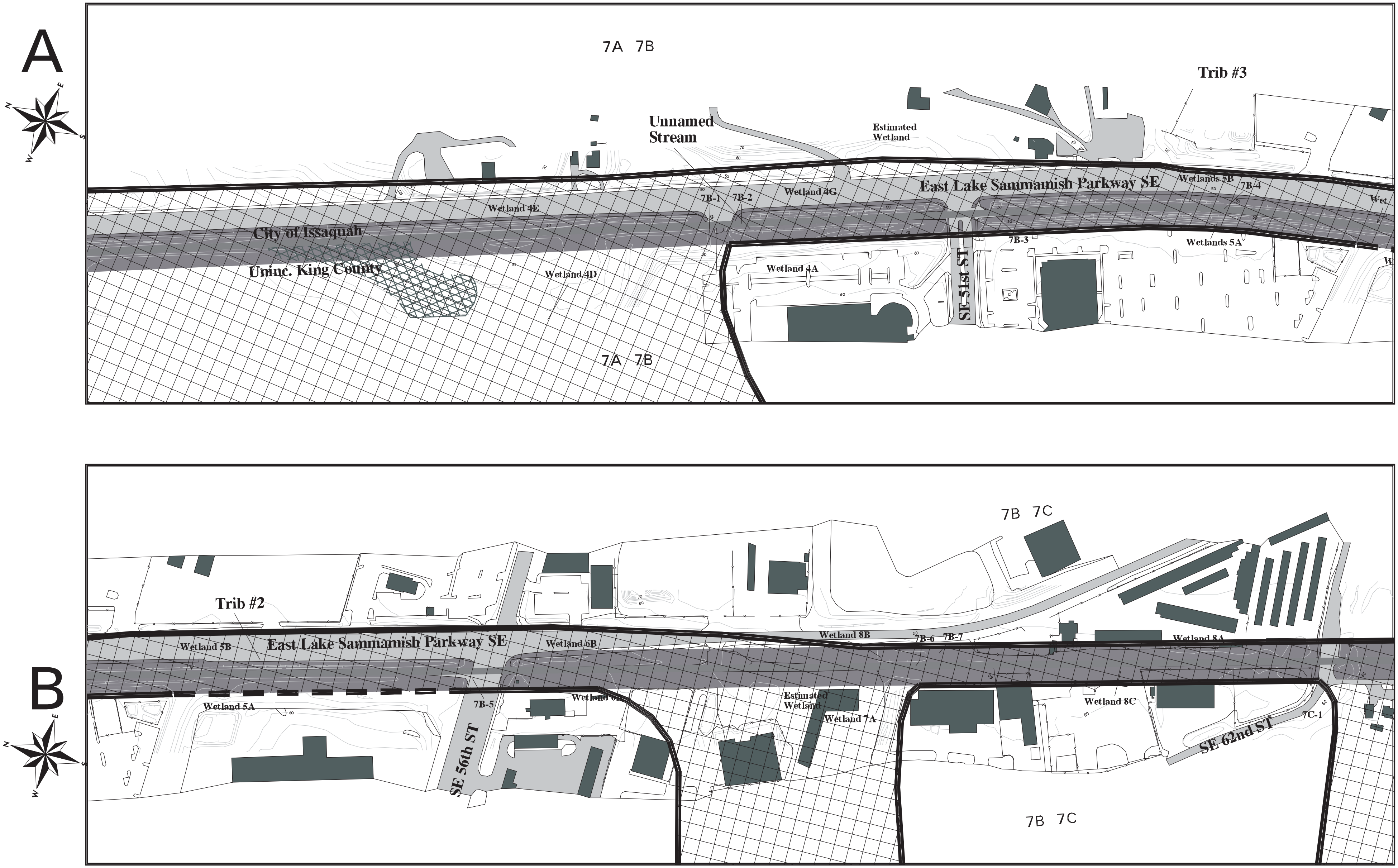
0 *Feet* 350

SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

Right of Way
Roads
Driveways
Deciduous Trees
Viewshed
Rail Bed
Blocked View
Seasonal View

FIGURE F-8
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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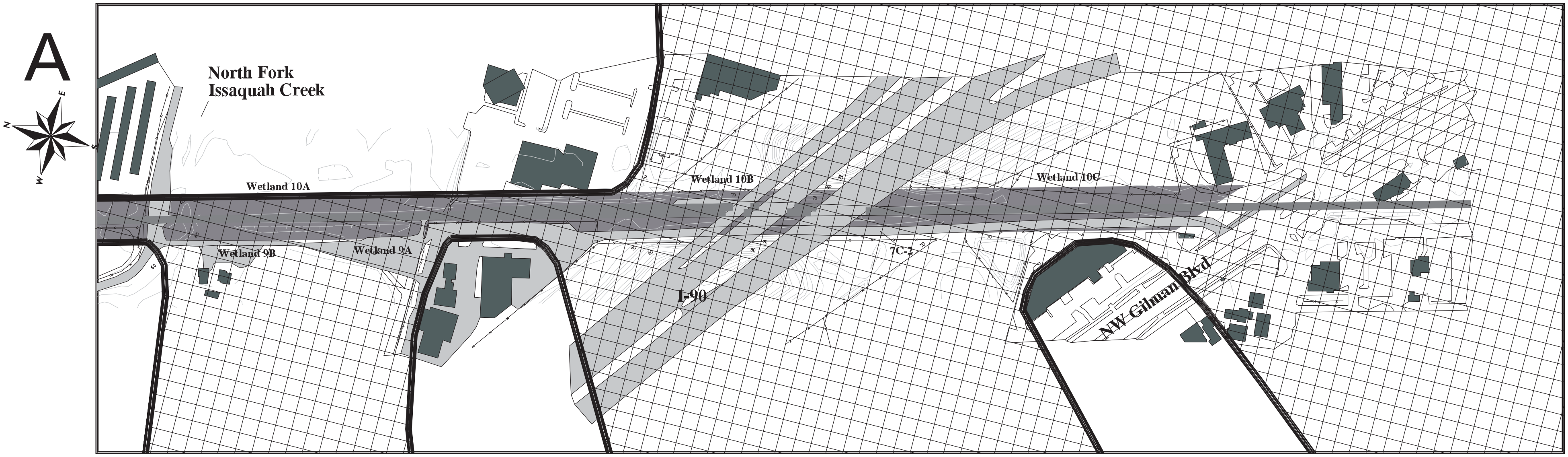
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

- Right of Way
- Roads
- Grassy Field
- Viewshed
- Rail Bed
- Blocked View
- Seasonal View

FIGURE F-9
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Capital Improvement Projects
Facilities Management Division, DES

0 Feet 350

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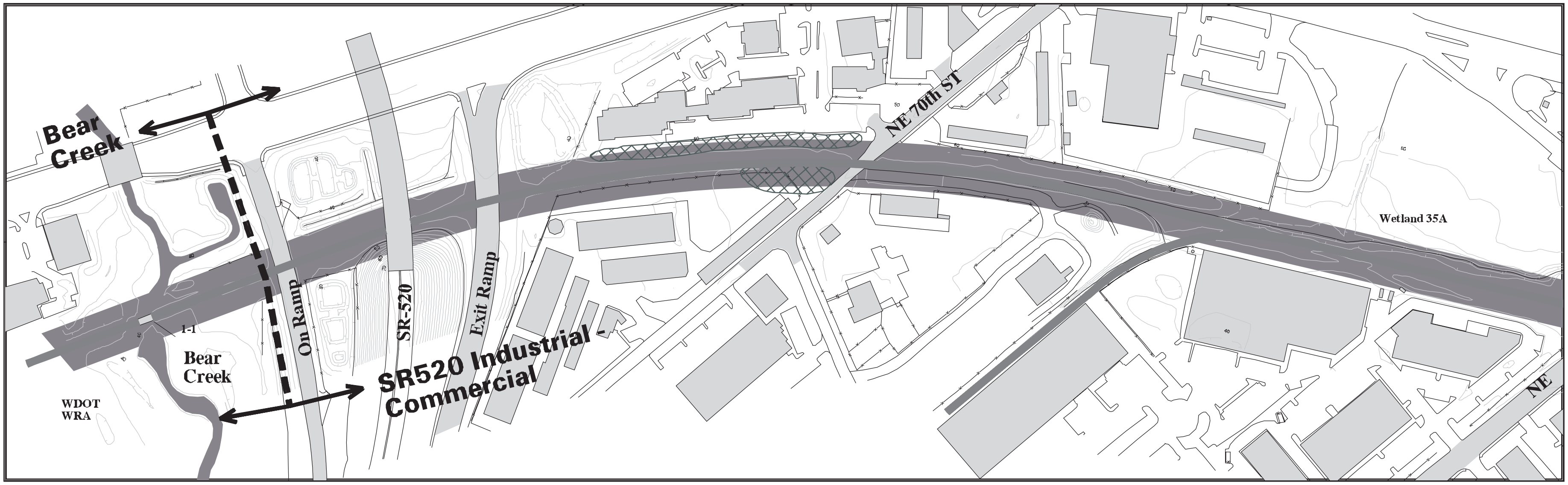
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_042805.aml
Date: May 4, 2005

Prepared by Parametrix

Right of Way
Roads
Viewshed
Rail Bed
Blocked View
Seasonal View

FIGURE F-10
VIEWSHED MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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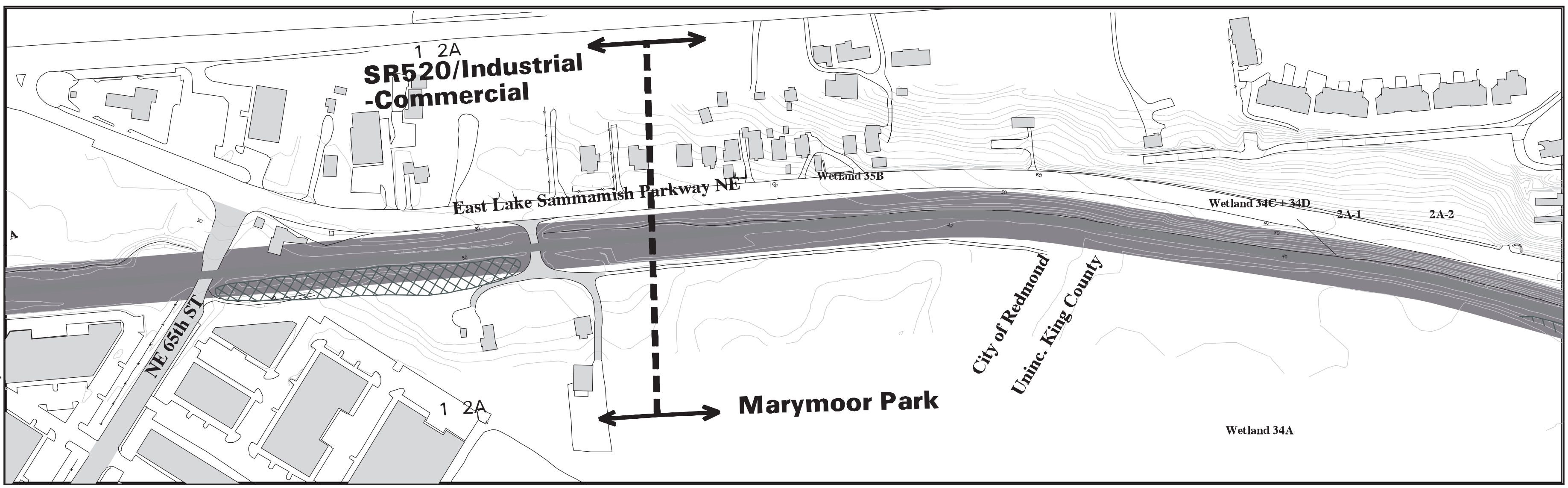

King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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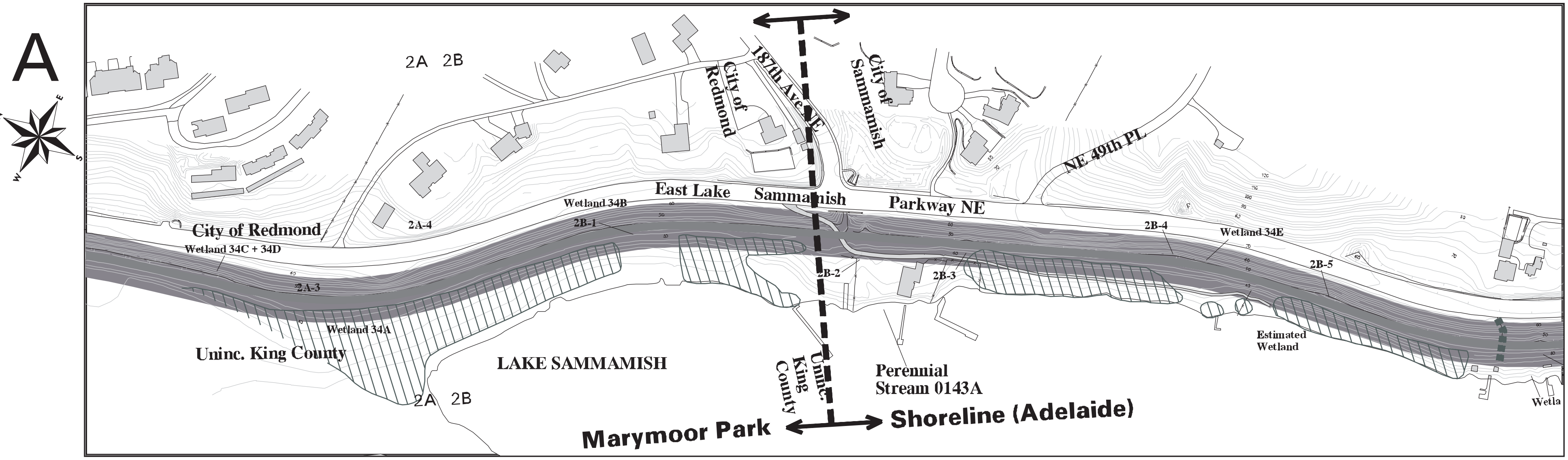
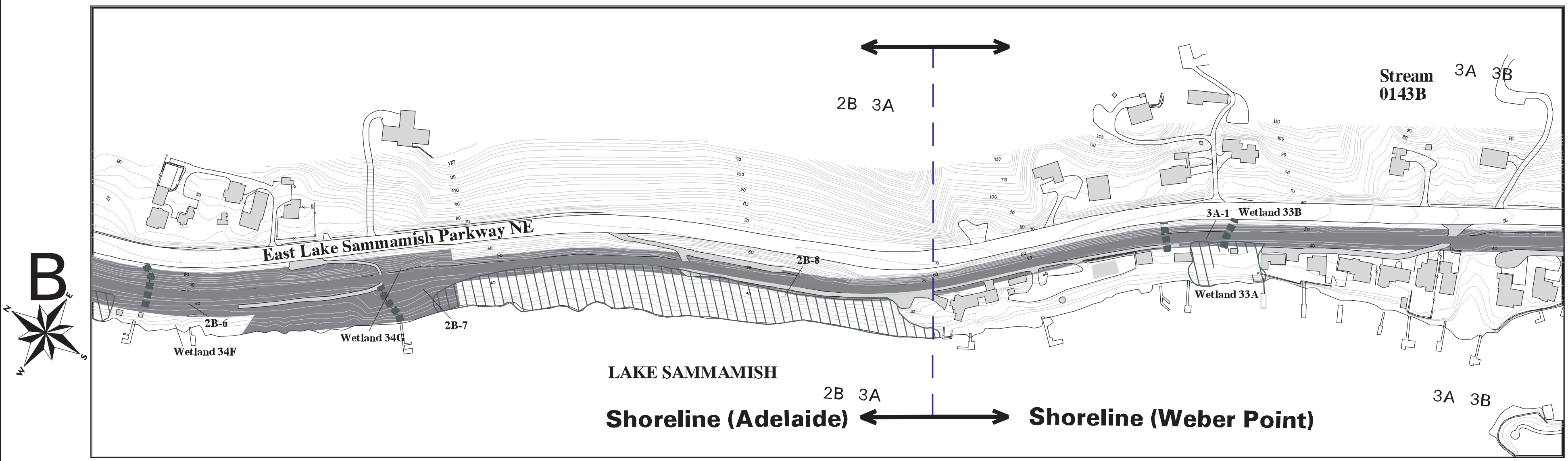
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_062994.aml
Date: June 30, 2004

Prepared by Parametrix

Right of Way
Roads
Driveways
Coniferous Trees
Rail Bed
Landscape Unit
Landscape Sub-unit

FIGURE F-11
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON





King County
Capital Improvement Projects
Facilities Management Division, DES

0 Feet 350

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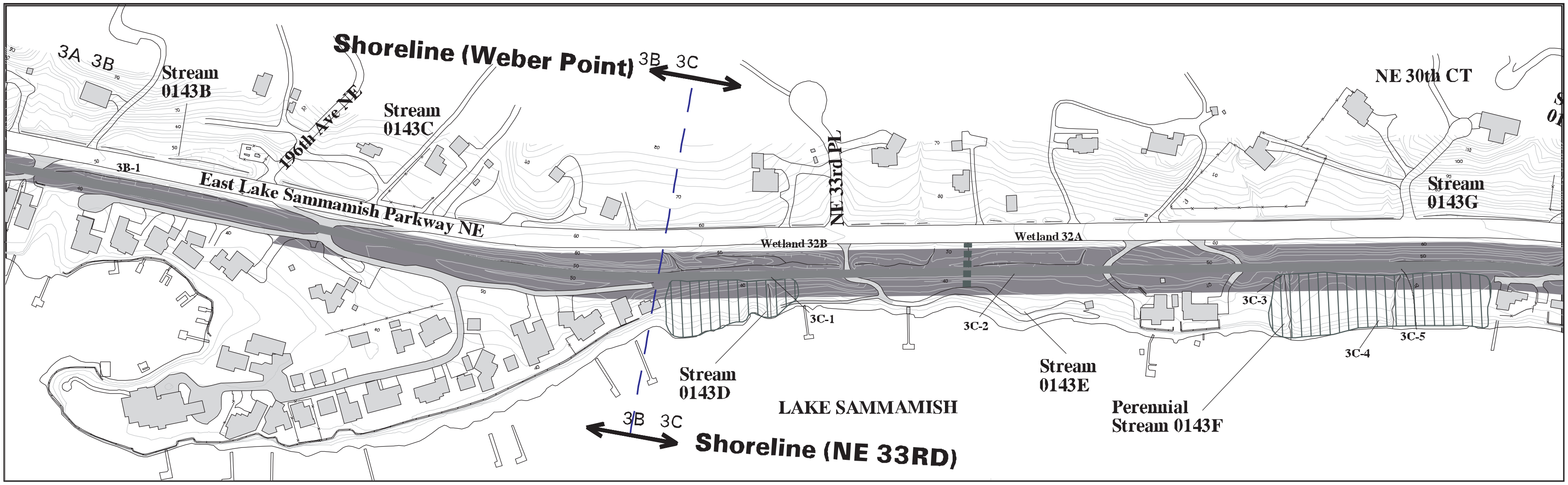
SOURCE: ./eastlake/plotamls/p_8x11_viewshed_062994.aml
Date: June 30, 2004

Prepared by Parametrix

Right of Way
Driveways
Deciduous Trees
Rail Bed
Residential Path
Landscape Unit
Landscape Sub-unit

FIGURE F-12
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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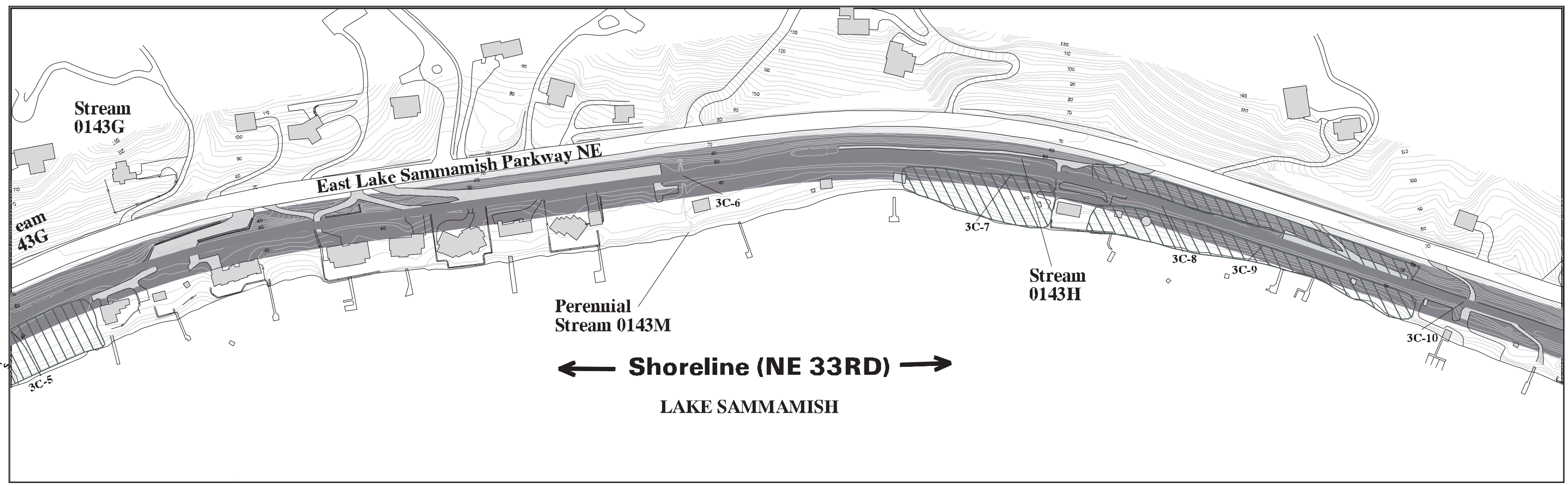

King County
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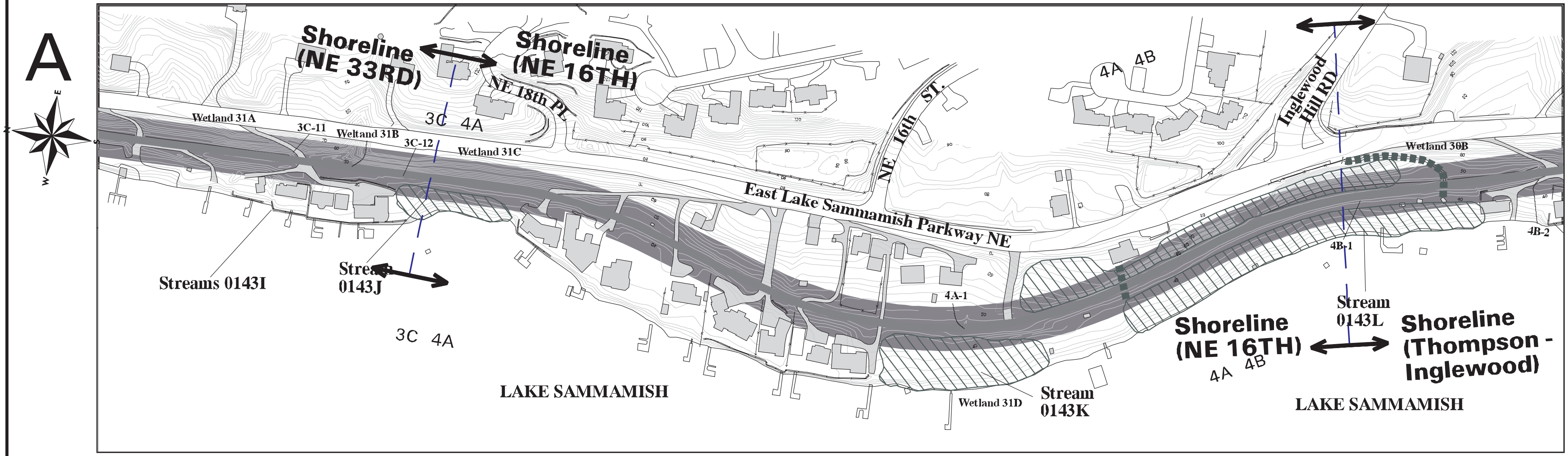
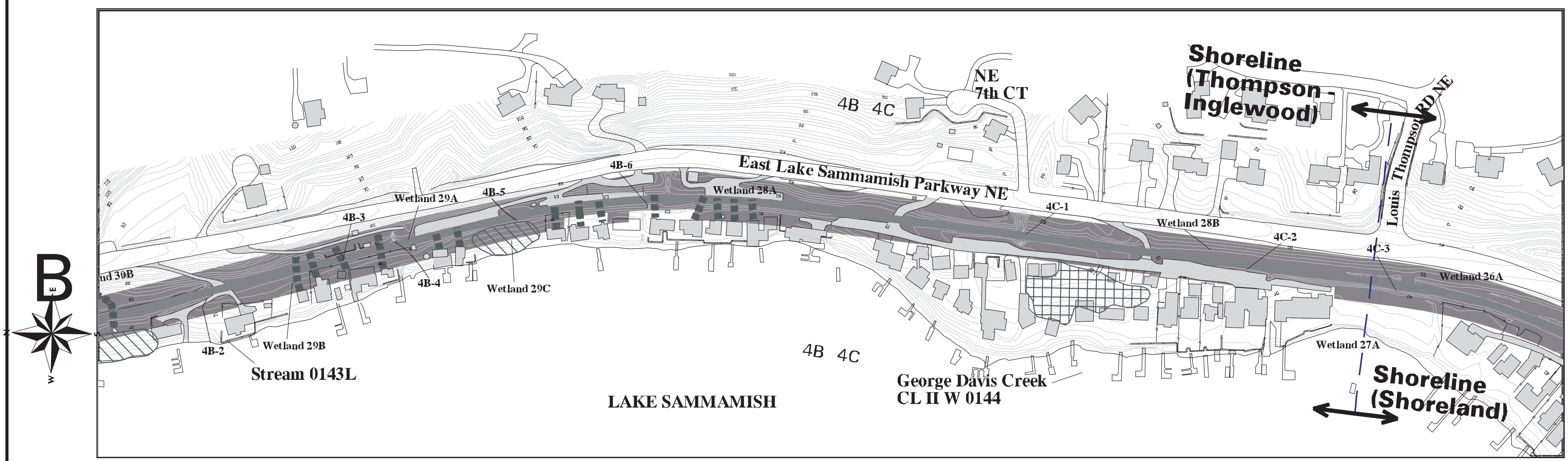
Date: June 30, 2004

Prepared by Parametrix

- Right of Way
- Driveways
- Deciduous Trees
- Rail Bed
- Residential Path
- Landscape Unit
- Landscape Sub-unit

FIGURE F-13
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON





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Date: June 30, 2004

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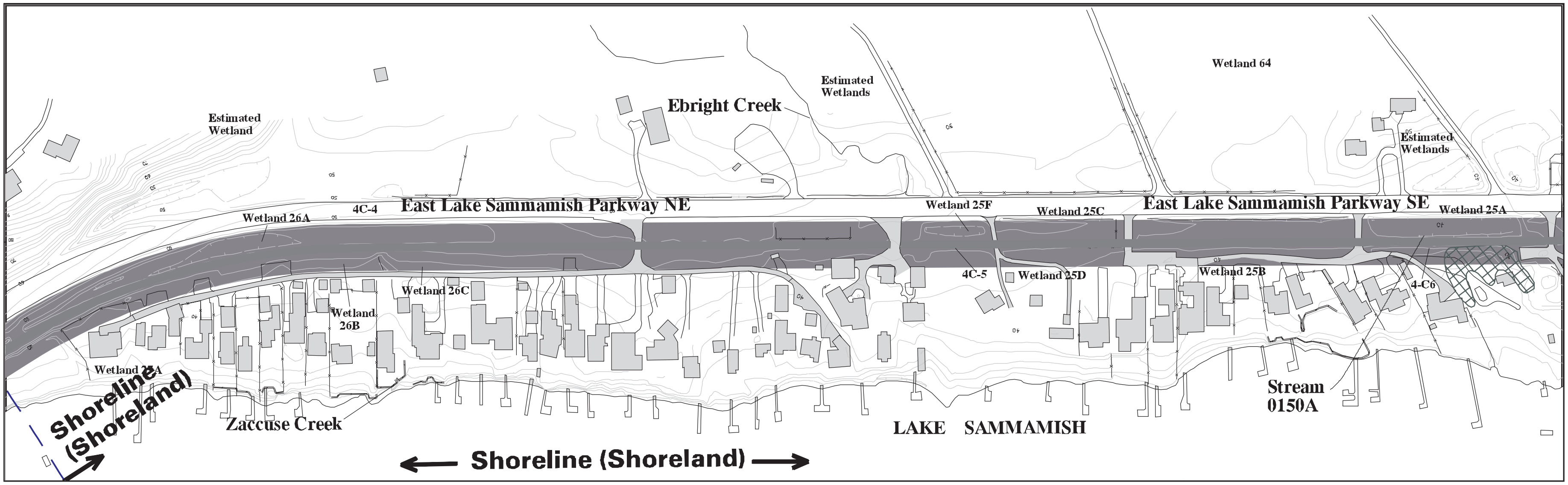
Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Rail Bed
Residential Path
Landscape Unit
Landscape Sub-unit

FIGURE F-14
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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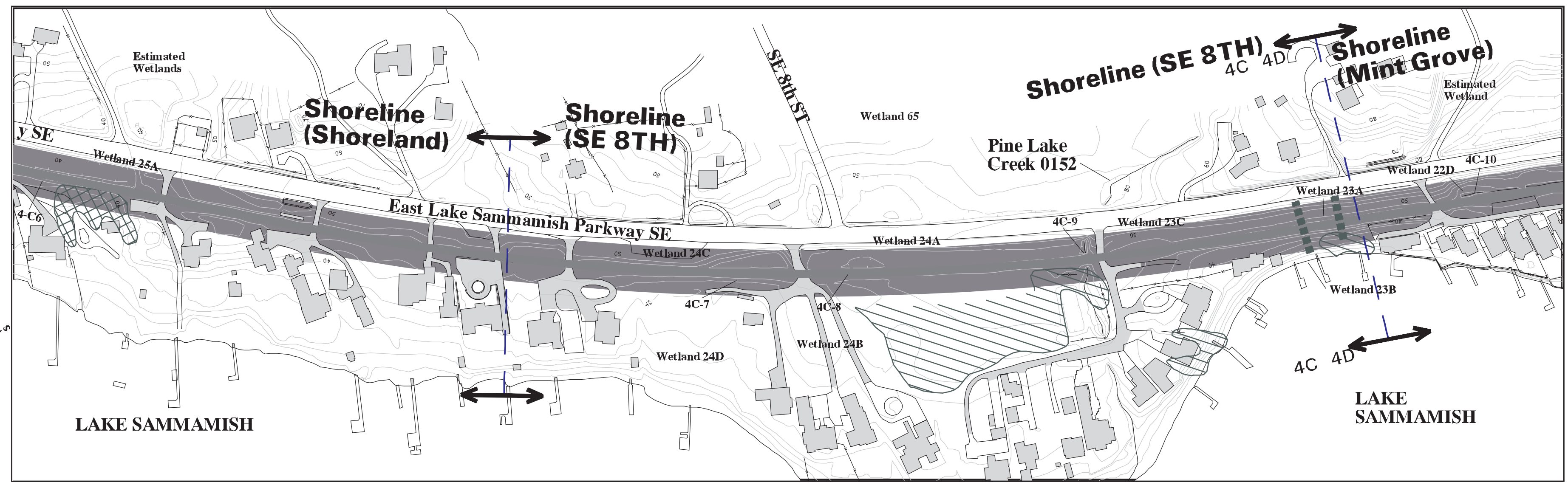

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Facilities Management Division, DES

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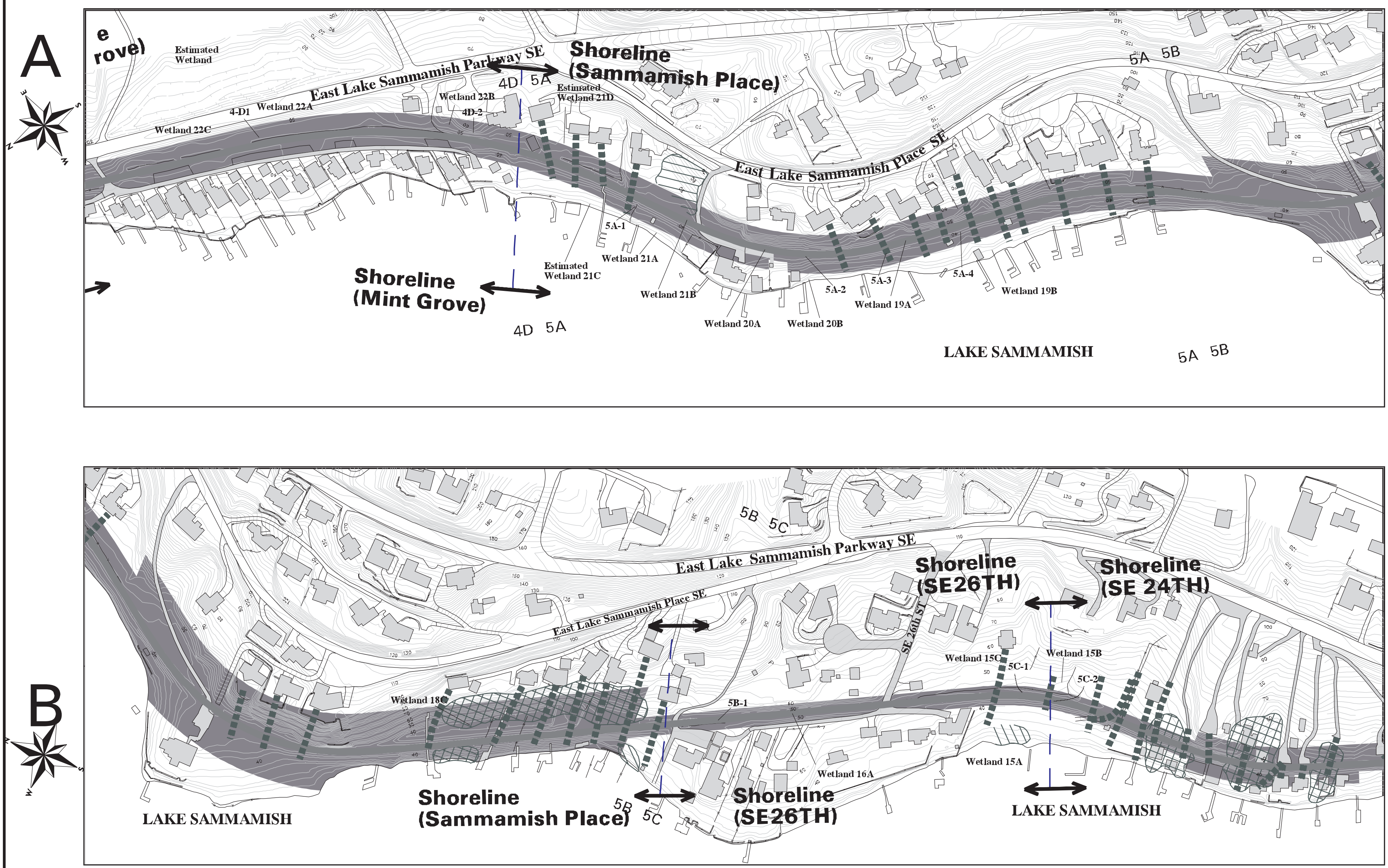
Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Rail Bed
Residential Path
Landscape Unit
Landscape Sub-unit

FIGURE F-15
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Capital Improvement Projects
Facilities Management Division, DES

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Date: June 30, 2004

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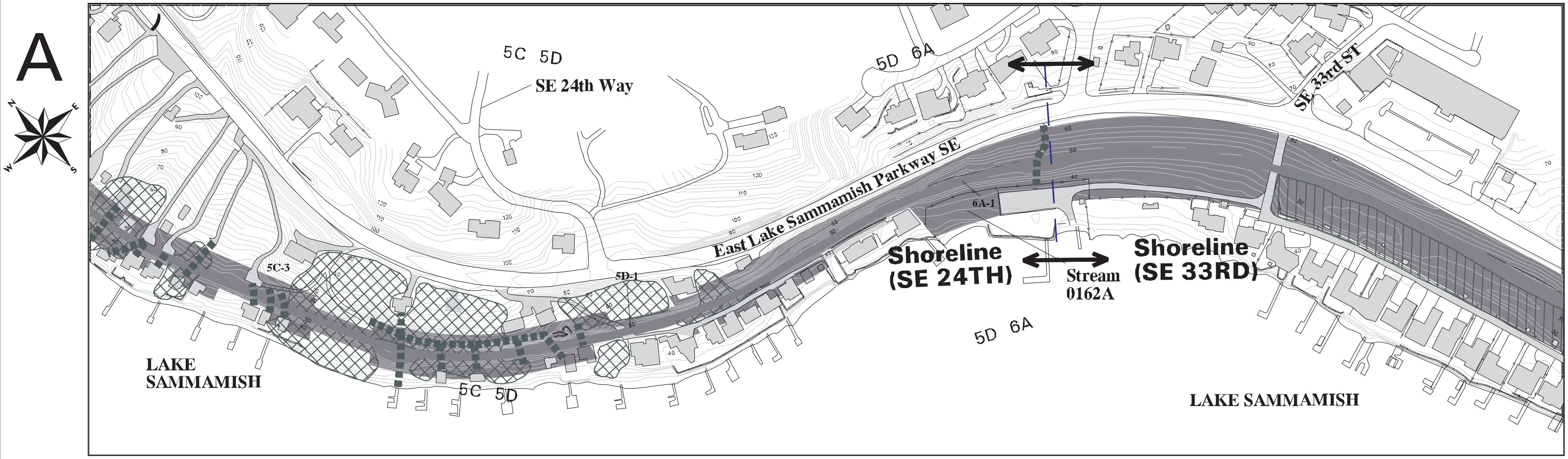
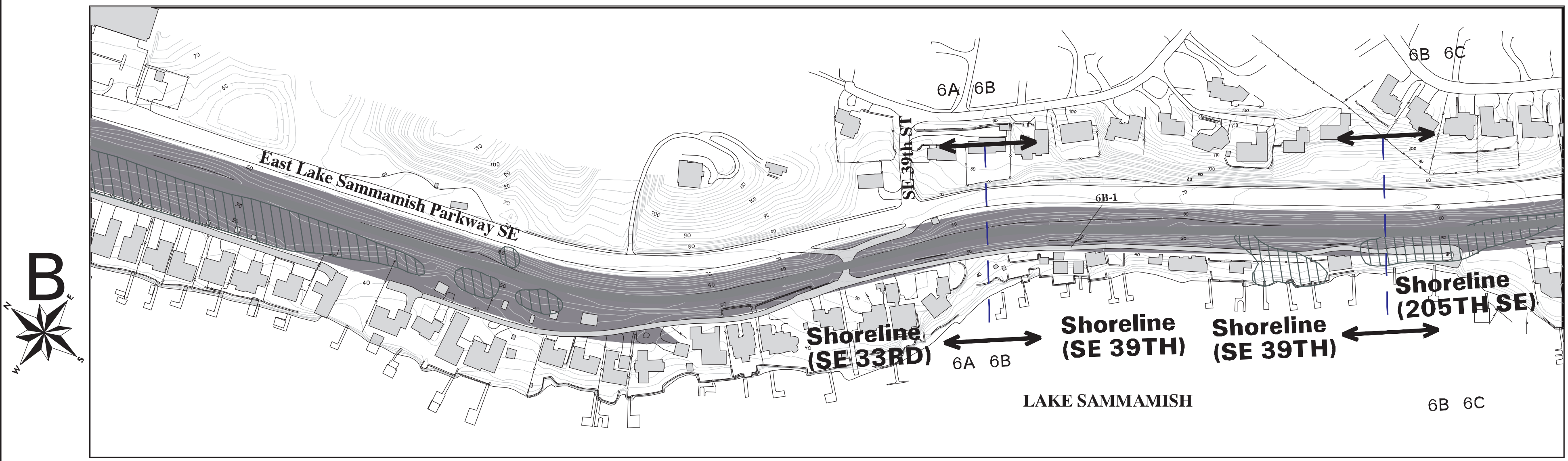
- Right of Way
- Driveways
- Deciduous Trees
- Coniferous Trees
- Rail Bed
- Residential Path
- Landscape Unit
- Landscape Sub-unit

FIGURE F-16
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON





King County
Capital Improvement Projects
Facilities Management Division, DES

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Date: June 30, 2004

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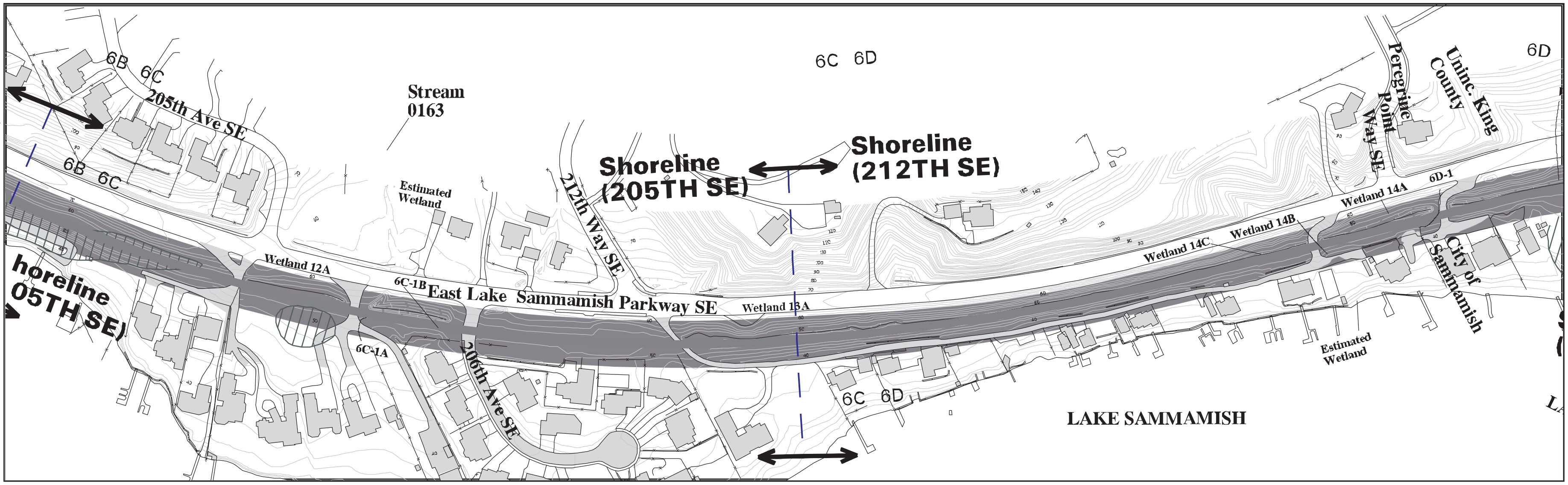
Right of Way
Driveways
Deciduous Trees
Coniferous Trees
Rail Bed
Residential Path
Landscape Unit
Landscape Sub-unit

FIGURE F-17
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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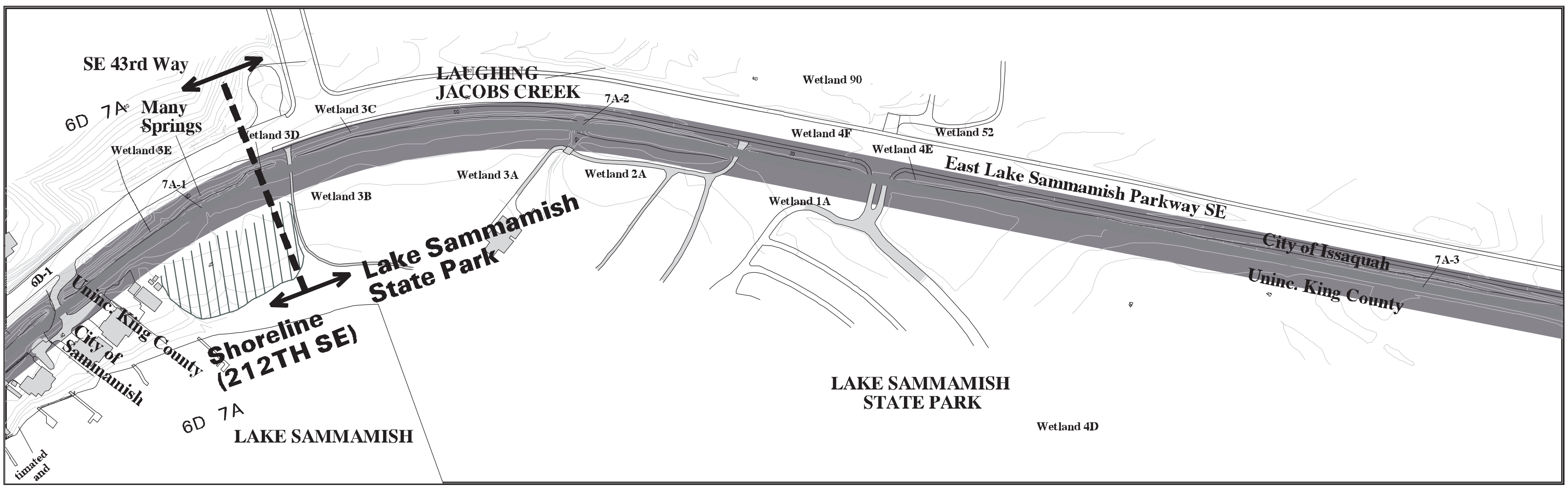

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Capital Improvement Projects
Facilities Management Division, DES

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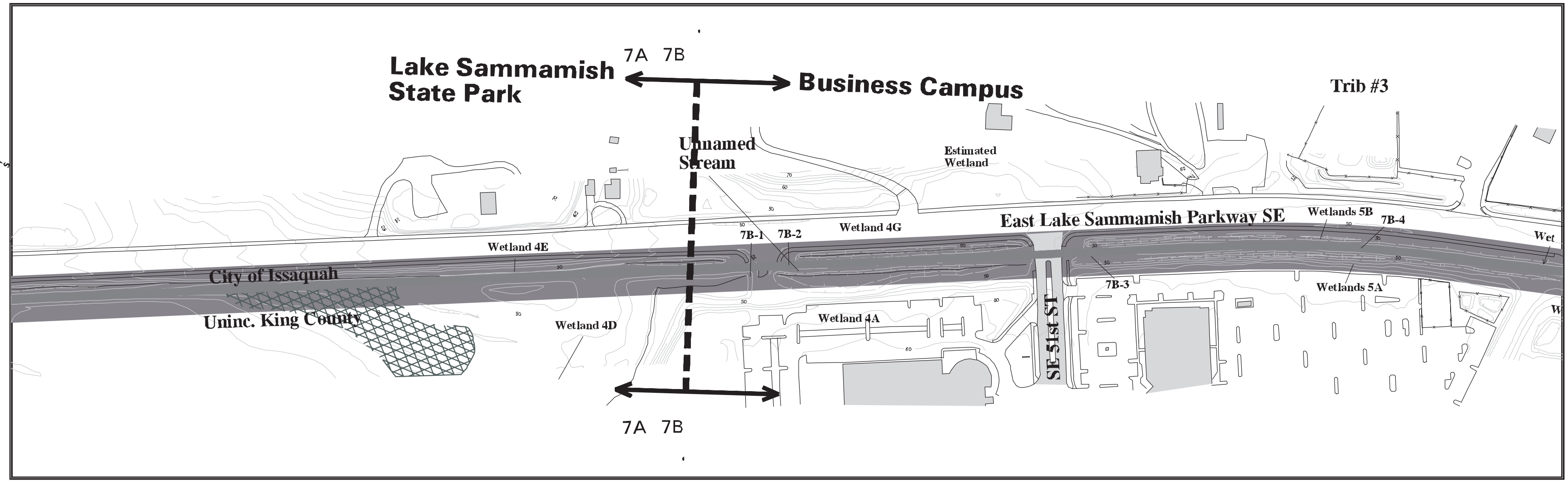
Date: June 30, 2004

Prepared by Parametrix

Right of Way
Roads
Driveways
Deciduous Trees
Rail Bed
Landscape Unit
Landscape Sub-unit

FIGURE F-18
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

A



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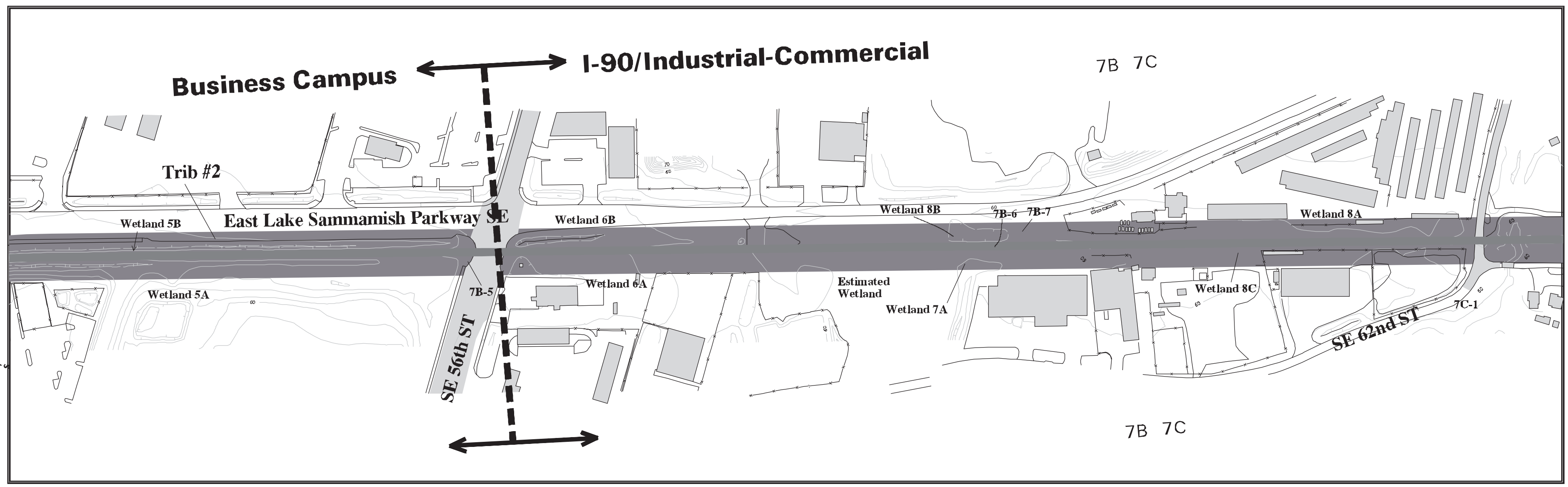


King County
Capital Improvement Projects
Facilities Management Division, DES

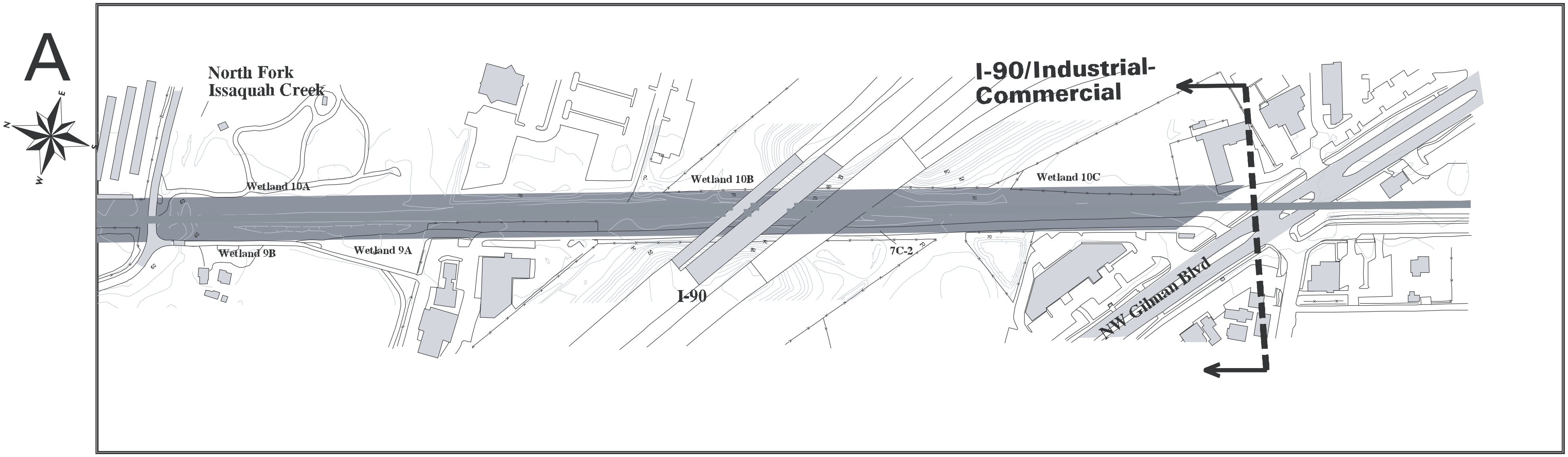
0 Feet 350

SOURCE: ./eastlake/plotamls/p_8x11_viewshed_062994.aml
Date: June 30, 2004

Prepared by Parametrix

Right of Way
Roads
Grassy Field
Rail Bed
Landscape Unit
Landscape Sub-unit

FIGURE F-19
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Capital Improvement Projects
Facilities Management Division, DES

0 *Feet* 350

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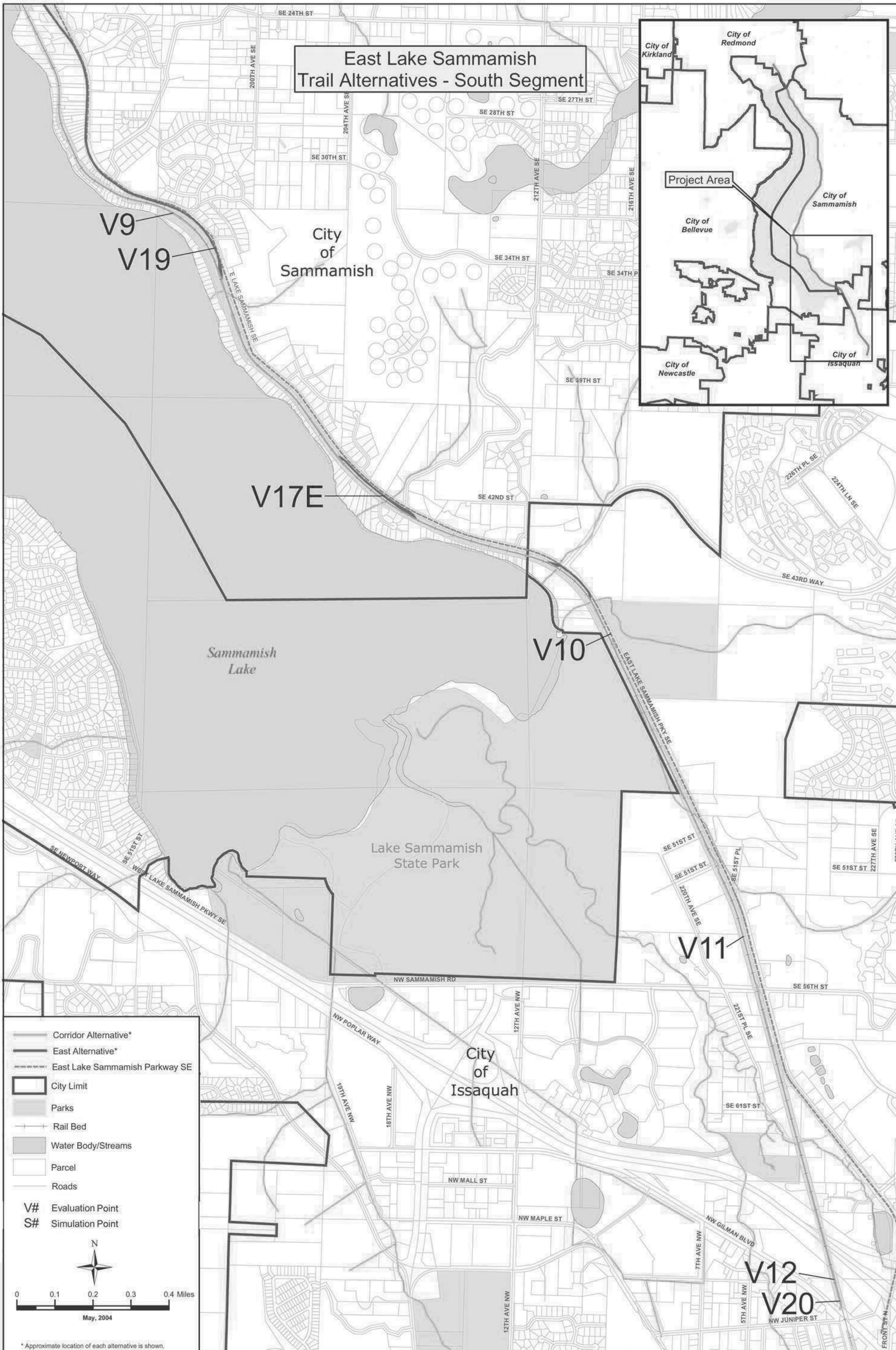
Date: June 30, 2004

Prepared by Parametrix

Right of Way
Roads
Rail Bed
Landscape Unit
Landscape Sub-unit

FIGURE F-20
LANDSCAPE UNIT MAPS
EASTLAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

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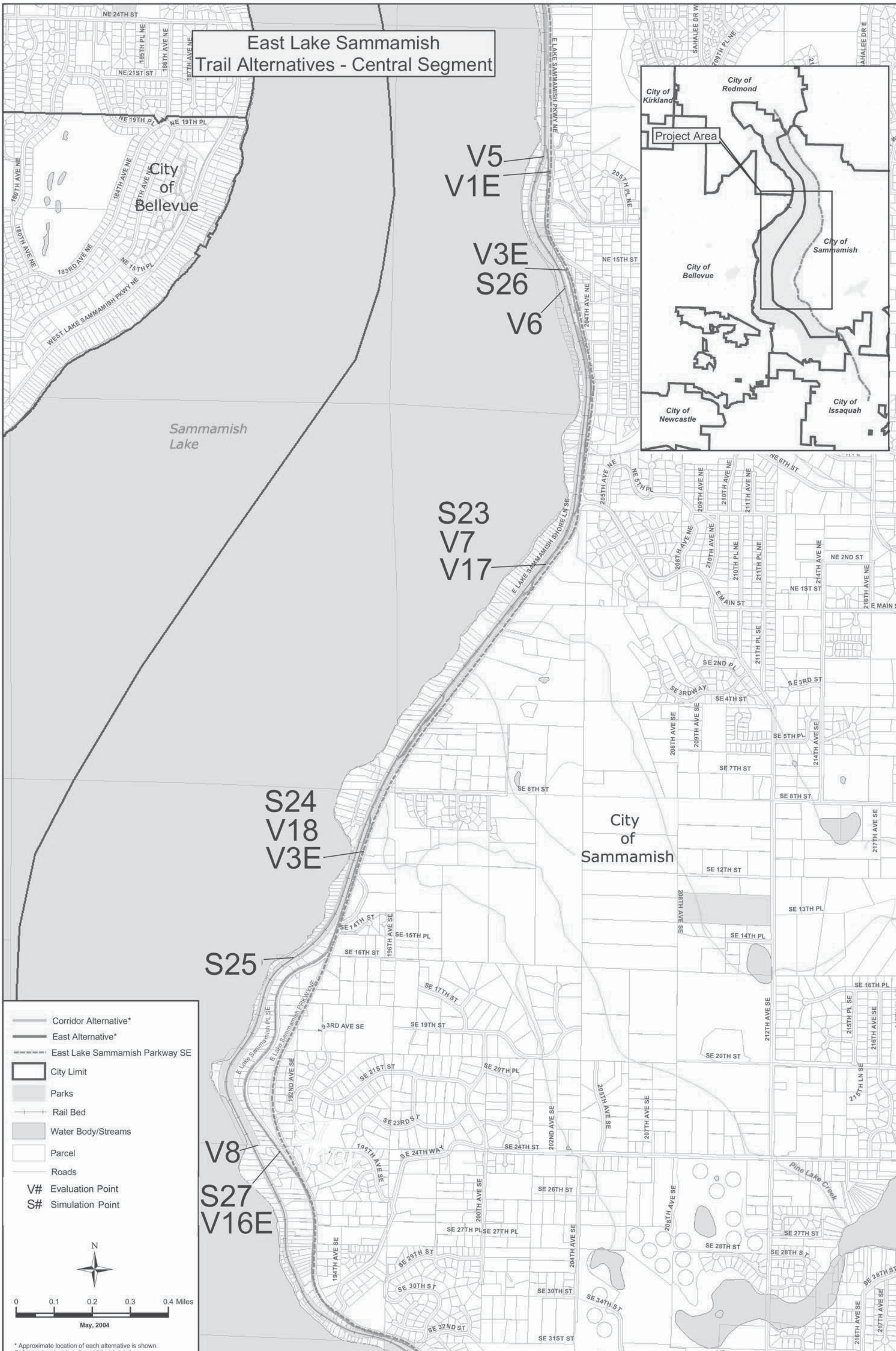
Data Sources: King County GIS, 2003

File Name:L:\ENVIR IMPACTS\2001 projects\21114 ELST Master Plan\gis\PARCELS1.mxd 5/7/2004 cm

FIGURE F-21A
EAST LAKE SAMMAMISH
TRAIL ALTERNATIVES-SOUTH SEGMENT
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY WASHINGTON



King County
Department of Natural Resources and Parks
Wastewater Treatment Division

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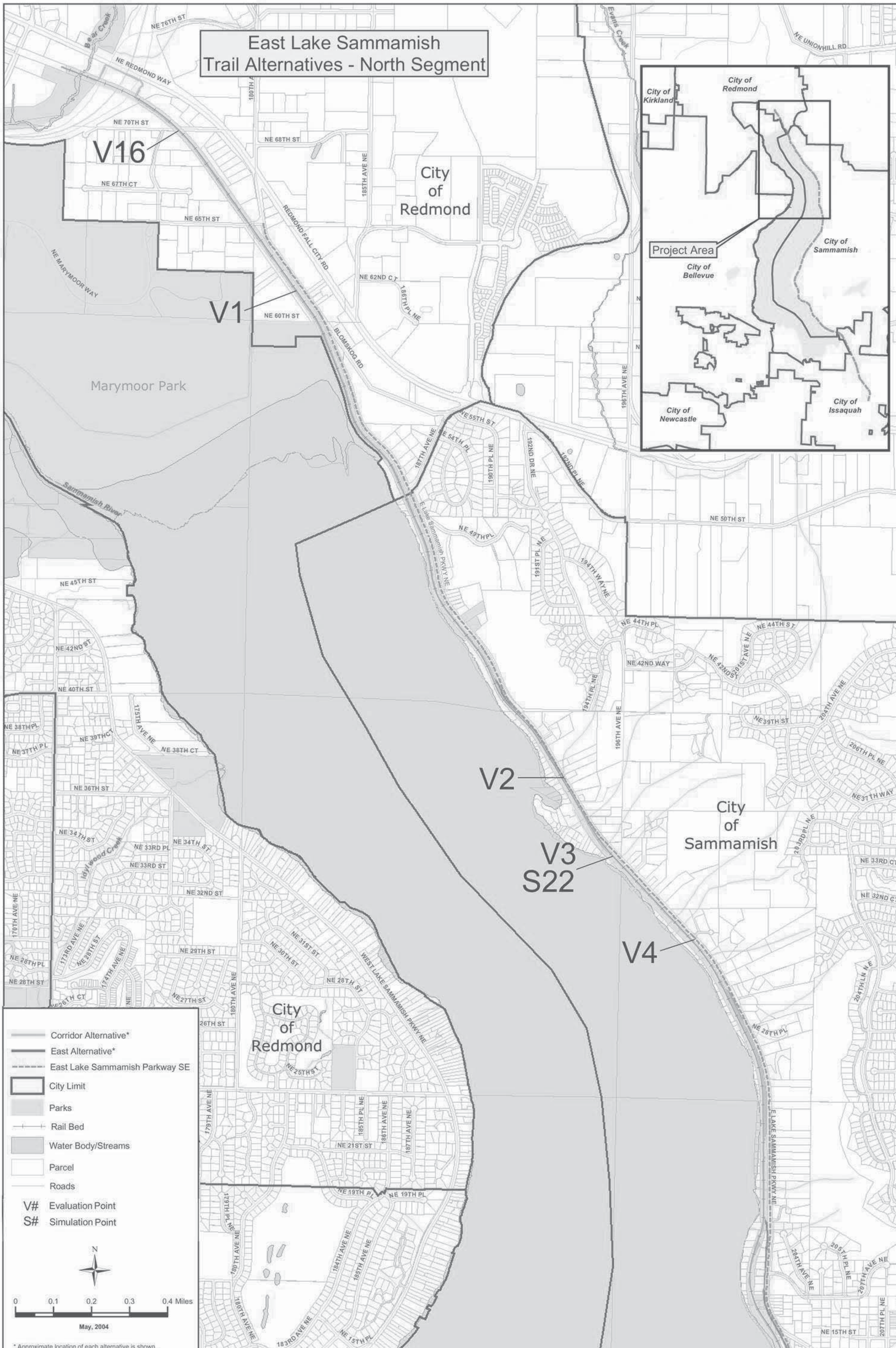
Data Sources: King County GIS, 2003

File Name:L:\ENVIR IMPACTS\2001 projects\21114 ELST Master Plan\gis\PARCELS1.mxd 5/7/2004 cm

FIGURE F-21-B
EAST LAKE SAMMAMISH TRAIL
ALTERNATIVES-CENTRAL SEGMENT
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON



King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

Data Sources: King County GIS, 2003

File Name:L:\ENVIR IMPACTS\2001 projects\21114 ELST Master Plan\gis\PARCELS1.mxd 5/7/2004 cm

FIGURE F-21C
EAST LAKE SAMMAMISH
TRAIL ALTERNATIVES-NORTH SEGMENT
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY WASHINGTON

Looking north from railbed in north-end Sammamish Place neighborhood.

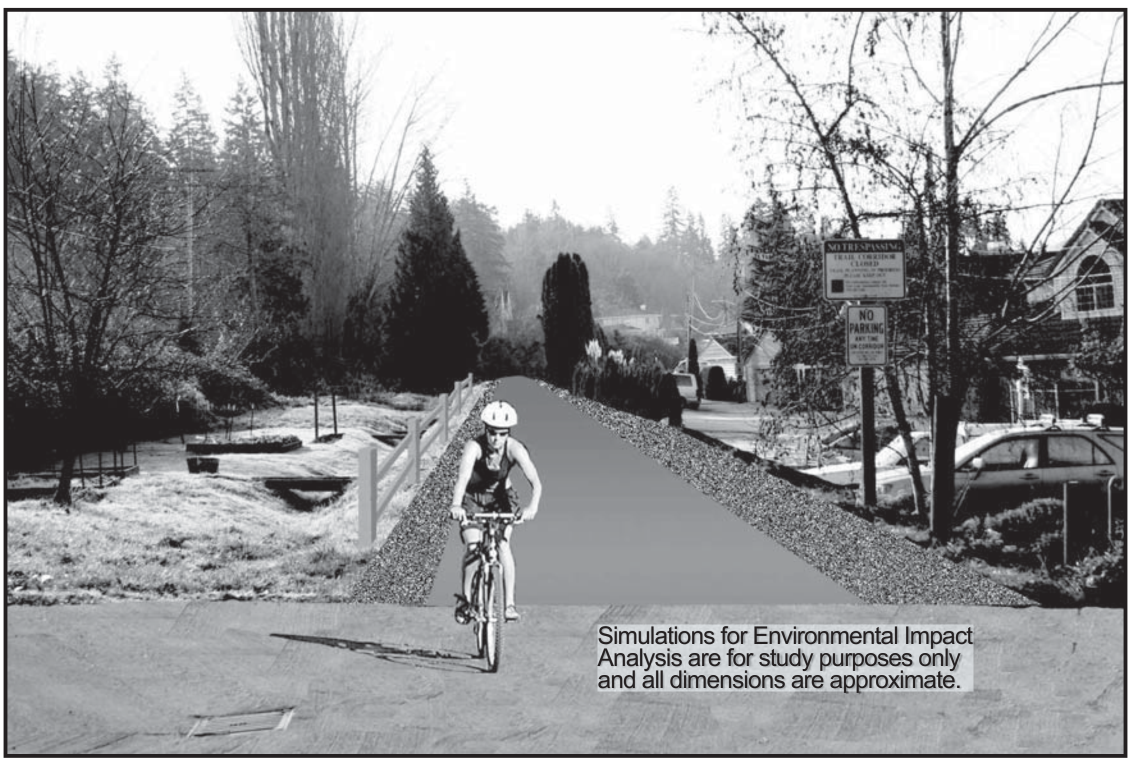
Corridor Alternative; Looking north from railbed in north-end Sammamish Place neighborhood. Paved path is 12 ft. wide with 3 ft. equestrian path on left and 2 ft. gravel shoulder on right.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-22
SIMULATION, CORRIDOR ALTERNATIVE STATION 356 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Looking south from railbed at Mint Grove entrance.



Corridor Alternative; Looking south from railbed at Mint Grove entrance. Paved path is 12 ft. wide with 2 ft. gravel shoulderon left and 5 ft. eqestrian path on right.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-23
SIMULATION, CORRIDOR ALTERNATIVE STATION 370 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Looking north from railbed just south of Shoreland entrance.

Corridor Alternative; Looking north from railbed just south of Shoreland entrance. Paved path is 12 ft. wide with 2 ft. gravel shoulders and 4 ft. equestrian path on left.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-24
SIMULATION, CORRIDOR ALTERNATIVE STATION 417 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Looking northwest from railbed and driveway across from NE 33rd Place.

Corridor Alternative; Looking northwest from railbed and driveway across from NE 33rd Place. Paved path is 12 ft. wide with 2 ft. gravel shoulders.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-25
SIMULATION, CORRIDOR ALTERNATIVE STATION 519 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Looking north from about 2100 block on E Lake Sammamish Place SE.

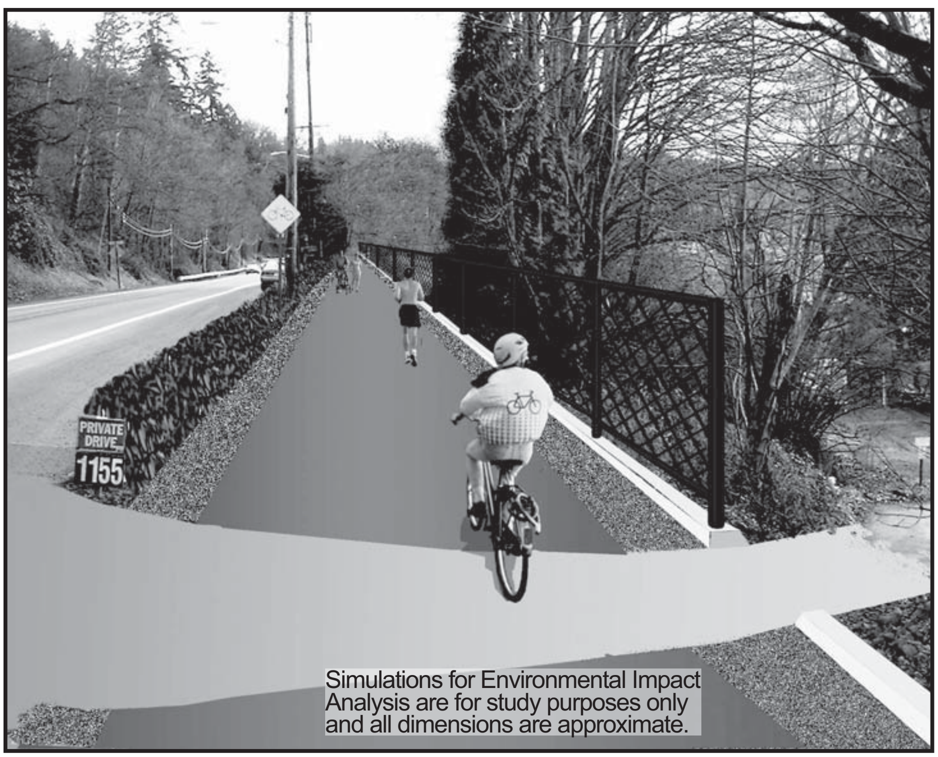
East Alternative; Looking north from about 2100 block on E Lake Sammamish Place SE. Paved path is 12 ft. wide with 2 ft. shoulders.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-26
SIMULATION, EAST ALTERNATIVE STATION 332 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Looking south from first driveway south of Inglewood Hill Road.



East Alternative; Looking south from first driveway south of Inglewood Hill Road. Paved path is 12 ft. wide with 2 ft. gravel shoulders.

King County
Capital Improvement Projects
Facilities Management Division, DES

SOURCE: Parametrix, 2004.

FIGURE F-27
SIMULATION, EAST ALTERNATIVE STATION 458 + 00
EAST LAKE SAMMAMISH TRAIL MASTER PLAN
KING COUNTY, WASHINGTON

Appendix G – Trail Intersections

East Lake Sammamish Master Plan Trail Trail Intersections

Prepared for

King County Facilities Management Division

Prepared by

Parametrix
411 – 108th Avenue NE, Suite 1800
Bellevue, WA 98004
(425) 458-6200
www.parametrix.com

October 2006

TABLE OF CONTENTS

LIST OF TABLES

Explanation of Crossing Types and Difficulty Ratings used in Tables G-1 and G-2.

Crossing Types

Type 1 – High-Volume Street/Driveway Crossing (signals located in close proximity)

Type 2 – Low-Volume Street/Driveway Crossings

Type 3 – Residential Driveway Crossings with Limited Sight Distance (>30 feet from Parallel Roadway Intersection)

Type 4 – Residential Driveway Crossings with Adequate Sight Distance (>30 feet from Parallel Roadway Intersection)

Type 5 – Residential Driveway Within 30 feet of Parallel Intersection with East Lake Sammamish Parkway

Type 6 – Multiple Crossings of a Residential Driveway

Type 7 – Frequent Residential Driveways (Distance between Crossings <200 feet)

Driveway Difficulty Levels

Level 1 – Very little, if any, grading required. Typically, less than or equal to 10 percent slope on both sides of crossing. Little or no impact to location of existing street or driveway vertically or horizontally. No walls required. No structures impacted.

Level 2 – Some regrading required. Typically, greater than 10 percent and less than 20 percent slope on one or both sides of the crossing. Little or no impact to location of street or driveway. Some impact to vertical alignment of existing street or driveway (50' to 100' in length) in order to maintain existing connection. Some walls will be required. No structures impacted.

Level 3 – High level of regrading required. Typically, greater than or equal to 20 percent slope on one or both sides of crossing. Significant impact to location of street or driveway and/or significant impact to vertical alignment of existing street or driveway (100' or more in length) in order to maintain existing connection. Significant walls will probably be required. May require recombining driveways in order to maintain access connection. No structures impacted.

Level 4 – Regrading, relocating or combining of driveways not physically possible. Use of property impacted.

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to Pickering Trail	117+45.00	N/A	None	N/A	Pedestrian path. WB and EB approaches are offset. EB path connected to a parking lot.	3%/10%	N/A	N/A
SE 62nd Street	123+70.00	N/A	None	450	Vegetation management recommended to maintain sight distance	2%/2%	2	1
SE 56th Street	144+85.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance. Direct trail users to crosswalk	2.5%/2%	1	1
SE 51st Street	163+30.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance. Direct trail users to crosswalk.	2%/2%	1	1
Service vehicle entrance	169+50.00	N/A	None	20	Signed no parking. Bollards or fence needed to prohibit auto access.	2%/2%	N/A	N/A
Access to Lake Sammamish State Park (197+00)	197+05.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance	6%/2%	2	1
Access to 4405 E. Lake Sammamish Parkway SE, near Laughing Jacobs Creek	200+20.00	N/A	Yes (NW, SW)	20	Some vegetation management recommended to maintain sight distance.	6%/2%	5	1
Access to Bella Mira	206+60.00	16	Yes (all)	40	Some vegetation management recommended to maintain sight distance.	2%/15%	4	2
Access to private driveway across from SE 43rd Way	209+90.00	N/A	Yes (NE, SE, SW)	40	Some vegetation management recommended to maintain sight distance.	2%/2%	4	1
Access to 4293-4301 E. Lake Sammamish Parkway SE	215+70.00	3	Yes (NW, SW)	60	Some vegetation management recommended to maintain sight distance.	10%/10%	3	2
Access to 4275-4289 E. Lake Sammamish Shore Lane SE	218+60.00	9	Yes (NE, NW, SW)	50	Some vegetation management recommended to maintain sight distance.	10%/10%	3	2
Access to 4200-4299 E. Lake Sammamish Shore Lane SE	232+25.00	5	Yes (SE, NW, SW)	50	Existing signal at 212th Way SE and ELS Pkwy is close to this driveway. Potential safety problem for driveway so close to a signal. Driveway realignment could be considered. Fence on the northwest corner may be a sight obstruction.	8%/12%	3	2
Access to 4216-4263 206th Ave. SE	236+80.00	14	Yes (NW, SW)	50	Some vegetation management recommended to maintain sight distance. Brick walls on northwest and southwest corners may be sight obstructions.	9%/12%	4	2
Access to 4121-4133 E. Lake Sammamish Shore Lane SE	239+35.00	4	Yes (NW, SE)	50	Some vegetation management recommended to maintain sight distance.	10%/11%	4	2
Access to 4101-4119 E. Lake Sammamish Parkway SE	241+90.00	5 to 6	Yes (NW, NE, SE)	50	Some vegetation management recommended to maintain sight distance.	25%/13%	3	3
Access to 3701-4039 E. Lake Sammamish Shore Lane SE	259+30.00	28	Yes (NE, SW, NW)	65	Vegetation management recommended to maintain sight distance.	13%/14%	3	2
Access to 3233-3611 E. Lake Sammamish Shore Lane SE via SE 33rd Street	280+70.00	15	Yes (All)	80	Vegetation management recommended to maintain sight distance.	9%/10%	4	1
Access to 3115-3167 E. Lake Sammamish Shore Lane SE	296+25.00	11	Yes (SE)	110	Trail delineation needed.	2%15%	3	3
Access to 2933 East Lake Sammamish Parkway	302+00.00	4	Yes (SW)	150	Vehicles will need to drive on paved/gravel area parallel to the trail to access homes. Guard rail might be needed to separate trail from driveway. Some vegetation management recommended to maintain sight distance.	2%/25%	3	3
	307+00.00	4	Yes (NE, SE)	300	Vehicles will need to drive on paved/gravel area parallel to the trail to access homes. Guard rail might be needed to separate trail from driveway.	2%/18%	4	2
Access to 2503-2607 E. Lake Sammamish Shore Lane SE via SE 26th Street	318+00.00	8 (west side)	Yes (NE, NW, SE)	450	Some vegetation management recommended to maintain sight distance. Trail delineation needed. Slope embankment on the northeast corner might be a sight obstruction.	2%/10%	4	2

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 2419 E. Lake Sammamish Place SE	323+40.00	2	Yes (NE, SE)	500	Some vegetation management recommended to maintain sight distance on east side of railroad. Slope embankment on the southeast corner might be a sight obstruction.	11%/11%	4	2
Access to 2005 E. Lake Sammamish Place SE	335+70.00	1	None	620 to E Lake Samm Pl SE	Good sight distance	2%/3%	4	2
Access to 1631-1635 E. Lake Sammamish Place SE	352+90.00	3	Yes (NE, SE)	180 to E Lake Samm Pl SE	Stop sign needed for autos due to poor sight distance east of the railroad. Vehicles will need to drive on trail to access driveways. Slope embankment on the southeast corner might be a sight obstruction.	8%/12%	3	2
Access to 1200-1499 E. Lake Sammamish Shore Lane SE	368+60.00	20	None	70	Existing trees may require removal. 2-foot high rockery located in the northwest corner.	16%/22%	3	3
Access to 800-999 E. Lake Sammamish Shore Lane SE	375+80.00	13	Yes (SW, NW)	70	Existing trees on southwest corner may be removed. Large tree on northwest corner needs to be trimmed.	2%/10%	4	1
Access to 645-659 E. Lake Sammamish Parkway SE	382+20.00	5	Yes (NE, SE)	65	Some vegetation management recommended to maintain sight distance.	5%/9%	4	1
Access to 477-485 E. Lake Sammamish Parkway SE	387+25.00	2	Yes (All)	65	Some vegetation management recommended to maintain sight distance. Bushes need to be removed and trees trimmed.	9%/9%	4	1
Access to 467 E. Lake Sammamish Parkway SE	388+75.00	1	Yes (SW, SE, NE)	65	Some vegetation management and grading recommended to maintain sight distance. Slope embankment on northeast corner might be a sight obstruction.	4%/15%	4/3	2
Access to 447-457 E. Lake Sammamish Parkway SE	390+25.00	2	Yes (NE, SE, SW)	65	Some vegetation management and grading recommended to improve sight distance. Slope embankment on northeast and southeast corners may be sight obstructions.	4%/15%	4/3	2
Access to 425-439 E. Lake Sammamish Parkway SE	392+75.00	5	Yes (NW, NE, SE)	65	Some vegetation management recommended to maintain sight distance. Storage shed on the northeast corner may be a sight obstruction.	4%/15%	3	2
Access to 303-407 E. Lake Sammamish Parkway SE	396+05.00	3	Yes (NW, SW)	50	Some vegetation management recommended to maintain sight distance. Slope embankment on the southwest corner may be a sight obstruction.	2%/4%	4	2
Access to 185 - 251 E. Lake Sammamish Parkway SE	400+20.00	7	Yes (SW, NW, NE)	50	Some vegetation management recommended to maintain sight distance.	12%/2%	3/4	2
Access to 159-181 E. Lake Sammamish Parkway SE	405+10.00	11	Yes (NW, NE, SE)	50	Some vegetation management recommended to maintain sight distance. Hedges to be trimmed.	16%/4%	3/4	2
Access to 135-145 E. Lake Sammamish Parkway SE	407+95.00	4	Yes (NE, SE)	50	Some vegetation management is recommended to maintain sight distance.	3%/3%	4	1
Access to 125-129 E. Lake Sammamish Parkway NE and 125 E. Lake Sammamish Parkway SE	410+10.00	6	Yes (NW, SW)	50	Some vegetation management is recommended to maintain sight distance. Existing driveway is gravel. A storage shed is located at the northeast corner, 50 ft from driveway, and may need to be removed.	4%/5%	4	1
Access to 101-273 E. Lake Sammamish Shore Lane NE	415+60.00	26 to 33	Yes (NE, SW)	40	Some vegetation management is recommended to maintain sight distance. Sign board on the northeast corner may be a sight obstruction.	5%/2%	2	1
Access to 425-667 E. Lake Sammamish Shore Lane NE	435+05.00	16 to 24	Yes (All)	50	Some vegetation management is recommended to maintain sight distance. Slope embankment on northeast corner may be a sight obstruction.	6%/15%	3	2
Access to 425-667 E. Lake Sammamish Shore Lane NE	440+80.00	16 to 24	Yes (NW)	50	Some vegetation management is recommended to maintain sight distance.	3%/9%	3	2
Access to 845-913 Sammamish Shore Lane NE	448+30.00	5	N/A	250	Trail footprint adjacent to houses and would likely displace some of the existing driveway and parking area. If rail bed and access driveway are swapped, a new trail crossing will be created.	2%/20%	3	3

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 845-913 Sammamish Shore Lane NE	454+20.00	4	Yes (NE)	40	Driveway leads to a parking area east of the railbed. Residents appear to park and cross the railbed to access their houses. Driveway reconfiguration may be needed. Some vegetation management on the NE corner is recommended.	2%/20%	4	2
Access to 1123-1155 E. Lake Sammamish Parkway NE	456+50.00	2	Yes (NW, SW)	80	Trail delineation required to separate trail from driveway. Vegetation management recommended on the west side of trail.	14%/20%	4/3	3
Pedestrian Access path	459+05.00	0	N/A	200	Pedestrian Access path to waterfront. Connects to trail	2%/20%	N/A	N/A
Recreational access	469+50.00	0	Yes (NE, SE)	160	Gated entry to recreational property. Trail delineation recommended. Vegetation management on the east side of trail recommended.	7%/20%	3	2
Access to 1629 E. Lake Sammamish Parkway NE	472+45.00	1	Yes (All)	320	Vegetation management on all corners (especially north) is recommended to maintain sight distance.	14%/10%	4/3	2
Access to 1707 E. Lake Sammamish Parkway NE	474+30.00	1	Yes (NE, SE)	300	Skewed crossing. If westbound approach is realigned, should consider regarding eastbound approach to maintain existing driveway grade. Some vegetation management is recommended to maintain sight distance.	20%/8%	3	2
Access to 1717-1723 E. Lake Sammamish Parkway NE	475+20.00	2	Yes (NE, SW, SE)	190	Some vegetation management is recommended to maintain sight distance. Existing rockery on the southeast corner blocking sight lines. Consider stopping or slowing bicycles due to poor sight lines.	20%/8%	4/3	2
Access to 1805 E. Lake Sammamish Parkway NE	477+45.00	1	Yes (SW, NW, SE)	280	Some vegetation management is recommended to maintain sight distance.	13%/20%	4/3	2
Access to 1815-1827 E. Lake Sammamish Parkway NE	479+00.00	2	Yes (NW, SW)	350	Some vegetation management is recommended to maintain sight distance. Trail delineation needed. Driveway consolidated with another.	10%/10%	4/3	2
Access to 1841 E. Lake Sammamish Parkway NE	480+45.00	1	Yes (SW)	50	Some vegetation management is recommended to maintain sight distance. Trail delineation needed. Driveway eliminated at this location and consolidated with another.	13%/2%	N/A	N/A
Access to 2007-2033 E. Lake Sammamish Parkway NE	486+20.00	3	Yes (SE)	160	Steep grade on eastbound approach. Some vegetation management is recommended to maintain sight distance.	6%/25%	3	3
Access to recreational property	490+00.00	2 boat launches	Yes (NE)	170	Steep grade on westbound approach, vegetation management required to improve sight distance.	25%/25%	3	3
New Access to Recreational Property for #50.	492+35.00	N/A	N/A	125	N/A	2%/20%	3	3
Old Access to Recreational Property. See #49	493+00.00	N/A	N/A	85	Driveway eliminated.	2%/20%	N/A	N/A
Access to 2533 E. Lake Sammamish Parkway NE and recreational property	499+35.00	1	Yes (NW, SW)	60	Gravel access is chained. Driveway adjusted to enter from the north instead of south. Driveway consolidated with others.	10%/8%	3	3
Access to 2629-2813 E. Lake Sammamish Parkway NE	512+55.00	3	None	60	Trail offset from rail bed. Access road will be adjacent to homes instead of the trail. Driveway removed and consolidated with another.	8%/12%	N/A	N/A
Access to 2825 E. Lake Sammamish Parkway NE	513+70.00	1	Yes (NE)	60	Limited sight distance and steep grade on Eastbound side. Some vegetation management is recommended to maintain sight distance.	20%/20%	3	3
Access to 2831 E. Lake Sammamish Parkway NE	515+50.00	1	Yes (NW, SW, NE)	60	Steep slope and rock wall on southeast corner may obstruct sight lines. Some vegetation management is recommended to maintain sight distance.	12%/12%	3	2
Access to 2841E. Lake Sammamish Parkway NE	518+20.00	1	None	140	Two interconnected driveways (see below). Trail delineation needed. Retaining wall at southeast corner may be a sight obstruction. Some vegetation management is recommended to maintain sight distance.	16%/10%	3	2
Access to 2???-2927 E. Lake Sammamish Parkway NE	519+10.00	2	None	250	Two interconnected driveways (see above). Trail delineation needed. Retaining wall at southeast corner may be a sight obstruction. Some vegetation management is recommended to maintain sight distance.	12%/12%	3	2

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 3103 & 3113 E. Lake Sammamish Parkway NE	526+00.00	2	Yes (SE, NE, SW)	140	Limited sight distance on westbound approach. Vegetation management required to improve/maintain sight distance.	12%/12%	3	2
Access to 3123 E. Lake Sammamish Parkway NE	528+90.00	1	Yes (All, especially SW)	120	Vegetation management required to improve/maintain sight distance.	8%/10%	3	2
Access near NE 33rd PL	534+40.00	0	Yes (SE)	50	Access to existing grass/gravel driveway is blocked by fence. Parked boats are on trail ROW.	4%/4%	3	2
Access to 3417-3629 E. Lake Sammamish Shore Lane NE	545+65.00	29	Yes (SE, NW, SW)	120,180	Vegetation management required to improve/maintain sight distance.	8%/10%	3	2
Access to 3665-3835 E. Lake Sammamish Parkway NE	552+00.00	5 to 6	Yes (NW, NE)	40	Very little room is available in the trail crossing area. Need to clearly mark for trail ROW. Vegetation management and trail delineation needed.	20%/2%	3	2
Access to 3840-3931 E. Lake Sammamish Parkway NE	569+40.00	3	Yes (NE)	240	Access road parallel and adjacent to rail bed ROW. Vehicles from ELS Parkway currently either drive on the access road or rail bed to access to the several residences south of the crossing. Trail delineation needed.	2%/30%	3	3
Access to recreational property	576+30.00	0	Yes (SW, NE)	300	Some vegetation management recommended to maintain sight distance. Existing grass/gravel access road is chained.	20%/12%	3	2
Access to 5011 E. Lake Sammamish Parkway NE	596+75.00	1	Yes (NW, SW, NE)	150	Some vegetation management recommended to maintain sight distance.	12%/15%	3	2
Access to 20-27 (180th Pl. NE)	633+10.00	3 to 4	Yes (NE, NW)	60	Trail is close to Pkwy. Extra warning sign or stop signs for fast-moving traffic from Pkwy needed. Some vegetation management recommended to maintain sight distance.	2%/2%	4	1
NE 65th Street Crossing	640+15.00	N/A	None	170	Move recycle bin (NE corner) to improve sight distance. Trail delineation needed.	2%/5%	1	1
NE 70th Street Crossing	656+65.00	N/A	Yes (NW, NE)	620 from Redmond Way	Consider trail crossing signal. Some vegetation management needed to improve sight distance. Trail delineation needed.	2%/2%	2	1
EB SR520 Off Ramp to SB Redmond Way Crossing	666+25.00	0	Yes	40 from Redmond Way	Trail brought up to the intersection of the existing SR-520 off-ramp and keyed in with the signal at the intersection.	2%/2%	1	1
WB SR520 On Ramp Crossing	671+65.00	0	Yes	10 from Redmond Way	Trail brought up to the intersection of the existing SR-520 on-ramp and keyed in with the signal at the intersection.	2%/2%	1	1

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to Pickering Trail	117+45.00	N/A	None	N/A	Pedestrian path. WB and EB approaches are offset. EB path connected to a parking lot.	3%/10%	N/A	N/A
SE 62nd Street	123+70.00	N/A	None	450	Vegetation management recommended to maintain sight distance	2%/2%	2	1
SE 56th Street	144+85.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance. Direct trail users to crosswalk	2.5%/2%	1	1
SE 51st Street	163+30.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance. Direct trail users to crosswalk. Cut shrubs and trees north. Move 3 utility boxes south of drive, cut tree and brush. Suggest keeping trail on corridor, intersection works well now.	2%/2%	1	1
Service vehicle entrance	169+50.00	N/A	None	20	Signed no parking. Fence installed. Driveway closed.	2%/2%	N/A	N/A
Access to Lake Sammamish State Park (197+00)	197+05.00	N/A	None	0	Trail will be off the rail bed and routed adjacent to ELS Pkwy. Good sight distance	6%/2%	2	1
Access to 4405 E. Lake Sammamish Parkway SE, near Laughing Jacobs Creek	200+20.00	N/A	Yes (NW, SW)	20	Some vegetation management recommended to maintain sight distance.	6%/2%	5	1
Access to Bella Mira	206+60.00	16	Yes (all)	40	Some vegetation management recommended to maintain sight distance.	2%/15%	4	2
Access to private driveway across from SE 43rd Way	209+90.00	N/A	Yes (NW, SW)	40	Some vegetation management recommended to maintain sight distance. Equestrian trail. Sign in conjunction with another driveway.	2%/2%	4/6	1
	210+10.00		Yes (NW, SW)	0	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with another driveway. Clear brush both north and south.	15%/2%	5/6	2
Access to 4293-4301 E. Lake Sammamish Parkway SE	216+10.00	3	Yes (NW, SW)	60	Some vegetation management recommended to maintain sight distance.	10%/10%	3	2
Access to 4275-4289 E. Lake Sammamish Shore Lane SE	218+95.00	9	Yes (NE, NW, SW)	50	Some vegetation management recommended to maintain sight distance.	10%/10%	3	2
Access to 4200-4299 E. Lake Sammamish Shore Lane SE	232+60.00	5	Yes (SE, NW, SW)	50	Existing signal at 212th Way SE and ELS Pkwy is close to this driveway. Potential safety problem for driveway so close to a signal. Driveway realignment could be considered. Fence on the northwest corner may be a sight obstruction. Equestrian Trail. Sign in conjuction another driveway.	8%/12%	3/6	1
	233+15.00		Yes (SW)	5	Clear brush to the south.	15%/2%	6/7	2
Access to 4216-4263 206th Ave. SE	236+80.00	14	Yes (NW, SW)	50	Some vegetation management recommended to maintain sight distance. Brick walls on northwest and southwest corners may be sight obstructions. Equestrian trail. Sign in conjuction with another driveway.	9%/12%	4/6	1
	237+20.00		None	5	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with another driveway. Recommend bringing trail to corridor. Sight distance okay	12%/2%	6/5	2
Access to 4121-4133 E. Lake Sammamish Shore Lane SE	239+35.00	4	Yes (NW, SE)	50	Some vegetation management recommended to maintain sight distance. Equestrian trail. Sign in conjuction with another driveway.	10%/11%	4/6	1
	239+75.00		None	5	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with another driveway. Recommend bringing trail to corridor. Big culvert and ditch south. Sight distance okay	11%/2%	6	2
Access to 4101-4119 E. Lake Sammamish Parkway SE	241+90.00	5 to 6	Yes (NW, NE, SE)	50	Some vegetation management recommended to maintain sight distance. Equestrian trail. Raise trail and adjust driveway to accommodate bike/ped trail. Sign in conjuction with other driveways.	25%/13%	6/7	2
	242+20.00		Yes (NE, SE)	15	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with other driveways.	13%/2%	6/7	3
	242+70.00		Yes (NE, SE)	15	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with other driveways. Consider consolidating with adjacent driveway. Some vegetation management recommended to maintain sight distance.	13%/2%	6/7	3
Access to 3701-4039 E. Lake Sammamish Shore Lane SE	259+65.00	28 (9 in 6B)	Yes (NE, SW, NW)	65	Vegetation management recommended to maintain sight distance.	13%/14%	3	2
Access to 3233-3611 E. Lake Sammamish Shore Lane SE via SE 33rd Street	281+30.00	15	Yes (All)	80	Vegetation management recommended to maintain sight distance. Equestrian Trail. Sign in conjunction with another driveway.	9%/10%	4/6	1
	281+30.00		Yes (All)	0	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with another driveway. Vegetation management recommended to maintain sight distance (north and south). Regrade berm.	20%/2%	5/6	2
Pedestrian Access path	286+80.00	0	Yes (NW, SW)	0	Pedestrian Access path to waterfront. Connects to trail	20%/2%	N/A	N/A
Access to shed along E. Lake Sammamish Parkway	294+00.00	1	Yes (NW)	5	Private property impacts. Cut shrubs north.	2%/2%	6/5	4
Access to 3131 E Lake Sammamish Parkway SE	295+30.00	1	Yes (NW)	5	Private property impacts. Cut shrubs north of driveway and natural trees.	10%/2%	6/5	4

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 3115-3167 E. Lake Sammamish Shore Lane SE and 3003-3027 E Lake Sammamish Parkway	297+10.00	12	Yes (SE)	110	Trail delineation needed. Equestian trail. Sign in conjuction with another driveway.	2%15%	3/6	1
	299+75.00	14	Yes (SE)	5	Bicycle/Pedestrian Path adjacent to roadway. Sign in conjuction with #16.	16%/2%	6/7	3
Access to 2903 E Lake Sammamish Parkway	301+70.00	1	Yes (NW,SW,NE)	5	Bicycle/Pedestrian Path adjacent to roadway. Cut vegetation north and south	15%/2%	6/5	2
Access to 2931-2933 E Lake Sammamish Parkway	303+20.00	4	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Cut deciduous shrubs north, cut natural vegetation south, move pole (south).	18%/2%	6/5	3
Access to 2819-2821 E Lake Sammamish Parkway	306+80.00	2	Yes (NW)	5	Bicycle/Pedestrian Path adjacent to roadway. Reconfigue Driveway.	18%/2%	6/5	3
Access to 2819-2821 E Lake Sammamish Parkway	307+20.00	2	Yes (SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Move pole (south), cut trees south.	18%/2%	6/5	3
Access to 2811-2815 E Lake Sammamish Parkway	307+45.00	2	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway.	18%/2%	6/5	3
Access to 2805 E Lake Sammamish Parkway	308+35.00	1	Yes (NW)	5	Bicycle/Pedestrian Path adjacent to roadway. Cut shrubs north.	18%/2%	6/5	3
Access to 2801 E Lake Sammamish Parkway	308+80.00	2	Yes (NW)	5	Bicycle/Pedestrian Path adjacent to roadway. Move pole (north)	5%/2%	6/5	1
Access to ???? E Lake Sammamish Parkway	309+40.00	1	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway.	5%/2%	6/5	1
Access to 2713-2717 E Lake Sammamish Parkway	309+85.00	2	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Reconfigue Driveway. Cut trees north, cut shrubs south.	18%/2%	6/5	3
Access to 2701 E Lake Sammamish Parkway	311+90.00	1	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Reconfigue Driveway. Steep grade cut trees south, move pole/ add wall south.	10%/2%	6/5	2
Access to 2623 E Lake Sammamish Parkway	313+35.00	1	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Cut trees north and south.	10%/2%	6/5	2
Access to 2617 E Lake Sammamish Parkway	315+74.00	1	Yes (NW,SW)	5	Bicycle/Pedestrian Path adjacent to roadway. Cut big trees north, cut shrubs south, move pole that is (north).	20%/2%	6/5	3
Access to 2503-2607 E. Lake Sammamish Shore Lane SE	319+45.00	8 (west side)	Yes (NE, NW, SE)	450	Some vegetation management recommended to maintain sight distance. Trail delineation needed. Slope embankment on the northeast corner might be a sight obstruction. Equestian Trail.	2%/10%	4/6	1
SE 26th Street	316+80.00	16	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut trees north and south. Private property impacts.	18%/2%	6/7	3
Access to 2405-2423 E. Lake Sammamish Place SE	322+00.00	2	Yes (NW)	15	Bicycle/Pedestrian Path adjacent to roadway. Grade huge 10' berm (north), remove decorative trees.	18%/2%	6/7	3
	324+70.00	1	Yes (NE, SE)	500	Some vegetation management recommended to maintain sight distance on east side of railroad. Slope embankment on the southeast corner might be a sight obstruction. Equestrian Trail	11%/11%	3/6	1
Access to 2405-2407 E Lake Sammamish Place	322+60.00	2	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut big evergreen, move pole, grade huge berm (10' high).	2%/2%	6/5	1
Access to 2401 E Lake Sammamish Place	323+75.00	1	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut trees south.	20%/2%	6/5	3
Access to 2331 E Lake Sammamish Place	324+30.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts.	13%/2%	6/5	4
Access to 2221-2325 E Lake Sammamish Place	324+80.00	5	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Very steep driveway, cut vegetation north.	20%/2%	6/5	3
Access to 2133 E Lake Sammamish Place SE	331+50.00	1	Yes (SW)	350	Circular driveway for one house. Two crossing points with trail. One should be eliminated. Driveway reconfiguration might be needed. Vegetation management is recommended at SW corner.	2%/2%	6/7	2
Access to 2133 E Lake Sammamish Place SE	332+50.00	1	Yes (NW, SW)	350	Potential to combine with another driveway.	2%/2%	6/5	2
Access to 2101-2127 E Lake Sammamish Place	333+10.00	5	Yes (NW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut deciduous shrubs north and grade berm.	8%/2%	6/5	1

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 2111 E Lake Sammamish Place	334+10.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Driveway Eliminated. House may remain. Private property impacts. Cut deciduous trees north and south.	10%/2%	6/5	4
Access to 2101 E Lake Sammamish Place	335+20.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts. Cut trees north and south.	20%/2%	6/5	4
Access to 2021 E Lake Sammamish Place	337+10.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Adjust driveway, cut big evergreen north, move mailboxes, cut shrubs.	14%/2%	6/5	3
Access to 2011 E Lake Sammamish Place	338+35.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts. Grade berm north, cut deciduous trees south.	15%/2%	6/5	4
Access to 2005 E. Lake Sammamish Place SE	339+00.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut big evergreen south of drive, cut decorative tree hedge and decorative shrubs.	8%/2%	6/7	2
	334+65.00		None	620 to E Lake Samm Pl SE	Good sight distance. Equestrian trail.	2%/3%	4/6	1
Access to 1901-1919 E Lake Sammamish Place	343+60.00	4	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut deciduous trees north and south, move poles north of drive. Private property impacts.	20%/2%	6/7	3
Access to 1817 E Lake Sammamish Place	344+70.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut natural trees north and south.	12%/2%	6/5	3
Access to 1809 E Lake Sammamish Place	345+10.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts. Cut natural trees north and south.	12%/2%	6/5	4
Access to 1801 E Lake Sammamish Place	345+85.00	1	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. North drive okay, cut deciduous shrubs to south, move pole to south.	25%/2%	6/5	3
Access to 1801 E Lake Sammamish Place	346+60.00	1	Yes (SW,NW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts. Cut trees both north and south, move light posts.	25%/2%	6/5	4
Access to 1721 E Lake Sammamish Place	347+40.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Private property impacts. Remove pole, remove deciduous tree to north, grade berm, remove natural vegetation to the south.	20%/2%	6/5	4
Access to 1721 E Lake Sammamish Place	348+45.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Grade berm to north, cut vegetation, remove big evergreen tree. Grade berm in the middle, remove pole.	15%/2%	6/5	4
Access to 1711 E Lake Sammamish Place	348+70.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Grade berm to north, cut vegetation, remove big evergreen tree. Grade berm in the middle, remove pole.	12%/2%	6/5	3
Access to 1705 E Lake Sammamish Place	350+00.00	1	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Remove telephone pole to the south.	16%/2%	6/5	3
Access to 1619 -1635 E. Lake Sammamish Place SE	351+20.00	4	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut natural vegetation, move utility pole and mailboxes.	16%/2%	6/7	3
	351+20.00	3	Yes (NE, SE)	180 to E Lake Samm Pl SE	Stop sign needed for autos due to poor sight distance east of the railroad. Vehicles will need to drive on trail to access driveways. Slope embankment on the southeast corner might be a sight obstruction. Connects to Equestrian Trail	8%/12%	3/6	1
Access to 1605 -1603 E Lake Sammamish Place	354+60.00	2	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Reconfigue Driveway. Cut natural vegetation north and south, move telephone pole.	10%/2%	6/5	3
Access to 1427 E Lake Sammamish Parkway	358+40.00	1	Yes (NW)	15	Bicycle/Pedestrian Path adjacent to roadway. Move flag pole, remove entrance light poles.	6%/2%	6/5	2
Access to 1407 E Lake Sammamish Parkway	359+70.00	1	Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Reconfigue Driveway. Private property impacts. Cut trees and vegetation north and south of driveway.	14%/2%	6/5	4
Access to 1200-1499 E. Lake Sammamish Shore Lane SE	368+60	20	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Grade berm on south side of driveway, remove evergreen trees south.	18%/2%	5/6	1
Access to 800-999 E. Lake Sammamish Shore Lane SE	375+20.00	13	Yes (SW, NW)	70	Existing trees on southwest corner may be removed. Large tree on northwest corner needs to be trimmed. Connects to Equestrian Trail	2%/10%	4/6	1
	375+20.00		Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut vegetation both north and south.	10%/2%	5/6	2
Access to 645-659 E. Lake Sammamish Parkway SE	381+75.00	5	Yes (NE, SE)	65	Some vegetation management recommended to maintain sight distance. Cut vegetation both north and south. Move utility pole south of driveway	5%/9%	4	1
Access to 477-485 E. Lake Sammamish Parkway SE	386+85.00	2	Yes (All)	65	Some vegetation management recommended to maintain sight distance. Bushes need to be removed and trees trimmed. Connects to Equestrian Trail	9%/9%	6/7	1
	386+90.00		Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut vegetation both north and south.	13%/2%	4/6/7	2

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 467 E. Lake Sammamish Parkway SE	388+35.00	1	Yes (SW, SE, NE)	65	Some vegetation management and grading recommended to maintain sight distance. Slope embankment on northeast corner might be a sight obstruction.	4%/15%	4/6	1
	388+50.00	1	Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut vegetation south.	20%/2%	5/6	2
Access to 447-457 E. Lake Sammamish Parkway SE	389+80.00	2	Yes (NE, SE, SW)	65	Some vegetation management and grading recommended to improve sight distance. Slope embankment on northeast and southeast corners may be sight obstructions. Connects to Equestrian Trail	4%/15%	4/6/7	1
	388+90.00		Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Some vegetation management recommended to maintain sight distance, north and south.	20%/2%	5/6	2
Access to 425-439 E. Lake Sammamish Parkway SE	392+35.00	5	Yes (NW, NE, SE)	65	Some vegetation management recommended to maintain sight distance. Storage shed on the northeast corner may be a sight obstruction. Connects to Equestrian Trail	4%/15%	4/6/7	1
	392+35.00		Yes (NW,SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Some vegetation management recommended to maintain sight distance, north and south.	20%/2%	6/7	2
Access to 303-407 E. Lake Sammamish Parkway SE	395+70.00	2	Yes (NW, SW)	50	Some vegetation management recommended to maintain sight distance. Slope embankment on the southwest corner may be a sight obstruction. Connects to Equestrian Trail	2%/4%	4/6	1
	395+70.00		Yes (SW)	15	Bicycle/Pedestrian Path adjacent to roadway. Cut big evergreen tree south of drive move utility pole south of drive. North corner is ok.	4%/2%	6/5	2
Access to 185 - 251 E. Lake Sammamish Parkway SE	399+90.00	7	Yes (SW, NW, NE)	50	Some vegetation management recommended to maintain sight distance (north and south). Move mailboxes.	12%/2%	3/4	2
Access to 159-181 E. Lake Sammamish Parkway SE	404+80.00	4	Yes (NW, NE, SE)	50	Some vegetation management recommended to maintain sight distance. Hedges to be trimmed. Move util pole south of driveway.	16%/4%	3/4	2
Access to 135-145 E. Lake Sammamish Parkway SE	407+65.00	4	Yes (NE, SE)	50	Some vegetation management is recommended to maintain sight distance.	3%/3%	4	1
Access to 125-129 E. Lake Sammamish Parkway NE and 125 E. Lake Sammamish Parkway SE	409+75.00	6	Yes (NW, SW)	50	Some vegetation management is recommended to maintain sight distance. Existing driveway is gravel. A storage shed is located at the northeast corner, 50 ft from driveway, and may need to be removed.	4%/5%	4	1
Access to 101-273 E. Lake Sammamish Shore Lane NE	415+35.00	26 to 33	Yes (NE, SW)	40	Some vegetation management is recommended to maintain sight distance. Sign board on the northeast corner may be a sight obstruction.	5%/2%	5/6	1
	415+35.00		None	15	Connects to ped/biketrail.	2%/2%	4/6	1
Access to 425-667 E. Lake Sammamish Shore Lane NE	435+05.00	16 to 24	Yes (All)	50	Some vegetation management is recommended to maintain sight distance. Slope embankment on northeast corner may be a sight obstruction. Connects to Equestrian Trail	6%/15%	3/6/7	1
	435+65.00		Yes (NW, SW, NE)	15	Connects to ped/bike trail. Reconfigure Driveway. Some vegetation management is recommended to maintain sight distance. Slope embankment on northeast corner may be a sight obstruction. Cut vegetation north and south.	15%/2%	6/7	3
	440+20.00		Yes (NW, SW)	15	Connects to ped/biketrail. Reconfigure driveway. Some vegetation management is recommended to maintain sight distance, cut vegetation north and south.	15%/2%	3/6	3
	440+80.00		Yes (NW)	50	Some vegetation management is recommended to maintain sight distance.Connects to equestrian trail.	3%/9%	5/6	1
New Access to 669-843 E. Lake Sammamish Shore Lane NE	442+65.00	5	None	15	New Driveway access and joined with another driveway.	33%/2%	6/5	3
	444+25.00		None	15	Driveway removed and combined with another driveway.	10%/10%	N/A	N/A
	445+75.00		None	15	Driveway combined with another driveway.	11%/2%	6/5	3
Access to 845-1121 Sammamish Shore Lane NE	446+80.00	6	Yes (NW, SW)	15	Reconstructed driveway. Combined with another driveway.	2%/25%	6/5	3
	448+40.00		Yes (NW, SW)	15	Driveway removed and combined with another driveway.	13%/2%	N/A	N/A
	455+65.00		Yes (NW, SW)	15	Reconstructed driveway. Combined with another driveway.	15%/2%	6/5	3
Access to 1123-1155 E. Lake Sammamish Parkway NE	456+55.00	2	Yes (NW, SW)	80	Trail delineation required to separate trail from driveway. Vegetation management recommended on the west side of trail. Connects to Equestrian Trail	14%/20%	4/6	2
	457+65.00		Yes (NW, SW)	15	Connects to ped/biketrail. Reconfigure driveway. Vegetation management recommended on the north and south of drive.	20%/2%	6/7	3
Pedestrian Access path	459+05.00	0	N/A	200	Pedestrian Access path to waterfront. Connects to Equestian trail.	2%/20%	N/A	N/A
	460+45.00	0	Yes (NW,SW)	15	Pedestrian Access path to waterfront. Adjust path. Connects to ped/biketrail. Cut vegetation north and south.	20%/2%	N/A	N/A
Access to 1??? E. Lake Sammamish Parkway NE	466+20.00	1	N/A		Private property impacts.	12%/2%	5	4

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Recreational access	469+20.00	0	Yes (NE, SE)	160	Gated entry to recreational property. Trail delineation recommended. Vegetation management on the east side of trail recommended. Connects to Equestrian Trail	7%/20%	3/6	1
	469+10.00		Yes (NW, SW)	15	Connects to ped/biketrail. Vegetation management on the north and south side of trail recommended. Move utility pole north side of driveway.	20%/2%	6/7	3
Access to 1??? E. Lake Sammamish Parkway NE	470+30.00	1	Yes (NW, SW)	15	Shared driveway. Reconfigure driveway. Cut natural vegetation house is very close.	4%/4%	6/5	2
Access to 1??? E. Lake Sammamish Parkway NE	471+40.00	1	Yes (NW, SW)	15	Shared driveway. Reconfigure driveway. Private property impacts.	4%/4%	6/5	4
Access to 1629 E. Lake Sammamish Parkway NE	471+80.00	1	Yes (All)	320	Vegetation management on all corners (especially north) is recommended to maintain sight distance. Equestrian Trail connection	14%/10%	4/6/7	1
	471+95.00	1	Yes (NW, SW)	15	Shared driveway. Reconfigure driveway.	12%/4%	6/5	2
Access to 16?? E. Lake Sammamish Parkway NE	472+20.00	1	Yes (NW, SW)	15	Private property impacts.	10%/4%	6/5	4
Access to 1707 E. Lake Sammamish Parkway NE	473+00.00	1	Yes (NW, SW)	15	Shared driveway. Reconfigure driveway. Connect to trail at parkway.	15%/2%	6/5	3
	473+65.00	1	Yes (NE, SE)	300	Skewed crossing. If westbound approach is realigned, should consider regarding eastbound approach to maintain existing driveway grade. Some vegetation management is recommended to maintain sight distance. Equestrian trail connection	20%/8%	3/6	1
Access to 1703 E. Lake Sammamish Parkway NE	473+70.00	1	Yes (NW, SW)	15	Private property impacts.	10%/2%	N/A	4
Access to 1717-1723 E. Lake Sammamish Parkway NE	474+50.00	2	Yes (NE, SW, SE)	190	Some vegetation management is recommended to maintain sight distance. Existing rockery on the southeast corner blocking sight lines. Consider stopping or slowing bicycles due to poor sight lines. Equestrian trail crossing.	20%/8%	4/6/7	1
	474+55.00	2	N/A		Reconfigured driveway.	12%/2%	5/6	3
	474+80.00	2	N/A		Driveway combined with another driveway.	12%/2%	N/A	N/A
Access to 1805-1827 E. Lake Sammamish Parkway NE	475+20.00		N/A		Driveway combined with another driveway.	8%/2%	N/A	N/A
Access to 1805 E. Lake Sammamish Parkway NE	476+70.00	1	Yes (SW, NW, SE)	280	Some vegetation management is recommended to maintain sight distance. Equestrian Trail Crossing.	13%/20%	3/4/6	1
Access to 1815-1827 E. Lake Sammamish Parkway NE	478+25.00	2	Yes (NW, SW)	350	Some vegetation management is recommended to maintain sight distance. Trail delineation needed. Equestrain trail crossing. Driveway consolidated with another driveway.	10%/10%	3/4/6	1
Access to 1841 E. Lake Sammamish Parkway NE	479+65.00	1	Yes (SW)	50	Some vegetation management is recommended to maintain sight distance. Trail delineation needed. Driveway eliminated at this location and consolidated with another driveway.	13%/2%	N/A	N/A
Access to 2007-2033 E. Lake Sammamish Parkway NE	485+45.00	3	Yes (SE)	160	Steep grade on eastbound approach. Some vegetation management is recommended to maintain sight distance.	6%/25%	3	3
Access to recreational property	489+25.00	2 boat launches	Yes (NE)	170	Steep grade on westbound approach, vegetation management required to improve sight distance.	25%/25%	3	3
New Access to Recreational Property for #50.	491+55.00	N/A	N/A	125	N/A	2%/2%	3	3
Old Access to Recreational Property. See #49	492+25.00	N/A	N/A	85	N/A	2%/20%	N/A	N/A
Access to 2533 E. Lake Sammamish Parkway NE and recreational property	498+55.00	1	Yes (NW, SW)	60	Gravel access is chained. Driveway adjusted to enter from the north instead of south. Driveway consolidated with other driveways.	10%/8%	3	3
Access to 2629-2813 E. Lake Sammamish Parkway NE	511+80.00	3	None	60	Trail offset from rail bed. Access road will be adjacent to homes instead of the trail. Driveway removed and consolidated with another driveway.	8%/12%	N/A	N/A
	512+45.00		N/A	18	Driveway removed and consolidated with another.	12%/12%	N/A	3
Access to 2825 E. Lake Sammamish Parkway NE	512+95.00	1	Yes (NE)	60	Limited sight distance and steep grade on Eastbound side. Some vegetation management is recommended to maintain sight distance.	20%/20%	3	3
Access to 2831 E. Lake Sammamish Parkway NE	514+75.00	1	Yes (NW, SW, NE)	60	Steep slope and rock wall on southeast corner may obstruct sight lines. Some vegetation management is recommended to maintain sight distance.	12%/12%	3	2

Roadway/Driveway Location/Address	Station	No. of Homes Using Driveway	Deficient Sight Corners	Trail Intersection - Distance From Parkway (ft)	Comments	Existing Grades WB/EB Approaches	Crossing Type	Difficulty
Access to 2841E. Lake Sammamish Parkway NE	517+50.00	1	None	140	Two interconnected driveways. Trail delineation needed. Retaining wall at southeast corner may be a sight obstruction. Some vegetation management is recommended to maintain sight distance.	16%/10%	3	2
Access to 2848-2927 E. Lake Sammamish Parkway NE	518+40.00	2	None	250	Two interconnected driveways. Trail delineation needed. Retaining wall at southeast corner may be a sight obstruction. Some vegetation management is recommended to maintain sight distance.	12%/12%	3	2
Access to 3103 & 3113 E. Lake Sammamish Parkway NE	525+30.00	2	Yes (SE, NE, SW)	140	Limited sight distance on westbound approach. Vegetation management required to improve/maintain sight distance.	12%/12%	3	2
Access to 3123 E. Lake Sammamish Parkway NE	528+20.00	1	Yes (All, especially SW)	120	Vegetation management required to improve/maintain sight distance.	8%/10%	3	2
Access near NE 33rd PL	533+70.00	0	Yes (SE)	50	Access to existing grass/gravel driveway is blocked by fence. Parked boats are on trail ROW.	4%/4%	3	2
Access to 3417-3629 E. Lake Sammamish Shore Lane NE	544+95.00	29	Yes (SE, NW, SW)	120,180	Vegetation management required to improve/maintain sight distance.	8%/10%	3	1
Access to 3665-3835 E. Lake Sammamish Parkway NE	551+15.00	5 to 6	Yes (NW, SW)	15	Connects to bike/ped trail. Vegetation management north and south of driveway.	8%/20%	5	3
	551+25.00		Yes (NW, NE)	40	Very little room is available in the trail crossing area. Need to clearly mark for trail ROW. Vegetation management and trail delineation needed. Equestrian trail connection.	20%/2%	3	1
Recreational access	566+75.00		None			10%/10%	N/A	N/A
Access to 3840-3931 E. Lake Sammamish Parkway NE	568+70.00	3	Yes (NE)	240	Access road parallel and adjacent to rail bed ROW. Vehicles from ELS Parkway currently either drive on the access road or rail bed to access to the several residences south of the crossing. Trail delineation needed.	2%/30%	3	3
Access to recreational property	575+60.00	0	Yes (SW, NE)	300	Some vegetation management recommended to maintain sight distance. Existing grass/gravel access road is chained.	20%/12%	3	2
Access to 5011 E. Lake Sammamish Parkway NE	596+05.00	1	Yes (NW, SW, NE)	150	Some vegetation management recommended to maintain sight distance.	12%/15%	3	2
Access to 20-27 (180th Pl. NE)	632+40.00	3 to 4	Yes (NE, NW)	60	Trail is close to Pkwy. Extra warning sign or stop signs for fast-moving traffic from Pkwy needed. Some vegetation management recommended to maintain sight distance.	2%/2%	4	1
NE 65th Street Crossing	639+45.00	N/A	None	170	Move recycle bin (NE corner) to improve sight distance. Trail delineation needed.	2%/5%	1	1
NE 70th Street Crossing	655+95.00	N/A	Yes (NW, NE)	620 from Redmond Way	Consider trail crossing signal. Some vegetation management needed to improve sight distance. Trail delineation needed.	2%/2%	2	1
EB SR520 Off Ramp to SB Redmond Way Crossing	665+55.00	0	Yes	40 from Redmond Way	Trail brought up to the intersection of the existing SR-520 off-ramp and keyed in with the signal at the intersection.	2%/2%	1	1
WB SR520 On Ramp Crossing	670+95.00	0	Yes	10 from Redmond Way	Trail brought up to the intersection of the existing SR-520 on-ramp and keyed in with the signal at the intersection.	2%/2%	1	1

Appendix H – Historic, Cultural and Archaeological Resources

East Lake Sammamish Master Plan Trail Historic, Cultural, and Archaeological Resources

Prepared for

King County Facilities Management Division

Prepared by

Paragon Associates
7352 – 20th Avenue Nw
Seattle, WA 98117

October 2006

TABLE OF CONTENTS

Table H-1. Cultural and Historic Resources Identified within 1 Mile of Project

JURISDICTION	SITE NUMBER/NAME	SITE TYPE	STATUS
All	45-KI-451	Seattle, Lake Shore & Eastern Railway grade	Not eligible to NRHP
Redmond	45-KI-8	Presumed occupation	Probably destroyed
Redmond	45-KI-9/Marymoor Site	Prehistoric occupation	Listed NRHP 1970
Redmond	45-KI-10	Presumed occupation	Not eligible to NRHP
Redmond	45-KI-190H/Justice Wm. White House	Historic residence/estate	Eligible to NRHP
Redmond	45-KI-191H/Clise Mansion	Historic residence/estate	Listed NRHP 1973
Redmond	45-KI-192H/Dutch Windmill	Dutch reproduction windmill	Listed SRHP 1973
Redmond	45-KI-196H Yellowstone/Red Brick Road	Historic road	Listed NRHP 1974
Redmond	45-KI-266	Possible prehistoric camp	Destroyed
Redmond	45-KI-466/Bear-Evans Creek Site	Prehistoric camp/historic roadbed	Not eligible to NRHP
Redmond	45-KI-467/Union Hill Road Site	Prehistoric/historic scatter	Destroyed
Redmond	45-KI-492	Prehistoric camp	Presumed eligible
Redmond	45-KI-493	Prehistoric camp	Presumed eligible
Redmond	HRI 523/Campbell Mill Boarding House	Historic boarding house, ca. 1910	Extant
Sammamish	45-KI-488/Monohon	Prehistoric/historic scatter	Not eligible to NRHP
Sammamish	HRI 170/Thomas Alexander House	Historic residence, ca. 1902	House moved
Sammamish	HRI 507/W.D. Norman Place/Raab Residence	Homestead/Historic farm, ca. 1906	Demolished
Sammamish	HRI 513/John Weber House	Historic residence, ca. 1895	Altered/lost
Sammamish	HRI 514/Quackenbush House	Historic residence, ca. 1905	Altered/lost
Sammamish	HRI 515/Old Weber Point Water Tank	Water Tank	Location unconfirmed
Sammamish	HRI 516/ Sanford House	Historic residence, ca. 1907	Locally significant
Sammamish	HRI 517/Murphy House	Historic residence, ca. 1914	Altered/lost
Sammamish	HRI 518/McNally House	Historic residence, ca. 1906	Altered/lost
Sammamish	HRI 777/Matt Mattila Farm	Multi-Use Farm, ca. 1920s	Extant
Issaquah	45-KI-142H/Pickering Farm	Historic dairy farm	Listed NRHP 1983
Issaquah	45-KI-452H	Concrete reservoir features	Not eligible to NRHP
Issaquah	45-KI-453H	Concrete foundation	Not eligible to NRHP
Issaquah	45-KI-457	Prehistoric lithic scatter	Not eligible to NRHP
Issaquah	HRI 168/Tibbetts House	Historic residence, pre 1900	Demolished

NRHP: National Register of Historic Places
SRHP: State Register of Historic Places
HRI: King County Historic Resource Inventory

Washington State Department of Transportation
Douglas B. MacDonald
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

June 29, 2005

Dr. Allyson Brooks
Office of Archaeology and Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

King County
East Lake Sammamish Trail
Cultural Resources Inquiry
Federal Aid # STPE-2017(045)
OAHP Log # 113000-10-KI

Dear Dr. Brooks:

King County proposes to construct a paved recreation trail atop the former Burlington Northern Railroad bed. This project is located in:

- **Sections 6, 7, 8, 16, 17, 21, & 28 of Township 24N, Range 6E**
- **Sections 1, 2, 11, 12 & 13 of Township 25N, Range 5E**
- **Sections 7, 8, 17, 18, 19, 20, 29, & 32 of Township 25N, Range 6E**

This project is located along the eastern shore of Lake Sammamish extending from Marymoor Park in Redmond to the city of Issaquah. The project is approximately 11 miles long. Please review the attached additional information included within this packet.

The trail will be constructed upon the former Burlington Northern Railroad bed. Parking and restroom facilities are included within the plan as well. The trail will accommodate pedestrian, bicycle, and equestrian users. A separate soft surface will parallel the paved trail for the equestrian use. The paved trail will be on average 27 feet wide with some areas narrowing to 18 feet. An interim trail is now in use within the proposed footprint and has been determined ineligible for the National Register due to its lack of integrity. Because of its close proximity to Lake Sammamish, unknown cultural resources may be present and this consideration has been recognized since the interim trail has been in use.

Pursuant to compliance with Section 106 of the National Historic Preservation Act and 36 CFR 800, we hereby initiate on the behalf of the Federal Highway Administration consultation for this project. We invite you to comment on the project's Area of Potential Effect (APE). We have included a series of diagramed maps laying out the APE, which run the length of the trail. Staging is expected to take place through out the length of the trail at various locations along the trail route.

The Department initiated consultation with the Muckleshoot, Snoqualmie and Tulalip Tribes on June 29, 2005. Please contact me at (360) 705-6975 if you have any questions.

Sincerely,

Trevin Taylor
Environmental Engineer
Highways & Local Programs Division

TMT:ac
Enclosures
cc: Ed Conyers, Northwest Region Local Programs, and MS NB82-121
Jim Leonard, FHWA, MS 40943
Sandie Turner, ESO Cultural Affairs, MS 47332
Mark Melroy, King County Road Services Division

Washington State Department of Transportation
Douglas B. MacDonald
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

June 29, 2005

Mr. Tim Brewer
Cultural Resource Specialist
Tulalip Tribe
6700 Totem Beach Road
Marysville, WA 98270-9715

King County
East Lake Sammamish Trail
Cultural Resources Inquiry
Federal Aid # STPE-2017(045)
OAHP Log # 113000-10-KI

Dear Mr. Brewer:

King County proposes to construct a paved recreation trail atop the former Burlington Northern Railroad bed. This project is located in:

- **Sections 6, 7, 8, 16, 17, 21, & 28 of Township 24N, Range 6E**
- **Sections 1, 2, 11, 12 & 13 of Township 25N, Range 5E**
- **Sections 7, 8, 17, 18, 19, 20, 29, & 32 of Township 25N, Range 6E**

This project is located along the eastern shore of Lake Sammamish extending from Marymoor Park in Redmond to the city of Issaquah. The project is approximately 11 miles long.

The trail will be constructed upon the former Burlington Northern Railroad bed. Parking and restroom facilities are included within the plan as well. The trail will accommodate pedestrian, bicycle, and equestrian users. A separate soft surface will parallel the paved trail for the equestrian use. The paved trail will be on average 27 feet wide with some areas narrowing to 18 feet. An interim trail is now in use within the proposed footprint and has been determined ineligible for the National Register due to its lack of integrity. Because of its close proximity to Lake Sammamish, unknown cultural resources may be present and this consideration has been recognized since the interim trail has been in use.

Your response to this letter, acknowledging your interest in this undertaking as a consulting party and identifying key tribal contacts, is appreciated. Please provide a response by **August 4, 2005** so we may discuss this undertaking, the Area of Potential Effect (APE), and identify any Traditional Cultural Properties. A request for assistance in defining the APE and identifying any cultural and/or historic properties within the proposed APE was sent to the Office of Archaeology and Historic Preservation on June 29, 2005. Please contact me at (360) 705-6975 if you have any questions.

Sincerely,

Trevin Taylor
Environmental Engineer
Highways & Local Programs Division

TMT:ac

cc: Ed Conyers, NW Region Local Programs, and MS NB82-121
Jim Leonard, FHWA, MS 40943
Sandie Turner, ESO Cultural Affairs, MS 47332
Mark Melroy, King County Road Services Division

Washington State Department of Transportation
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Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

June 29, 2005

Mr. Kellie Kvasnikoff
Snoqualmie Tribe of Indians
P. O. Box 280
Carnation, WA 98014-0280

King County
East Lake Sammamish Trail
Cultural Resources Inquiry
Federal Aid # STPE-2017(045)
OAHP Log # 113000-10-KI

Dear Mr. Kvasnikoff:

King County proposes to construct a paved recreation trail atop the former Burlington Northern Railroad bed. This project is located in:

- **Sections 6, 7, 8, 16, 17, 21, & 28 of Township 24N, Range 6E**
- **Sections 1, 2, 11, 12 & 13 of Township 25N, Range 5E**
- **Sections 7, 8, 17, 18, 19, 20, 29, & 32 of Township 25N, Range 6E**

This project is located along the eastern shore of Lake Sammamish extending from Marymoor Park in Redmond to the city of Issaquah. The project is approximately 11 miles long.

The trail will be constructed upon the former Burlington Northern Railroad bed. Parking and restroom facilities are included within the plan as well. The trail will accommodate pedestrian, bicycle, and equestrian users. A separate soft surface will parallel the paved trail for the equestrian use. The paved trail will be on average 27 feet wide with some areas narrowing to 18 feet. An interim trail is now in use within the proposed footprint and has been determined ineligible for the National Register due to its lack of integrity. Because of its close proximity to Lake Sammamish, unknown cultural resources may be present and this consideration has been recognized since the interim trail has been in use.

Your response to this letter, acknowledging your interest in this undertaking as a consulting party and identifying key tribal contacts, is appreciated. Please provide a response by **August 4, 2005** so we may discuss this undertaking, the Area of Potential Effect (APE), and identify any Traditional Cultural Properties. A request for assistance in defining the APE and identifying any cultural and/or historic properties within the proposed APE was sent to the Office of Archaeology and Historic Preservation on June 29, 2005. Please contact me at (360) 705-6975 if you have any questions.

Sincerely,

Trevin Taylor
Environmental Engineer
Highways & Local Programs Division

TMT:ac

cc: Ed Conyers, NW Region Local Programs, and MS NB82-121
Jim Leonard, FHWA, MS 40943
Sandie Turner, ESO Cultural Affairs, MS 47332
Mark Melroy, King County Road Services Division

Washington State Department of Transportation
Douglas B. MacDonald
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

June 29, 2005

Ms. Laura Murphy
Cultural Resource Specialist
Muckleshoot Tribe
39015 172nd Avenue SE
Auburn, WA 98092-9763

King County
East Lake Sammamish Trail
Cultural Resources Inquiry
Federal Aid # STPE-2017(045)
OAHP Log # 113000-10-KI

Dear Ms. Murphy:

King County proposes to construct a paved recreation trail atop the former Burlington Northern Railroad bed. This project is located in:

- **Sections 6, 7, 8, 16, 17, 21, & 28 of Township 24N, Range 6E**
- **Sections 1, 2, 11, 12 & 13 of Township 25N, Range 5E**
- **Sections 7, 8, 17, 18, 19, 20, 29, & 32 of Township 25N, Range 6E**

This project is located along the eastern shore of Lake Sammamish extending from Marymoor Park in Redmond to the city of Issaquah. The project is approximately 11 miles long.

The trail will be constructed upon the former Burlington Northern Railroad bed. Parking and restroom facilities are included within the plan as well. The trail will accommodate pedestrian, bicycle, and equestrian users. A separate soft surface will parallel the paved trail for the equestrian use. The paved trail will be on average 27 feet wide with some areas narrowing to 18 feet. An interim trail is now in use within the proposed footprint and has been determined ineligible for the National Register due to its lack of integrity. Because of its close proximity to Lake Sammamish, unknown cultural resources may be present and this consideration has been recognized since the interim trail has been in use.

Your response to this letter, acknowledging your interest in this undertaking as a consulting party and identifying key tribal contacts, is appreciated. Please provide a response by **August 4, 2005** so we may discuss this undertaking, the Area of Potential Effect (APE), and identify any Traditional Cultural Properties. A request for assistance in defining the APE and identifying any cultural and/or historic properties within the proposed APE was sent to the Office of Archaeology and Historic Preservation on June 29, 2005. Please contact me at (360) 705-6975 if you have any questions.

Sincerely,

Trevin Taylor
Environmental Engineer
Highways & Local Programs Division

TMT:ac
cc: Ed Conyers, NW Region Local Programs, and MS NB82-121
Jim Leonard, FHWA, MS 40943
Sandie Turner, ESO Cultural Affairs, MS 47332
Mark Melroy, King County Road Services Division

STATE OF WASHINGTON

Office of Archaeology and Historic Preservation

1063 S. Capitol Way, Suite 106 • PO Box 48343 • Olympia, Washington 98504-8343 • (360) 586-3065
Fax Number (360) 586-3067 • http://www.oahp.wa.gov

July 6, 2005

Mr. Trevin Taylor.
Highways & Local Programs
Department of Transportation
Transportation Building
PO Box 47300
Olympia, Washington 98504-7300

Highways & Local Programs
RECEIVED
JUL 07 2005
OLYMPIA, WA

Log No.: 070605-10-FHWA
Re: East Lake Sammamish Trail Project
Federal Aid Number: STPE-2017(045)

Dear Mr. Taylor:

Thank you for contacting our office. We have reviewed the materials for the proposed East Lake Sammamish Trail Project in King County, Washington. Thank you for your description of the Area of Potential Effect (APE). We concur with your definition of the Area of Potential Effect. We look forward to the results of your consultation with the concerned tribes and receiving the survey report.

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer for compliance with Section 106 of the National Historic Preservation Act and its implementing regulations 36CFR800. We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4). If the APE changes please notify our office and assure the new APE is surveyed for cultural resources.

Should additional information become available, our assessment may be revised. In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and the tribe's cultural committee and this office notified. Thank you for the opportunity to comment.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 586-3080
email: robw@cted.wa.gov

ADMINISTRED BY THE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT fish & wildlife resource survey

THE TULALIP TRIBES

Cultural Resources Department
x̌alal?tx̌
6410 - 23rd Avenue N.E.
Tulalip, WA 98271-9694
(360) 651-3300
FAX (360) 651-3312

The Tulalip Tribes are the successors in interest to the Snohomish, Snoqualmie, and Skykomish tribes and other tribes and band signatory to the Treaty of Point Elliott

July 12, 2005

Washington State Department of Transportation
Trevin Taylor, Environmental Engineer
310 Maple Park Avenue S.E.
P.O.B. 47300
Olympia, WA 98504-7300

Highways & Local Programs
RECEIVED
JUL 14 2005
OLYMPIA, WA

King County
East Lake Sammamish Trail
Cultural Resources Inquiry
FED AID #STPE-2017 (045)
OAHP Log 113000-10-KI

Dear Trevin:

This letter is in response to your letter regarding the above referenced project(s). The Tulalip Tribes are successors to the Snohomish, Skykomish, Snoqualmie and other tribes and bands signatory to the 1855 Treaty of Point Elliott. The project is located within the aboriginal or "Usual and Accustomed" use territory of the Tulalip people. The Tulalip Tribes has continuously used its aboriginal lands and waters for fishing, hunting, gathering and ceremonial purposes.

The project should be fully evaluated against relevant data bases for potential archaeological and cultural resources in the area effected by the project. Where projects are located near shorelines or where data indicates a likelihood of cultural resources in the area, a cultural resources survey should be conducted prior to construction.

Furthermore fish, wildlife and native plants are all important treaty resources to the Tulalip Tribes, and adverse impacts to these resources should be fully evaluated prior to project approval. We also request compliance with all state and federal laws regarding archaeological sites, cultural resources and Native American burials, including the requirement of immediate work stoppage and consultation in the event cultural resources or burials are disturbed. Please send initial notices to the following contacts. We will inform you if we need additional information, such as permit applications and reports.

Hank Gobin, Manager
Tulalip Tribes Cultural Resources
6410 23rd Ave. NE
Tulalip, WA 98271

Richard Young
Director of Environment
7615 Totem Beach Road
Tulalip, WA 98271

The Tulalip Tribes looks forward to further consultations regarding this project.

Sincerely yours,

Hank Gobin, Manager
Cultural Resources Department

Appendix I – Agency Concurrence Letters

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

NMFS Tracking No.
2007/05319

February 14, 2008

Trevin Taylor
WSDOT Highway and Local Program
PO Box 47331
Olympia, WA 98504

RE: Endangered Species Act Section 7 Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation: East Lake Sammamish Trail Project (HUC 171100120202, 171100120401, and 171100120201)

Dear Mr. Taylor:

This correspondence is in response to your request for consultation under the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and management Act (MSA).

Endangered Species Act

The National Marine Fisheries Service (NMFS) has reviewed the Biological Assessment (BA) and Essential Fish Habitat (EFH) assessment received from the Washington State Department of Transportation (WSDOT), the non-Federal representative for the Federal Highway Administration (FHWA) on August 10, 2007. The Federal action by the FHWA is the funding of the project, in whole or in part. NMFS has also reviewed your request for concurrence with effect determinations of "may affect, not likely to adversely affect" for Puget Sound (PS) Chinook salmon (*Onchorhynchus tshawytscha*), PS Steelhead (*O. mykiss)*, and Chinook salmon critical habitat.

NMFS designated PS Chinook salmon as threatened under the Endangered Species Act (ESA) on March 24, 1999 (50 CFR 223 and 224). NMFS designated critical habitat for the PS Chinook salmon became effective on January 2, 2006. NMFS designated PS steelhead as threatened under the ESA on June 11, 2007 (72 FR 26722).

According to the BA and subsequent information provided on December 18, 2007 and January 24, 2008, King County is proposing to construct 10.8 miles of paved trail between the cities of Issaquah and Redmond, Washington. Due to the length of the project, trail construction will be phased by segments over three seasons (not necessarily consecutive). The project will replace the existing, unpaved interim use trail with a paved, non-motorized, multi-use recreational trail that will accommodate pedestrian, wheeled, and equestrian uses on paved and adjacent, separated soft surfaces. The proposed action will widen the trail to a width of 18 – 27 feet, which at its widest location includes a 3-foot clear zone, 4-foot pedestrian/equestrian trail, 3- foot vegetated buffer, two 2-foot gravel shoulders, 12-foot paved trail, and 1-foot vegetated clear zone. To accommodate trail width, culverts on 18 streams will require lengthening or replacement. Culverts on fish-bearing streams or potentially fish-bearing streams will be made fish passable. Only minor modifications above the ordinary high water mark (OHWM) will occur on existing fish-passable culverts and bridges over streams that currently have documented presence of ESA-listed fish species. Retaining walls will be required along some trail segments to minimize the trail footprint and reduce impacts of fill on sensitive areas.

The project will result in a total of 20 acres of new impervious surface, and will have impacts to 1.04 acres of wetlands, 3.89 acres of wetland buffer, and 2.3 acres of stream buffers located adjacent to numerous tributaries to Lake Sammamish. Staging areas will occur at three proposed parking area locations and at the two proposed restroom facilities to minimize disturbance within the action area. Trail construction will include permanent and temporary impacts to riparian vegetation.

Species Presence in the Action Area

The aquatic portion of the action area included streams or drainage features flowing into Lake Sammamish. The action area is based upon maximum turbidity effects (should the BMPs fail) that will not extend more that 100 feet into the lake. The action area includes trail crossings across streams along the trail corridor, the north terminus of which is in the Bear Creek Basin, and the southern terminus in the Issaquah Creek Basin.

<u>Puget Sound Chinook Salmon</u>

PS Chinook salmon occur in Lake Sammamish, Big Bear and Issaquah Creeks, and potentially Laughing Jacobs and Pine Lake creeks. Adults enter freshwater in August and September and spawning begins in late September, peaking in October. Most of the spawning in the action area occurs in the Issaquah Creek drainage. Juvenile Chinook typically rear in fresh water for a couple of months and migrate downstream in the spring, but may rear for longer periods of time in large systems such as Lake Sammamish. Specific life histories studies on Chinook are lacking for Lake Sammamish and its tributaries, but is likely to be similar to nearby Lake Washington. Based on recent life history work from that lake, it is assumed that some juveniles may be rearing in the mouth of some streams within the action area and are present along the Lake Sammamish shoreline in the spring.

<u>Puget Sound Steelhead</u>

The Lake Washington system supports one winter stock of steelhead only (i.e. no summer stock), which is supplemented by a hatchery program utilizing the stock to assist in the recovery of winter steelhead populations in the north Lake Washington tributaries. Spawning takes place in the Lake Washington system, including Lake Sammamish River and some tributaries. Within the project action area east of Lake Sammamish, steelhead spawning is from mid-December through early June. Spawning is limited to Issaquah Creek, a tributary to Lake Sammamish and steelhead likely rear in Lake Sammamish.

Species Determination

Direct affects of the project action include potential change in stream flow conditions and/or increase turbidity, and unavoidable impacts to wetland, wetland buffer, riparian buffer areas due to trail widening and construction of stormwater treatment facilities. Indirect affects of the project action on PS Chinook and PS steelhead include changes to water quality and quantity from additional impervious surfaces, lowered groundwater recharge and summer low flows, and increased summer temperatures of streams. Trail operations resulting in stormwater runoff contaminated with animal waste, especially horse manure, could have detrimental impacts to water quality and fish habitat.

Puget Sound Chinook Salmon

NMFS has analyzed the potential impacts of the project on PS Chinook and determined that the impacts will be discountable and insignificant.

The effects will be discountable because no in-water work for culvert replacement or extension will occur in streams where juvenile or adult Chinook salmon occur (North Fork Issaquah Creek, Bear Creek, Laughing Jacobs and Pine Lake creeks). Chinook do occur in Lake Sammamish downstream of project activities occurring in other project area streams. Summer low flows present physical barriers to juvenile fish passage. Higher water temperatures in the summer will further limit the use of project area streams and nearshore areas of the lake by Chinook. In addition, most Chinook are ocean-type fish and juveniles will have migrated to marine waters in the spring, and therefore will not be in action area waters during the summer in-water work window.

The effects will be insignificant because Best Management Practices (BMPs) to minimize mobilization of sediment and potential pollutants will be used and will include implementation of a Temporary Erosion and Sedimentation (TESC) Plan and a Spill Prevention Control and Countermeasures (SPCC) Plan. In-water work will be limited to the driest time of year over the shortest period possible (two weeks typically) during the approved in-water construction window established in the hydraulic Project Approval (HPA) permit. In addition, work areas will be isolated from stream flow to minimize affects to Chinook that may be downstream in the lake.

Baseline conditions for water quality and quantity will be maintained. Project action will result in 20.0 acres total of new impervious surface, 1.2 acres of which (parking lot and restroom facilities) will be pollution generating impervious surface (PGIS). One hundred percent (100%) of the PGIS will include stormwater detention and treatment. The 18.8 acres of non-PGIS consists of approximately 10.8 acres of effective impervious area (directly discharging via pipe or ditch to stream) and 8.0 acres non-effective impervious (discharge as sheet flow to vegetated buffers and gravel for infiltration). Discharges from effective surfaces could potentially increase peak flows and reduce base flows in ditches and streams within the project corridor; however, the effect is expected to be discountable because the runoff is relatively small increase per sub-basin and will be discharged in the basin it originated in. The trail corridor constitutes only a small part of the watershed, rendering the potential impacts of stormwater, reduced groundwater recharge, and stream and lake temperature increases immeasurable. In addition, horse manure is not expected to result in measurable increases in nutrients, bacteria and other contaminants because many equestrian users are from local watershed and therefore do not constitute a new source of contaminants within the watershed. Sensitive areas along the trail will be fenced to prevent access by public and vegetated buffers between trail, streams, wetlands, and lake will filter out pollutants prior to reaching receiving waters.

Wetland and buffer mitigation will be conducted onsite and/or offsite, will satisfy the most stringent level of regulatory requirement applicable, and will replace affected function and values within the project area at an equal or greater rate than provided for by existing conditions. The relatively limited amount of stream adjacent riparian vegetation to be removed as a result of the project are comprised primarily of non-native herbs and shrubs that provide limited riparian function such as stream shading and woody debris recruitment. Areas impacted adjacent to streams will be replanted with native vegetation including shrubs and trees where feasible. In addition, no salmonid spawning or quality rearing habitat will be lost or permanently altered due to project activities.

Because all potential adverse effects to PS Chinook are discountable or insignificant, NMFS concurs with the WSDOT determination of "may affect, not likely to adversely affect" for PS Chinook.

Puget Sound Steelhead

NMFS has analyzed the potential impacts of the project on PS Steelhead and determined that the impacts will be discountable and insignificant.

The effects will be discountable because those streams known to support PS Steelhead (North Fork Issaquah Creek, Bear Creek, Laughing Jacobs and Pine Lake creeks) will have no in-water work. Project areas streams that will have in-water work are subject to low summer flows that render them inaccessible or unsuitable for adult or juvenile steelhead; therefore it is very unlikely that any steelhead will be in the area.

Juvenile steelhead may rear in lower Zaccuse Creek, which has a perched culvert along the trail slated for culvert replacement. Although this barrier is likely passable by adult salmonids, it presents a barrier to juvenile salmonids during low summer flows. There is no spawning habitat in Zaccuse Creek, so it is unlikely that adult steelhead will be in the Creek. The work area will be isolated from the stream channel. During the flow diversion process at this location, in the unlikely event individual juvenile steelhead are in the area despite summer low flow conditions, a fish biologist will be on-site to ensure no fish are stranded. If fish are observed, the diversion process will be halted until fish can be herded from the area. Fish cannot hold in the culvert being replaced as the perched downstream end eliminates any backwatering effects. There is no substrate in the existing pipe which will allow for observation of any potential fish stranding and facilitate herding of fish out of the area if they are present. Once flow is diverted, the old culvert will be blocked or removed.

The effects will be insignificant for the same reasons as for PS Chinook Salmon above.

Because all potential adverse effects to PS Steelhead are discountable or insignificant, NMFS concurs with the WSDOT determination of "may affect, not likely to adversely affect" for PS Steelhead.

Critical Habitat Determination

NMFS has designated critical habitat for PS Chinook salmon evolutionarily significant unit (ESU), however, the closest critical habitat for the species is in Lake Washington, thirteen miles downstream of the project site. Neither Lake Sammamish nor any of its tributaries contains any designated critical habitat for PS Chinook, therefore there is no PS Chinook designated critical habitat within the project action area.

This concludes informal consultation on these actions in accordance with 50 CFR 402.14(b)(1). The FHWA must re-analyze this ESA consultation: (1) If new information reveals effects of the action that may affect listed species in a way not previously considered; (2) if the action is modified in a manner that causes an effect to the listed species that was not previously considered; or (30 if a new species is listed or critical habitat designated that may be affected by the identified actions.

Magnuson-Stevens Fishery Conservation and Management Act

Federal agencies are required, under section 305(b)(2) of the MSA and its implementing regulations (50 CFR 600 Subpart K0, to consult with NMFS regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH). The MSA section 3 defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." If an action would adversely affect EFH, NMFS is required to provide the Federal action agency with EFH conservation recommendations (MSA section 305(b)(4)(A)). This consultation is based, in part, on information provided by the Federal action agency and descriptions of EFH for Pacific salmon contained in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (August 1999) developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (September 27, 2000).

The proposed project is described by the BA submitted by WSDOT. The proposal encompasses habitats that have been designated as EFH for various life stages Chinook and coho salmon (*O. kisutch*).

The EFH Conservation Recommendations: Because the habitat requirements for the MSA-managed species in the action area are similar to those of the ESA-listed species, and because the conservation measures that FHWA/WSDOT included as part of the proposed action to address ESA concerns are also adequate to avoid, minimize, or otherwise offset potential adverse effects to designated EFH, conservation recommendations pursuant to MSA (section 305(b)(4)(A)) are not necessary. Since NMFS is not providing conservation recommendations at this time, no 30-day response from FHWA/WSDOT is required (MNA section 305(b)(4)(B)).

This concludes consultation under the MSA. If the proposed action is modified in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations, FHWA/WSDOT will need to reinitiate consultation in accordance with the implementing regulations for EFH at 50 CRF 600.920(1).

If you have questions regarding either the ESA or EFH consultation, please contact Michael Grady of the Washington State Habitat Office at (206) 526-4645, or by electronic mail at Michael.Grady@noaa.gov

Sincerely,

D. Robert Lohn
Regional Administrator

cc: Paul Wagner, WSDOT HQ

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

In Reply Refer To:
13410-2007-I-0500

SEP 17 2007

Mr. Trevin Taylor
Washington State Department of Transportation
Highways & Local Programs Division
P.O. Box 47300
Olympia, Washington 98504-7300

Dear Mr. Taylor:

This letter is in response to your request for informal consultation on the East Lake Sammamish Trail project for King County, Washington. On August 8, 2007, our office received your letter and Biological Assessment providing information in support of a "may affect, not likely to adversely affect" determination for bull trout (*Salvelinus confluentus*). It is our understanding this request is being submitted by the Washington State Department of Transportation on behalf of King County. This informal consultation has been conducted in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (Act).

The Washington State Department of Transportation has determined that the project "may affect, and is not likely to adversely affect" the bald eagle (*Haliaeetus leucocephalus*). The bald eagle was removed from the Federal List of Threatened and Endangered Wildlife, effective August 8, 2007. Given that your project will be implemented after that date, consultation under section 7(a)2 of the Act is not required. We have therefore not provided concurrence on your effect determination for the bald eagle.

The proposed project will enhance 10.8 miles of a multi-use interim trail located on the east shoreline of Lake Sammamish. The project includes construction of three parking areas and restrooms. The work will include vegetation removal, paving, grading, excavation, fence and retaining wall installation, and culvert modifications or replacements. Enhancing the trail and the construction of new facilities will result in a net increase of 20 acres of impervious surface, of which 18.8 will be Non-Pollution Generating (NPG). Trail improvements will also result in 1.04 acres of permanent impacts to wetlands, 3.9 acres of wetland buffer and 3 acres of riparian buffer impacts.

We believe sufficient information has been provided to determine the effects of the proposed project modifications to federally listed species and to conclude whether the changes are likely to adversely affect those species. Our concurrence would be based on information in your letter, information in the Biological Assessment, successful implementation of the Best Management Practices and Minimization Measures and the following rationale:

Bull Trout

Bull trout are known to occur in the Lake Washington/Sammamish basin and could utilize the action area as foraging, migration, and overwintering habitat. Bull trout spawning is not known to occur in the action area; therefore, juvenile bull trout are not expected to be present. However, suitable spawning habitat is available for other salmonids providing a potential foraging opportunity for adult and sub-adult bull trout.

The required grading, excavation, and dewatering for retaining wall installation and culvert placement could result in sediment entering streams causing temporary increases in turbidity. In-water work will occur during the summer low flow period. Exposure of bull trout and bull trout prey species to temporary increases in turbidity is unlikely due to the low numbers of bull trout in the system and because occurrence of bull trout during the expected work window is extremely unlikely. Given the timing of the proposed project and the low numbers of bull trout in the action area, the potential for exposure of bull trout to construction-related effects is so low that it is considered discountable.

The project will also result in the removal of moderate-quality native and non-native riparian vegetation. Loss of riparian vegetation could further degrade habitat quality for bull trout and their prey species. However, all disturbed buffer and wetland areas will be replanted with native deciduous and coniferous trees and shrubs at a 1:1 ratio. The remaining vegetation, along with the replanted trees, will provide stream shading and organic input. Therefore, impacts to bull trout are not expected to be measurable, and are considered insignificant.

The project will also result in 20 new acres of impervious surface, of which 18.8 acres will be NPG impervious surface. Increased impervious surface is known to decrease low flows and increase peak flows (due to decreased infiltration, decreased groundwater recharge, and increased runoff) and may degrade water quality (due to increased runoff). Most of the stormwater runoff (excluding parking lots) will be addressed with gravel shoulders and/or surrounding vegetated areas adjacent to the trail for water to infiltrate into the soils or will collect in existing ditches. Runoff from the additional impervious surface will be treated at water detention and water quality treatment facilities. Additionally, because the majority of the new impervious surface is NPG, there will be a minimal increase in contaminants and runoff entering streams directly. As such, the water quality and quantity potential effects are not expected to result in measurable effects to bull trout and are therefore insignificant.

To expedite the environmental review process, if the Federal Highway Administration concurs with the effect determinations for listed species, then you may consider this action to be in compliance with requirements of the Act (50 CFR 402.13), thereby concluding the consultation process. The project should be reanalyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation. The project should also be reanalyzed if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or a new species is listed or critical habitat is designated that may be affected by this project.

If you have any questions about this letter or your responsibilities under the Act, please contact Brooke Hamilton at (360) 753-9073 of my staff.

Sincerely,

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:
FHWA, Olympia, WA
WSDOT, Seattle, WA (E. Conyers)
WSDOT, Olympia, WA (P. Wagner)