

CRITICAL AREAS REPORT

FIRCREST SCHOOL CAMPUS MASTER PLAN
SHORELINE, WASHINGTON

Prepared for
City of Shoreline
and
AHBL, Inc.
Tacoma, Washington 98403

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DISCLAIMER

Herrera Environmental Consultants, Inc., has prepared this report for use by AHBL, Inc., and the City of Shoreline. The results and conclusions in this report represent the professional opinion of Herrera Environmental Consultants, Inc. They are based upon examination of public domain information concerning the study area, site reconnaissance, and data analysis.

The work was performed according to accepted standards in the field of jurisdictional wetland determination and delineation using the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region* (Environmental Laboratory 2010). However, final determination of jurisdictional wetland boundaries pertinent to Section 404 of the Clean Water Act is the responsibility of the Seattle District of the US Army Corps of Engineers. Various agencies of the State of Washington and local jurisdictions may require a review of final site development plans that could potentially affect zoning, buffer requirements, water quality, or habitat functions of lands in question. Therefore, the findings and conclusions in this report should be reviewed by appropriate regulatory agencies before any detailed site planning or construction activities.

HERRERA QUALIFICATIONS

Established in 1980, Herrera Environmental Consultants, Inc. is an innovative, employee-owned, consulting firm focused on three practice areas: water, restoration, and sustainable development. The following staff authored this report and conducted field work in support of this report. A summary of their qualifications is provided.

Rayna Gleason, ISA Arborist

Rayna Gleason is an arborist and landscape designer with 11 years of experience in urban forestry, native habitat restoration, forest and meadow restoration, environmental design, and invasive species management. Rayna provides tree inventories, tree risk assessments, planting plans, vegetation monitoring surveys, wetland delineation, and native Pacific Northwest habitat restoration consulting. Rayna writes tree assessment reports, critical areas reports, wetland and stream delineation reports, and vegetation monitoring reports. Rayna creates JARPA permitting and mitigation planting plans for Washington municipalities.

Credentials

- ISA Arborist, NY-5710A, PNW Chapter, 2011
- ISA TRAQ Qualification, 2019

Eliza Spear, PWS

Eliza Spear is an ecologist and permitting specialist with 6 years of experience in wetland, forest, and meadow restoration; wetland delineation; environmental permitting; and invasive species control. Eliza delineates wetlands and ordinary high water marks of streams and shorelines, and prepares wetland and stream delineation reports, critical areas reports, and mitigation plans for impacts to wetlands, streams, and buffers. Eliza coordinates with local, state, and federal agencies; completes applications; and obtains permits and approvals for project compliance with regulations including local critical area ordinances, the State Hydraulic Code, SEPA, and Clean Water Act Sections 401 and 404.

Credentials

- BS, Environmental Science and Ecology, College of William and Mary, 2013
- Certificate in Wetland Science and Management, University of Washington, 2018
- PWS, Professional Wetland Scientist, Society of Wetland Scientists, 2021
- WSDOT Junior Biological Assessment Author, 2020

EXECUTIVE SUMMARY

This critical areas and significant tree investigation was performed as a subconsultant for AHBL, Inc. (AHBL) in support of the Fircrest School Campus Master Plan. This report presents the results of a wetlands and stream investigation conducted by Herrera Environmental Consultants, Inc. (Herrera) in May 2018, a significant tree survey conducted by Herrera in 2018, and a landslide and erosion hazard assessment conducted by South Sound Geotechnical Consulting in February 2022. Critical areas present on the site include two non-fish-bearing streams and one priority habitat (critical roosting habitat for little brown bat). The project is not expected to directly impact the streams, but may impact stream buffers. Mitigation for impacts on stream buffers must be mitigated according to City of Shoreline Critical Areas code.

The significant tree survey found that most of the trees measured on the site met the City of Shoreline definition of a significant tree. Any significant trees removed for the project are required to be replaced according to City of Shoreline replacement ratios.

No wetlands were found on the site, and no landslide hazard areas or areas of erosion were identified.

Most of the trees measured on site met the City of Shoreline definition of a significant tree.

INTRODUCTION

The critical areas investigation and significant tree survey described in this report was performed as a subconsultant for AHBL, in support of the Fircrest School Campus Master Plan (hereafter referred to as the project). AHBL is proposing to create a campus master plan to improve modifications to facilities and campus layout. Critical areas regulated by the City of Shoreline and relevant to this project include wetlands, fish and wildlife habitat conservation areas (streams, priority habitats, and species), and geologic hazard areas. Significant trees are regulated under the City's development standards. This report documents baseline conditions of significant trees and critical areas in the study area and applicable regulations and guidance regarding potential project impacts on these resources.

PROJECT SETTING

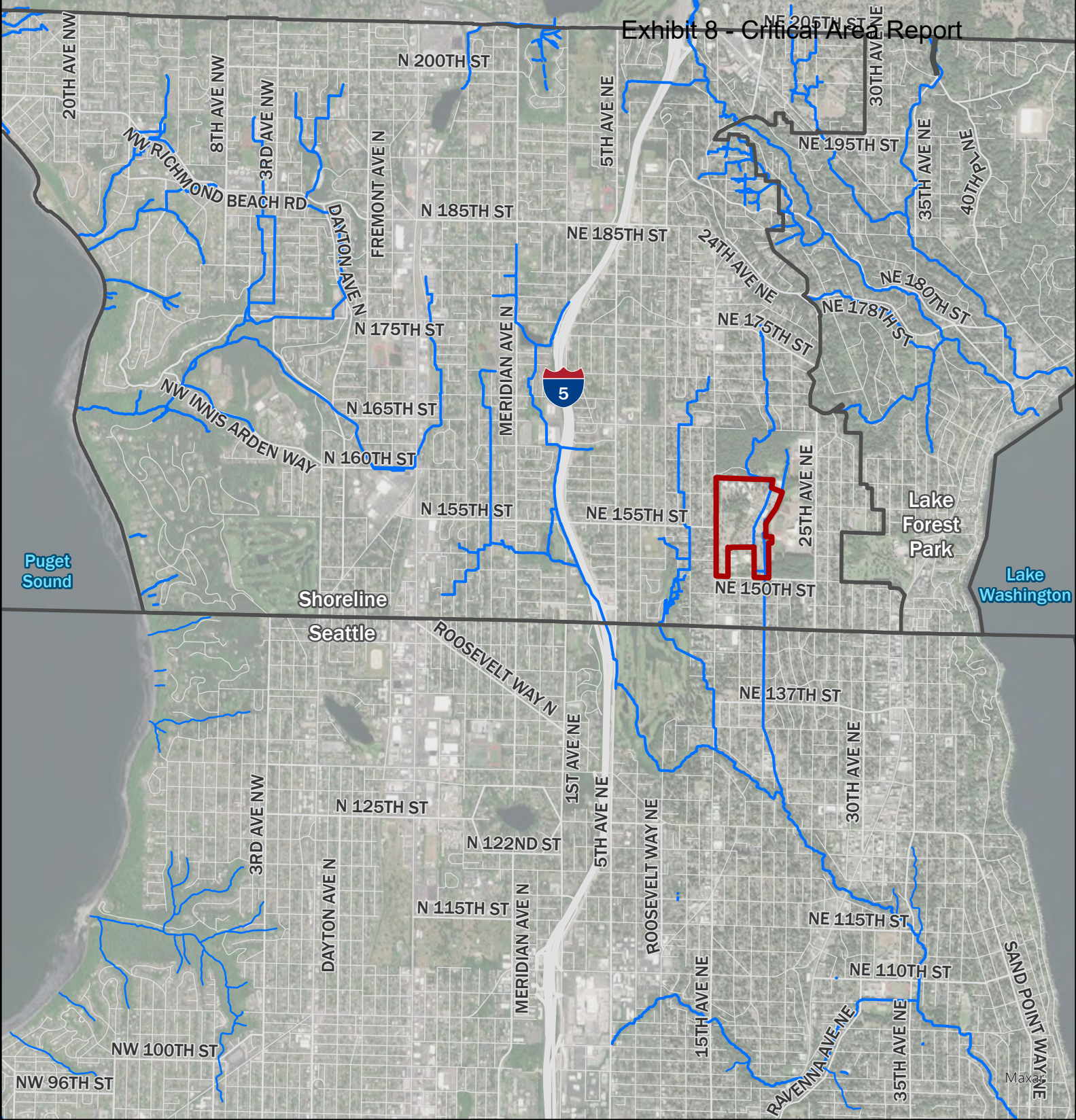
The Fircrest School campus is located at 15230 15th Avenue Northeast, Shoreline, Washington 98155 (Figure 1). The approximately 53-acre area, investigated for the presence of wetlands and streams (the study area), is located at latitude 47.5968633, longitude -122.3236344 in Sections S5 T24N and R4E, Township T24N North, Range R4E East of the Willamette Meridian (WDFW 2009).

The study area is in the Cedar River/Lake Washington portion of Water Resource Inventory Area (WRIA) Cedar-Sammamish (WRIA 8). The study area is within the subbasin referred to as the North Branch Thornton Creek drainage basin, which discharges into Lake Washington.

STUDY OBJECTIVES

The objectives of the study were to:

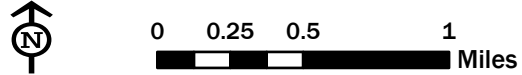
- Identify any wetlands and fish and wildlife habitat conservation areas (FWHCAs) in the study area.
- Identify all significant trees within the study area.
- Identify geologic hazards in the study area.
- Identify regulations and guidance applicable to project impacts on wetlands, FWHCAs, significant trees, and buffers set forth by local, state, and federal authorities.



- Legend**
- Study Area
 - City Limits
 - Streams



Figure 1.
Vicinity Map for the Fircrest School Master Plan.



Esri Imagery, City of Shoreline, King County

METHODS AND MATERIALS

Evaluating the presence, extent, and type of critical areas and significant trees requires a review of available information about the site (e.g., surveys, studies), followed by an onsite wetland investigation. The following sections describe the research methods and field protocols for the evaluations.

REVIEW OF AVAILABLE INFORMATION

A literature review was performed to determine the historical and current presence of critical areas in and near the study area. Sources of information included:

- Aerial photographs of the study area (Google Earth 2022)
- National Wetlands Inventory map of wetland areas in the study area (USFWS 2022)
- King County wetland inventory (King County 2022)
- Hydrographic data (stream locations) for King County (King County 2022)
- SalmonScape online mapping (WDFW 2022b)
- Washington State priority habitat and species (PHS) data (WDFW 2022c).
- Washington State Natural Heritage data (DNR 2022)
- Soil survey maps for the study area (NRCS 2022)
- Landslide and Erosion Hazard Assessment (Appendix A)
- Thornton Creek and West Lake Washington Basin Characterizations Report (Tetra Tech 2004)

WETLAND INVESTIGATION

The wetland investigation was performed in accordance with the *Regional Supplement to the US Army Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region* (Environmental Laboratory 2010), which is consistent with the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987).

The methods in the guidance manuals listed above use a three-parameter approach for identifying and delineating wetlands and rely on the presence of field indicators for hydrophytic vegetation, hydric soils, and hydrology.

FISH AND WILDLIFE HABITAT CONSERVATION AREA DELINEATION AND CLASSIFICATION

A Fish and Wildlife Habitat Conservation Areas (FHWCA) is an area that supports regulated fish or wildlife species or habitats, typically identified by known point locations of specific species, habitat areas, or both. Streams and piped stream segments are FHWCA's according to Shoreline Municipal Code (SMC) 20.80.270(B)(5). SMC defines streams as "those areas where surface waters produce a defined channel or bed, not including irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses, unless they are used by fish or are used to convey streams naturally occurring prior to construction." FHWCA's also include Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species.

In accordance with the City of Shoreline, streams on the site were classified using the Washington State Department of Natural Resources (DNR) water typing system based on WAC 222-16-030.

Stream locations and conditions, and potential wildlife presence and habitats, were evaluated through the review of available information and onsite investigations.

SIGNIFICANT TREE INVESTIGATION

In 2018 a Herrera arborist and a biologist inventoried the entire Fircrest Campus project area, measuring 176 significant trees or tree groves that met the minimum circumference per the City of Shoreline Municipal Code, *Chapter 22.62 Landscaping Regulations*. Within the code, *Chapter 22.62.009 Retention and protection of significant trees*, states that "significant trees are healthy evergreen trees with a minimum 12-inch DBH and healthy deciduous trees with a minimum nine-inch DBH (diameter at breast height)."

Prior to the initial site visit, a desktop analysis was done for the campus property, private buildings, and access points. Once in the field, tree circumference was measured at 4.5 feet above grade (dbh), identified by genus and species, and mapped by hand with a unique tree number and location within the project area. Trees that were dead, damaged, in decline, or hazardous were noted at the time.

The tree inventory of the Fircrest Campus is grouped into two categories: specimen trees and tree groves. Specimen trees are categorized as trees of significant size or approximately significant size that are planted on site. Tree groves are larger groups of trees that may have been planted or generated naturally. They tend to have a mixture of sizes and species, and often a mature native canopy with invasive species in the understory. Tree groves are also defined by

a complex understory (versus grass or a planting bed for specimen trees). Understory species are listed in the comments section of the tree inventory for each grove. Constraints on the project timeline did not allow each tree in a tree grove to be measured. Instead, the species diversity was identified, and the dbh range was provided based on measurements taken of the high and low end of the spectrum of tree sizes. Tree groves receive one unique Tree ID Number, although they have multiple trees in each grove.

The final tree inventory spreadsheet (see Appendix B) shows the Tree ID Number, Species, Common Name, DBH, Significant Tree per City Standards (Yes or No), whether the tree species is native, nonnative, on the Washington State Noxious Weed Board's invasive monitor list or its invasive list, Tree Grove vs Tree Specimen, General Tree Health (Good, Fair, Poor), Risk of Physical Failure (Low, Medium, High), Location by Building Number, and Notes.¹

Notes detail dead trees present, justifications for a "Fair" or "Poor" General Tree Health rating, or Risk of Physical Failure Rating of "Medium" or greater.

The Fircrest School Campus Master Plan project was put on hold, and the original tree inventory was not delivered to the City upon completion in 2018. The completed tree inventory and corresponding map (see Figure 2) reflects the health and size of significant species inventoried in 2018. Trees that have died, become damaged, grown into significant size per City standards, or have been removed since 2018 have not been noted.

¹ General Tree Health and Risk of Physical Failure refer to the Type 1 Tree Risk Assessment (TRAQ) standards set by the International Society of Arboriculture (ISA).

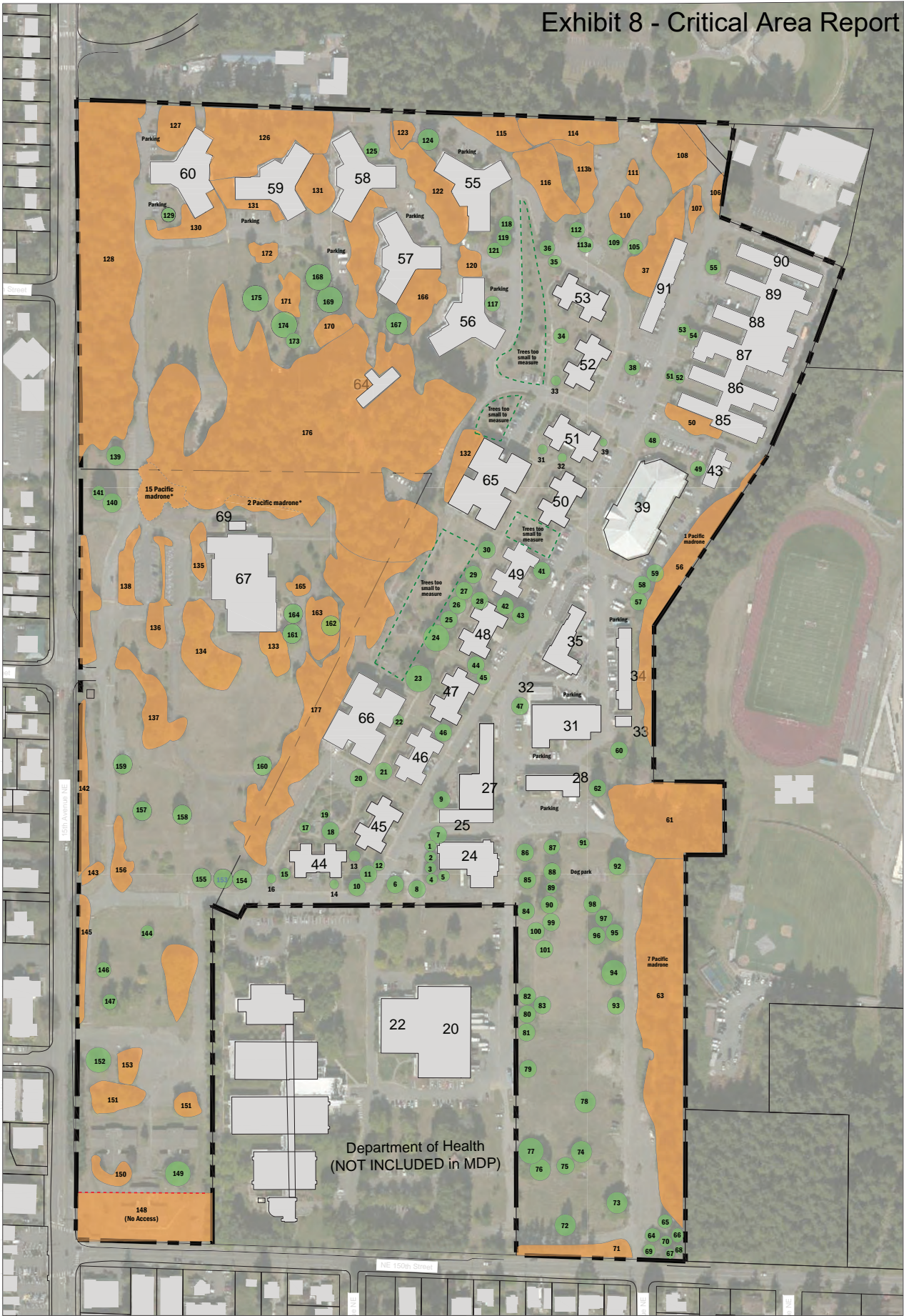


Figure 2. Fircrest Campus Tree Inventory – 2018.

RESULTS

This section discusses the results of the site investigations, including a review of information obtained from various references, and an analysis of critical area conditions in the study area as observed during field investigations.

ANALYSIS OF AVAILABLE INFORMATION

The available existing information compiled for the critical areas investigation is summarized in the following subsections.

Previously Mapped Wetlands and Streams

The National Wetlands Inventory (NWI) does not map any wetlands in the study area. NWI maps show West Hamlin Creek flowing under Northeast 160th Street from Hamlin Park to the north. West Hamlin Creek is then conveyed through pipes to the eastern boundary of the study area, where it joins with East Hamlin Creek and flows out of the study area to the south before joining the main Thornton Creek system south of the Shoreline city limits boundary (Tetra Tech 2004).

East Hamlin Creek is also mapped flowing through a mixed open channel conveyance and piped system on the eastern boundary of the study area. East Hamlin Creek collects drainage from primarily single-family residential areas before flowing south into Thornton Creek downstream of the study area (Tetra Tech 2004).

Fish Habitat Use

Based on WDFW's SalmonScape and PHS mapping, there is no fish use in West or East Hamlin Creek (WDFW 2022b, 2022c). SalmonScape mapping shows multiple fish passage barriers downstream of the study area, including multiple natural barriers due to excessive slopes for fish passage.

Wildlife Habitat Use

According to WDFW PHS data (WDFW 2022c), the Fircrest Campus is potential habitat for the little brown bat (*Myotis lucifugus*), similar to the entire Shoreline city limits. The little brown bat is one of the most common bat species in Washington and is found throughout forested habitats. The species is a habitat generalist and occurs most commonly in both conifer and hardwood forests and forest margins (WDFW 2022a).

The little brown bat is not federally regulated or regulated within Washington State. Critical roosting habitat preservation is encouraged, but not enforced. Critical roosting habitat per the WDFW are remnant forest patches, large snags, hollow trees, and large-diameter trees in areas that are heavily managed (i.e., the Fircrest Campus). As of the 2018 site visit, no critical little brown bat roost habitat was identified.

RESULTS OF FIELD INVESTIGATIONS

This section presents the results of the 2018 significant tree survey and wetland investigation, the 2022 FWHCA investigation, and the February 2022 geologic hazard investigation.

Wetlands

Herrera biologists found no evidence of hydrophytic vegetation or wetland hydrology during the site investigation and determined that no wetlands are present in the study area.

Fish and Wildlife Habitat Conservation Areas

Streams

The small segment of West Hamlin Creek that was not piped in the study area did not have any bed or bank characteristics and instead was observed to be a vegetated swale that conveys the stream flows from mapped piped stream segments to the north and south. A majority of the small segment of East Hamlin Creek that was not piped in the study area displayed characteristics consistent with those observed in West Hamlin Creek; however, a small segment of the vegetated swale appeared to have been maintained, resulting in bed and bank characteristics likely caused by human intervention, rather than by natural flow processes. Piped stream segments and segments without OHWM but that convey naturally occurring streams are regulated as FWHCAs per SMC 20.80.270(B)(5) and SMC 20.80.270(B)(5)(E). Stream conditions are summarized in Tables 1 and 2.

Table 1. Stream Summary Table—West Hamlin Creek.



Stream Name	West Hamlin Creek	
		Photo showing the non-piped section of West Hamlin Creek lacking OHWM at the northern boundary of the study area.
Local Jurisdiction	City of Shoreline	
DNR Stream Type	Type Ns	
Local Stream Rating	Type Ns	
City of Shoreline Buffer Width	45-foot buffer on non-piped section, 10-foot buffer on piped sections	
Documented Fish Use	No known fish use (WDFW 2022b and 2022c). Mapped natural barriers downstream.	
Location of Stream Relative to Project Corridor	Stream flows south from Hamlin Park through the eastern portion of the study area. At the southeastern corner of the study area, West Hamlin Creek flows into East Hamlin Creek.	
Riparian/Buffer Condition	The buffer in the northernmost portion of the study area where West Hamlin Creek is conveyed through an open channel consists of mature trees and a mowed, grassy understory. West Hamlin Creek is then conveyed through pipes that are within the paved development of the Fircrest School Campus.	

Table 2. Stream Summary Table—East Hamlin Creek.

Stream Name	East Hamlin Creek
	Photo showing the non-piped section of East Hamlin Creek lacking OHWM at the eastern boundary of the study area.
Local Jurisdiction	City of Shoreline
DNR Stream Type	Type Ns
Local Stream Rating	Type Ns
City of Shoreline Buffer Width	45-foot buffer on non-piped section, 10-foot buffer on piped sections
Documented Fish Use	No known fish use (WDFW 2022b, 2022c). Mapped natural barriers downstream.
Location of Stream Relative to Project Corridor	East Hamlin Creek flows south into the study area at its northeast corner. East Hamlin Creek flows south out of the study area at its southeast corner after joining with West Hamlin Creek.
Riparian/Buffer Condition	The buffer within the study area consists of narrow strips of managed, upland lawn. Beyond this vegetation, the buffer is comprised of paved surfaces associated with the buildings on the Fircrest School Campus.

Wildlife

During field reconnaissance, a large number of domesticated rabbits and raptors, predominantly red-tailed hawk (*Buteo jamaicensis*), were observed on site. It is probable the domesticated rabbits are feral offspring of pets. No other wildlife were observed during the site visit.

Significant Trees

The current tree canopy within the Fircrest Campus is a mixture of mature native tree species and ornamental species, many from the eastern United States. On average, trees within the project area were about 23 inches dbh in 2018. Most of the trees measured on site met the City of Shoreline definition of a significant tree.

Specimen Trees

Ornamental and native trees are located around each of the buildings and along the roadways, within the off-leash dog park, and within an open field along the southeastern portion of the campus. The predominant ornamental/specimen trees species are American sycamore (*Platanus occidentalis*), horse chestnut (*Aesculus hippocastanum*), Norway maple (*Acer platanoides*), sycamore maple (*Acer pseudoplatanus*), Port Orford cedar (*Chamaecyparis lawsoniana*), Northern red oak (*Quercus rubra*) and Scots pine (*Pinus sylvestris*).

Most specimen trees around the campus appear healthy and provide significant benefits to the look of the campus. A few specimen trees were dead or had obvious health problems. A few trees had experienced structural damage. Dead, damaged, or trees in decline were noted within the Notes section of the 2018 tree inventory.

Tree Groves

Tree Groves are predominantly along the edges of the property line, along with a large grove of trees around the Naval Hospital Chapel. Healthy, large stands of Pacific madrone (*Arbutus menziesii*) and mature native conifers such as Douglas fir (*Pseudotsuga menziesii*), Western white pine (*Pinus monticola*), Western hemlock (*Tsuga heterophylla*), Western redcedar (*Thuja plicata*) are prominent throughout. Other native species found within the tree groves are bigleaf maple (*Acer macrophyllum*), Ponderosa pine (*Pinus ponderosa*), quaking aspen (*Populus tremuloides*), black cottonwood (*Populus balsamifera ssp trichocarpa*), red alder (*Alnus rubra*), Pacific dogwood (*Cornus nuttallii*), and bitter cherry (*Prunus emarginata*). Nonnative species found within the tree groves are Scots pine and horse chestnut. Species within the tree groves on the Washington State Noxious Species Board's list of Invasive of Invasive Monitor are Norway maple, English laurel (*Prunus laurocerasus*), and English holly (*Ilex aquifolium*).

Native species within the tree grove understory often consisted of bracken fern (*Pteridium aquilinum*), salal (*Gaultheria shallon*), Western swordfern (*Polystichum munitum*), dull Oregon grape (*Mahonia nervosa*), red huckleberry (*Vaccinium parvifolium*), Pacific blackberry (*Rubus*

ursinus), osoberry (*Oemleria cerasiformis*), beaked hazelnut (*Corylus cornuta*), common snowberry (*Symphoricarpos albus*) and small native tree saplings.

Invasive understory species within the tree groves are: Himalayan blackberry (*Rubus armeniacus*), common hawthorn (*Crataegus monogyna*), English ivy (*Hedera helix*), English holly, and herb Robert, (*Geranium robertianum*), English laurel, creeping buttercup (*Ranunculus repens*), field bindweed (*Convolvulus arvensis*), and Norway maple saplings.

Landslide and Erosion Hazard Assessment

A complete description of the landslide and erosion hazard assessment is included in Appendix A of this report. This assessment indicated that the study area does not include a Landslide Hazard Area. The study area is anticipated to have a slight to moderate potential for erosion and Best Management Practices for erosion control should be applied to limit the risk of offsite transport of sediment during construction.

REGULATORY IMPLICATIONS

Critical areas are subject to a variety of federal, state, and local regulations that will apply to any future activities planned for the project. Federal laws regulating wetlands and streams include Sections 404 and 401 of the Clean Water Act (United States Code, Title 33, Chapter 1344 and 1251 [33 USC 1344 and 1251]) and the Navigable Waters Protection Rule (33 Code of Federal Regulations [CFR] Part 328). Washington State laws and programs designed to control the loss of wetland acreage include the State Environmental Policy Act (SEPA) and Section 401 of the Clean Water Act (administered in the State of Washington by the Washington State Department of Ecology [Ecology], as mandated by the Washington State Water Pollution Control Act). In addition, Washington State laws include the state Hydraulic Code (Washington Administrative Code [WAC] 220-110). SMC 20.80 specifies wetland categories, required wetland buffer widths, development standards, and wetland mitigation requirements for critical areas in its jurisdiction. Federal, state, and county regulations require mitigation for impacts on wetlands and streams.

Clean Water Act Sections 404 and 401

The project is not anticipated to require Section 404 or 401 permitting because there are no anticipated direct impacts to a water of the United States.

Section 404 of the federal Clean Water Act regulates the placement or removal of soil or other fill, grading, or alteration (hydrologic or vegetative) in waters of the United States, including wetlands and streams (33 USC 1344). The Seattle District of the US Army Corps of Engineers (USACE) administers the permitting program under the act. The permits include nationwide (general) permits for projects involving small areas of fill, grading or alteration and individual permits for projects that require larger areas of wetland disturbance. USACE does not regulate wetland buffers.

Section 401 of the Clean Water Act requires that proposed dredge (removal) and fill activities permitted under Section 404 be reviewed and certified to ensure that such activities meet state water quality standards. State 401 certification is administered by Ecology for all Section 404 permits. State 401 certification is granted without the need for a separate permit from Ecology for projects that qualify for a Section 404 nationwide permit, meet specific 401 certification conditions of the nationwide permit, and meet Ecology 401 General Conditions. If that is not the case, an Individual 401 Water Quality Certification permit is required by Ecology.

Washington State Laws

The project is not anticipated to require a Hydraulic Project Approval (HPA) because there is no work proposed that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state.

Washington State laws and programs designed to control the loss of wetland acreage include SEPA and Section 401 of the Clean Water Act (a federal law that is implemented in the state by Ecology as noted above and as mandated by the Washington State Water Pollution Control Act).

The WDFW administers the Hydraulic Project Approval (HPA) program under the state Hydraulic Code (WAC 220-110), which was specifically designed to protect fish life. An HPA is required for projects that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state.

City of Shoreline Municipal Code

FWHCAs

The open conveyances are regulated as streams because they “are used to convey streams naturally occurring prior to construction” (SMC 20.80.270(5)). West and East Hamlin Creek convey flows in an area where historical aerial photographs indicate the presence of multiple streams (Tetra Tech 2004), indicating this system is part of a historical stream network that existed prior to human intervention in this area.

In accordance with the City of Shoreline, streams on the site were classified using the Washington State Department of Natural Resources water typing system based on WAC 222-16-030. This system is based primarily on fish, wildlife, and human use, and consists of four stream types: Type S, F, Np, or Ns. Type S streams are those surface waters that are inventoried as “Shorelines of the State” under the Shoreline Management Master Program for the City, pursuant to Revised Code of Washington (RCW) Chapter 90.58.030. Type F streams and water bodies are those known to be used by fish or meet the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year; they may be perennial or seasonal. Physical criteria for fish use include stream segments having a defined channel of 2 feet or greater within the bankfull width in Western Washington; and having a gradient of

16 percent or less. Type Np streams have flow year-round and may have spatially intermittent dry reaches downstream of perennial flow. Type Np streams do not meet the physical criteria of a Type F stream and have been proven not to contain fish. Type Ns streams do not have surface flow during at least some portion of the year, and do not meet the physical criteria of a Type F stream.

The piped segments of these streams are afforded a 10-foot standard buffer width and the open conveyances are afforded a 45-foot standard buffer width per SMC 20.80.280(C)(1). Per SMC 20.80.280(D)(7), areas that are functionally isolated and physically separated from streams due to existing, legally established roadways or paved areas 8 feet or more in width shall be considered physically isolated and functionally separated stream buffers. Development proposals are allowed in these areas as approved by the City of Shoreline. Mitigation will be required for impacts to stream buffers that are not physically separated or functionally isolated from West and East Hamlin Creek (Figure 3).

Significant Trees

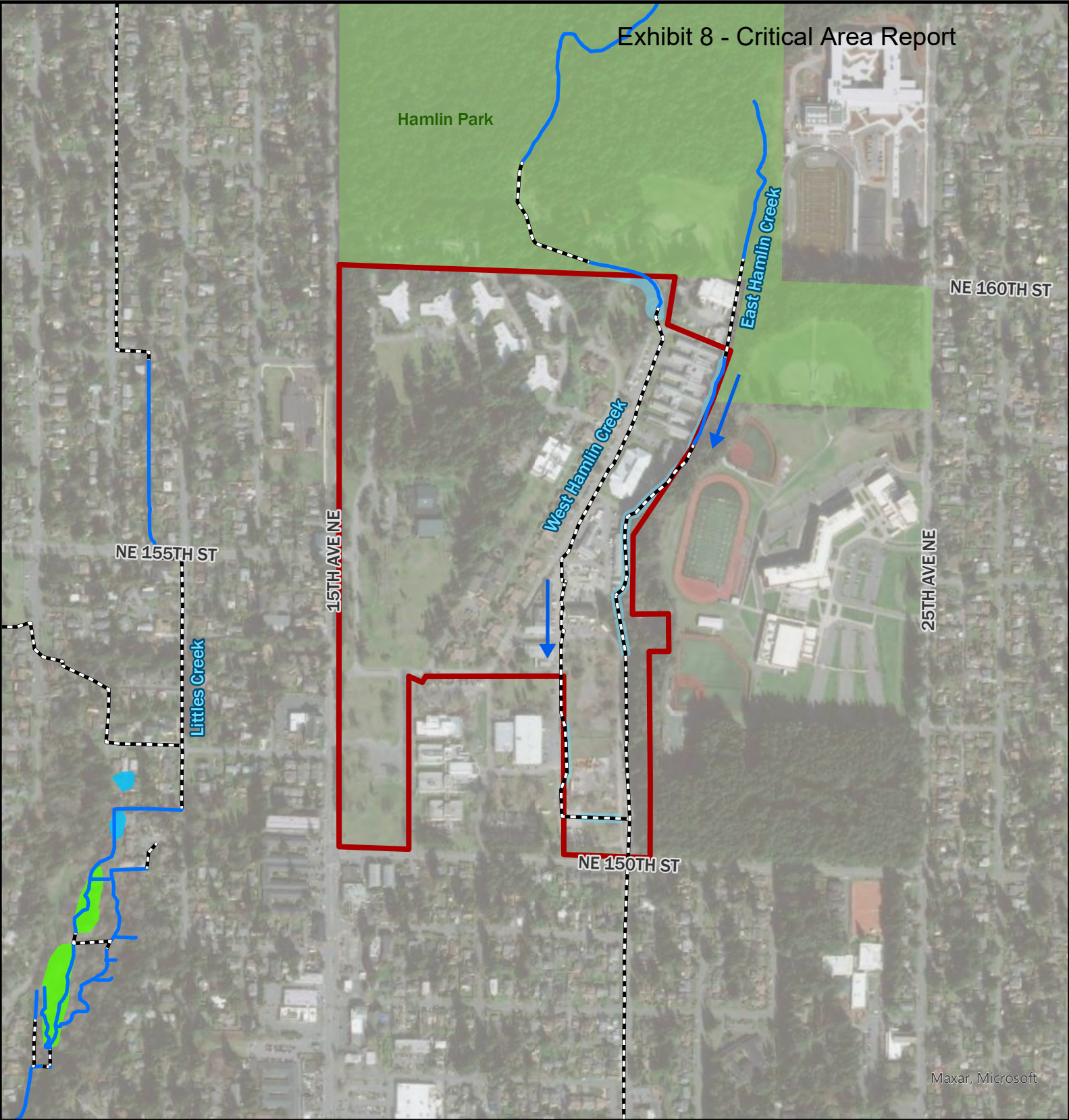
The City of Shoreline defines a significant tree as 8 inches in diameter or larger for evergreen conifers, and 12 inches in diameter for other trees. The City's tree regulations, SMC 20.50.290–370 Significant Sized Trees, state that “up to six significant trees may be removed during a 3-year period based on the parcel sizes below. Trees over 30 inches in diameter (94.2” in circumference) are not exempt and will need a permit to remove.” Trees that are dead, a high risk, or dying may be removed as they are not counted as a significant tree. Critical root zones (CRZs) of each tree that remains must be protected during the length of construction; and prior to construction, an arborist must approve a tree protection plan.

Per City of Shoreline code, landscaping credit may be given for significant trees retained, especially if trees that provide screening, habitat, buffering, or extend canopy coverage are maintained.

City of Shoreline Replacement Requirements (SMC 20.50.360.D) for all significant trees removed on site are as follows: One existing significant tree of 8 inches in diameter at breast height for conifers or 12 inches in diameter at breast height for all others equals one new tree.

1. Each additional 3 inches in diameter at breast height equals one additional new tree, up to three trees per significant tree removed.
2. Minimum size requirements for replacement trees under this provision: Deciduous trees shall be at least 1.5 inches in caliper and evergreens 6 feet in height.

Prior to the construction phase of the Master Plan, it is recommended that an updated tree survey be generated for all trees that will be removed. Tree sizes, health, and replacement ratios should be updated; and an in-depth analysis of all tree groves may be required per City code.



Legend

- Study Area
- Freshwater Forested/Shrub Wetland
- Open Water Course
- Freshwater Pond
- Piped Water Course
- Park
- Flow Direction
- Stream Buffers

Figure 3.
Previously Mapped Wetlands and Streams in the Vicinity of the Study Area for the Fircrest School Master Plan.



0 180 360 720
 Feet



Esri Imagery, City of Shoreline, USFWS

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APPENDIX A

Landslide and Erosion Hazard Assessment

Exhibit 8 - Critical Area Report

South Sound Geotechnical Consulting

February 4, 2022

AHBL
2215 North 30th Street, Suite 200
Tacoma, Washington 98403-3350

Attention: Ms. Brittany Port

Subject: Landslide and Erosion Hazard Assessment
Fircrest School Master Plan
Shoreline, Washington
SSGC Project No. 22012

Ms. Port,

South Sound Geotechnical Consulting (SSGC) has prepared this landslide and erosion hazard assessment at the DSHS Fircrest School in Shoreline, Washington. Our services have been completed in general conformance with our proposal P21160 (dated December 21, 2021) and authorized per AHBL subconsultant agreement. Our scope of services included a site visit, review of available geologic, soil, topographic, and geologic hazard maps, and preparation of this report.

PROJECT INFORMATION

The project area is on the east side of the Fircrest campus. Construction of new residential cottages is planned in the central portion of the campus near the east boundary. This area is near the base of a west-facing slope that extends up to the ballfields of Shorecrest High School. We understand the City of Shoreline is requesting a landslide hazard assessment of the slope regarding future development plans.

DOCUMENT REVIEW

The following documents were reviewed as part of our assessment of this site:

- Shoreline Municipal Code (SMC).
- USGS “Geologic Map of Northeastern Seattle (Part of the Seattle North 7.5’ x 15’ Quadrangle), King County”, 2009.
- USDA NRCS Soil Survey of King County Area, Washington.
- King County iMap System.
- Washington State DNR Geologic Information Portal Web Site.

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Fircrest School
Shoreline, WA
SSGC Project No. 22012
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Document Summary

Native soil on the west-facing slope have been classified on the referenced USGS map as Vashon Stade glacial till. Ice-contact deposits are mapped at the top of the slope on the Shorecrest High School grounds. Till is described as a compact diamict of silt, sand, and gravel deposited directly under the last advancing glacial ice-sheet.

Native soil on the slope is mapped as “Alderwood gravelly sandy loam” per the USDA Soil Conservation Service map of King County. Alderwood soils reportedly formed in glacial till/drift.

Slopes on the property are not shown as having landslide susceptibility on the DNR Geologic Information portal or King County iMap system. Portions of the slope in the northern side of the Fircrest campus are shown on the King County iMap system as a potential soil erosion hazard. The slope near the planned cottages is not mapped as an erosion hazard.

Topography of the west-facing slope shows an elevation change of about 50 feet per King County GIS topographic information. Average slope inclination is on the order of 30 to 35 percent.

SITE CONDITIONS

SSGC completed a reconnaissance of the west-facing slope on February 1, 2022. Site observations include:

- The west-facing slope is vegetated with a mixture of young and mature deciduous and conifer trees with an understory of vines, ferns, grasses, and brush. Mature fir trees exhibited generally straight trunks.
- A drainage ditch and culvert system is at the base of the slope. North of the planned cottage building area, the lower portion of the slope above the ditch has been previously graded to a near vertical cut-face. Exposed soils in the cut-face appeared to be glacial till. No excessive erosion or evidence of slope movement was observed in the cut-face.
- A rockery extends across a portion of the slope base on the east side of the existing parking lot. The tallest portion of the rockery is on the order of 7 (+/-) feet tall. No evidence of deformation (e.g. bulging of rocks) was observed.
- Evidence of recent slope movement (such as slumps, slides, tension cracks, head scarps, etc.) was not observed on the slope.
- No evidence of excessive erosion was observed on the slope.

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February 4, 2022

- The presence of seeps or springs was not observed on the slope at the time of our site visit. Wet soil vegetation (such as horsetail, rushes, or other) was not observed on or at the base of the slope.

GEOLOGIC HAZARD AREAS DISCUSSION

Chapter 20.80.210 of the SMC addresses geologic hazards. Based upon our review of the referenced documents and our field observations, we offer the following statements regarding the geologic hazard areas as described in the SMC.

Landslide Hazard

The SMC utilizes landslide hazard indicators that include the combination of slope inclinations and heights, soil conditions, groundwater conditions, and surface expressions of past or ongoing slope movement. The west-facing slope has an average inclination between about 30 to 35 percent. Locally steeper cut-slopes have inclinations near vertical. No evidence of recent landslide activity was apparent on the slope or on neighboring properties at the time of our site visit.

Based on our site observations and document review, this parcel is not considered a Landslide Hazard Area. The slope appears to consist of dense, glacially consolidated till. We understand planned cottage development is west of the base of the slope and existing parking lot. Construction of the cottages should not adversely affect stability of the west-facing slope.

Erosion Hazard

Native soils are reported to have slight to moderate potential for erosion per the USDA Soil Conservation Service. Evidence of natural erosion was not observed on slopes during our site visit. Excessive erosion was not observed in graded cut slopes.

Regarding construction of the planned development, it is our opinion Best Management Practices (BMP) for erosion control (silt fencing, straw bales, etc) can be utilized such that the risk of off-site transport of sediment is limited during construction. Additional erosion control measures may be necessary if earthwork is scheduled during the wetter seasons. All erosion control provisions should follow City of Shoreline regulations to reduce the risk of off-site transport of sediments. Exposed soils following any construction should be vegetated as soon as possible. Irrigation should be minimized on or near slopes. Temporary and permanent stormwater control measures should prevent concentrated flow onto site slopes.

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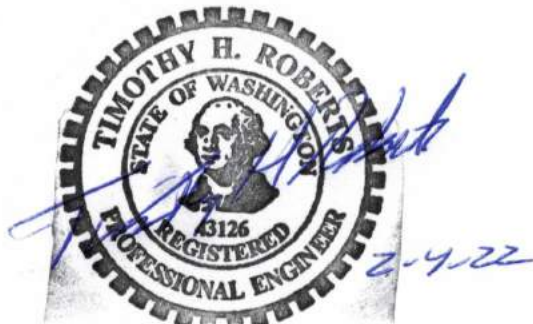
REPORT CONDITIONS

This letter has been prepared for the exclusive use of AHBL, Inc. for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No warranties, either express or implied, are intended or made. The opinions and recommendations contained in this letter are based on surface and subsurface conditions observed during our February 1, 2022 site visit and the referenced documents. Should site conditions presented in this document change, or new information become available, the conclusions and recommendations contained herein shall not be considered valid unless SSGC reviews the new/revised information and either verifies or modifies the conclusions in writing. Additional geotechnical evaluations may be necessary based on future development of the site.

We appreciate the opportunity to work with you on this project. Please contact us if we can be of further assistance.

Respectfully,

South Sound Geotechnical Consulting



Timothy H. Roberts, P.E.
Member/Geotechnical Engineer

APPENDIX B

Tree Inventory

Fircrest Tree Survey – 2018

Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
1	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	26.4	Y	N		x	G	L	Blg 24	
2	<i>Pseudotsuga menziesii</i>	Douglas fir	28	Y	N		x	G	L	Blg 24	
3	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	na	N	N		x	P	L/M	Blg 24	Dead, no obvious signs of decay
4	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	na	N	N		x	P	L/M	Blg 24	Dead, no obvious signs of decay
5	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	28.75	Y	N		x	G	L	Blg 24	Double leader
6	<i>Catalpa sp.</i>	Catalpa	33	Y	NN		x	G	L	Blg 24	Significant tree
7	<i>Acer japonica</i>	Japanese maple	17.5	Y	NN		x	G	L	Blg 24	
8	<i>Pinus sylvestris</i>	Scots pine	15.75	Y	NN		x	G	L	Blg 24	
9	<i>Pseudotsuga menziesii</i>	Douglas fir	26.5	Y	N		x	G	L	Blg 25	
10	<i>Aesculus hippocastanum</i>	Horse chestnut	23.5	Y	NN		x	G	L	Blg 44	Invasive species in WA
11	<i>Liquidambar styraciflua</i>	Sweetgum	21	Y	NN		x	G	L	Blg 44	
12	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	18	Y	N		x	G	L	Blg 44	
13	<i>Acer platanoides</i>	Norway maple	14.75	Y	IM		x	G	L	Blg 44/45	Species of concern in WA
14	<i>Juniperus sp.</i>	Cultivar juniper	11	N	NN		x	G	L	Blg 44	Cultivar unknown
15	<i>Cedrus atlantica</i> 'Glauca'	Blue Atlas cedar	22	Y	NN		x	G	L	Blg 44	
16	<i>Chamaecyparis obtusa</i>	Hinoki cypress	19.5	Y	NN		x	G	L	Blg 44	Double leader
17	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	18.25	Y	N		x	G	L	Blg 44 (Garden)	Double leader
18	<i>Acer pseudoplatanus</i>	Sycamore maple	21	Y	NN		x	G	L	Blg 44 (Garden)	
19	<i>Metasequoia glyptostroboides</i>	Dawn redwood	15	Y	NN		x	G	L	Blg 44 (Garden)	
20	<i>Acer pseudoplatanus</i>	Sycamore maple	28.5	Y	NN		x	G	L	Blg 66	Triple leader, species of concern in WA
21	<i>Pinus sylvestris</i>	Scots pine	16	Y	NN		x	G	L	Blg 66	
22	<i>Acer circinatum</i>	Vine maple	30	Y	N		x	F	L	Blg 64	Quadruple leader; dieback on one leader
23	<i>Platanus occidentalis</i>	American sycamore	54	Y	NN		x	G	L	Blg 47	Significant tree
24	<i>Acer platanoides</i>	Norway maple	18.5	Y	IM		x	G	L	Blg 47/48	Species of concern in WA
25	<i>Platanus occidentalis</i>	American sycamore	45	Y	NN		x	G	L	Blg 48	Significant tree
26	<i>Acer pseudoplatanus</i>	Sycamore maple	20	Y	NN		x	G	L	Blg 48	Species of concern in WA
27	<i>Platanus occidentalis</i>	American sycamore	23	Y	NN		x	G	L	Blg 48/49	
28	<i>Pinus ponderosa</i>	Ponderosa pine	18	Y	N		x	G	L	Blg 48/49	
29	<i>Acer platanoides</i>	Norway maple	18	Y	IM		x	G	L	Blg 49	Species of concern in WA
30	<i>Acer platanoides</i>	Norway maple	20	Y	IM		x	G	L	Blg 49	Species of concern in WA
31	<i>Cedrus atlantica</i> 'Glauca'	Blue Atlas cedar	13.5	Y	NN		x	G	L	Blg 65/51	
32	<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan cherry	15	Y	NN		x	F/P	L/M	Blg 51/50	Tree very stressed
33	<i>Pyrus calleryana</i>	Callery pear	14	Y	NN		x	G/F	L	Blg 52	Poor branch structure
34	<i>Cedrus atlantica</i> 'Glauca'	Blue Atlas cedar	13.5	Y	NN		x	G	L	Blg 53	
35	<i>Pseudotsuga menziesii</i>	Douglas fir	20	Y	N		x	G	L	Blg 53	
36	<i>Pseudotsuga menziesii</i>	Douglas fir	37	Y	N		x	G	L	Blg 53	

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
37	<i>Populus balsamifera ssp. trichocarpa</i>	Black cottonwood	13–20	Y	N	x		G	L	Blg 91	Understory: Natives: <i>Gaultheria shallon</i> , <i>Pteridium aquilinum</i> , <i>Mahonia nervosa</i> , <i>Rubus ursinus</i> , <i>Tsuga heterophylla</i> Invasives: <i>Hedera helix</i> , <i>Ilex aquifolium</i> , <i>Rubus armeniacus</i> , <i>Crataegus monogyna</i> , <i>Prunus</i>
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Tsuga heterophylla</i>	Western hemlock		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
38	<i>Pinus monticola</i>	Western white pine	12.5	Y	N		x	G	L	Blg 91 Parking area	
39	<i>Picea pungens</i>	Colorado blue spruce	9	N	NN		x	G	L	Blg 51	
40	<i>Cedrus deodara</i>	Deodar cedar	28	Y	NN		x	G	L	Blg 50	
41	<i>Acer rubrum</i>	Red maple	32	Y	NN		x	P	M	Blg 49	Mostly dead. Recommend removal.
42	<i>Platanus occidentalis</i>	American sycamore	41	Y	NN		x	G	L	Blg 49/48	Significant tree
43	<i>Platanus occidentalis</i>	American sycamore	39	Y	NN		x	G	L	Blg 49/48	Significant tree
44	<i>Acer platanoides</i>	Norway maple	22.5	Y	IM		x	G	L	Blg 48	Species of concern in WA
45	<i>Acer pseudoplatanus</i>	Sycamore maple	19	Y	NN		x	G	L	Blg 47	
46	<i>Acer pseudoplatanus</i>	Sycamore maple	22	Y	NN		x	G	L	Bldg 47/46	
47	<i>Aesculus hippocastanum</i>	Horse chestnut	15.5	Y	NN		x	G	L	Bldg 32/31	Invasive species in WA
48	<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan cherry	15	Y	NN		x	G	L	Blg 39	
49	<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan cherry	11	Y	NN		x	G	L	Blg 39	
50	<i>Acer platanoides</i>	Norway maple	14–25	Y	IM	x		G	L	Blg 85	9 trees total, 1 large beaked hazelnut shrub (<i>Corylus cornuta</i>) also in the grove.
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Aesculus hippocastanum</i>	Horse chestnut		Y	NN						
	<i>Aesculus hippocastanum</i>	Horse chestnut		Y	NN						
	<i>Malus spp.</i>	Fruiting apple		Y	NN						
	<i>Pyrus calleryana</i>	Callery pear		N	NN						
51	<i>Ilex aquifolium</i>	English holly	~30	Y	IM		x	G	L	Blg 85	Invasive species in WA. Many leader tree
52	<i>Ilex aquifolium</i>	English holly	~30	Y	IM		x	G	L	Blg 85	Invasive species in WA. Many leader tree
53	<i>Acer platanoides</i>	Norway maple	18	Y	IM		x	G/F	L	Blg 85/86	Species of concern in WA
54	<i>Aesculus hippocastanum</i>	Horse chestnut	20	Y	NN		x	G	L	Blg 85/86	Invasive species in WA
55	<i>Acer platanoides</i>	Norway maple	19.5	Y	IM		x	G	L	Blg 89/90	Species of concern in WA
56	<i>Acer platanoides</i>	Norway maple	8–15	N	IM	x		G	L	Edge of property along Blg 34–39	Understory: <i>Rubus armeniacus</i> , <i>Hedera helix</i> , <i>Mahonia nervosa</i> , <i>Prunus laurocerasus</i> , <i>Gaultheria shallon</i> , <i>Symphoricarpos albus</i> , <i>Polystichum munitum</i> , <i>Thuja plicata</i> (sapling), <i>Geranium robertianum</i>
	<i>Acer pseudoplatanus</i>	Sycamore maple		N	NN						
	<i>Aesculus hippocastanum</i>	Horse chestnut		Y	NN						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Picea spp.</i>	Spruce		Y	NN						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
57	<i>Pseudotsuga menziesii</i>	Douglas fir	26	Y	N		x	G	L	Blg 39 edge	
58	<i>Pseudotsuga menziesii</i>	Douglas fir	31	Y	N		x	G	L	Blg 39 edge	
59	<i>Pseudotsuga menziesii</i>	Douglas fir	28	Y	N		x	G	L	Blg 39 edge	
60	<i>Acer macrophyllum</i>	Bigleaf maple	30	Y	N		x	G	L		
61	<i>Acer platanoides</i>	Norway maple	12–35	Y	IM	x		G	L	Edge of property adjacent to Blg 28	Understory: <i>Rubus armeniacus</i> , <i>Convolvulus arvensis</i> , <i>Ranunculus repens</i> , <i>Pteridium aquilinum</i> , <i>Geranium robertianum</i> , <i>Epilobium ciliatum</i> , <i>Hedera helix</i> , <i>Rumex crispus</i>
	<i>Acer pseudoplatanus</i>	Sycamore maple		Y	NN						
	<i>Aesculus hippocastanum</i>	Horse chestnut		Y	NN						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Prunus emarginata</i>	Bitter cherry		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western hemlock		Y	N						
62	<i>Pseudotsuga menziesii</i>	Douglas fir	14	Y	N		x	G	L	Blg 28	
63	<i>Acer macrophyllum</i>	Bigleaf maple	8–35	Y	N	x				Edge of property adjacent to open field	Multistem madrones. Some are partially dead. Madrones ~14" dbh. Understory: <i>Symphoricarpos albus</i> , <i>Rubus armeniacus</i> , <i>Rubus ursinus</i> , <i>Ilex aquifolium</i> , <i>Dactylis glomerata</i> , <i>Hedera helix</i> , <i>Mahonia nervosa</i> , <i>Crataegus monogyna</i> , <i>Mahonia aquifolium</i> , <i>Plantago lanceolata</i>
	<i>Alnus rubra</i>	Red alder		Y	N						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Cornus nuttalli</i>	Pacific dogwood		Y	N						
	<i>Cornus nuttalli</i>	Pacific dogwood		Y	N						
	<i>Cornus nuttalli</i>	Pacific dogwood		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
64	<i>Thuja plicata</i>	Western redcedar	28.5	Y	N		x	G	L	Parking lot in south	
65	<i>Ilex aquifolium</i>	English holly	19	Y	IM		x	G	L		Double leader. Invasive species in WA.
66	<i>Ilex aquifolium</i>	English holly	20	Y	IM		x	G	L		Double leader. Invasive species in WA.
67	<i>Pseudotsuga menziesii</i>	Douglas fir	26	Y	N		x	G	L		
68	<i>Arbutus menziesii</i>	Pacific madrone	12	Y	N		x	G	L		Significant tree
69	<i>Alnus rubra</i>	Red alder	40	Y	N		x	G	L		~7 leaders
70	<i>Prunus emarginata</i>	Bitter cherry	30	Y	N		x	G	L		~6 leaders, thicket

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
71	<i>Pseudotsuga menziesii</i>	Douglas fir	~20	Y	N	x		G	L		10 Douglas fir and 1 Western redcedar in grove. Understory: <i>Ilex aquifolium</i> , <i>Juniperus</i> sp (shrub), <i>Acer platanoides</i> (sapling), ornamental rose
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
72	<i>Populus balsamifera ssp. trichocarpa</i>	Black cottonwood	18	Y	N		x	G/F	L		Suckering at base
73	<i>Platanus occidentalis</i>	American sycamore	39	Y	NN		x	G	L		Significant tree
74	<i>Platanus occidentalis</i>	American sycamore	24	Y	NN		x	G	L		Some dead branches. Recommend pruning.
75	<i>Prunus serrulata 'Kwanzan'</i>	Kwanzan cherry	15	Y	NN		x	F	L		Overtaken by Himalayan blackberry
76	<i>Quercus rubra</i>	Northern red oak	30	Y	NN		x	G	L		
77	<i>Platanus occidentalis</i>	American sycamore	~80	Y	NN		x	G	L		4 leaders
78	<i>Prunus serrulata 'Kwanzan'</i>	Kwanzan cherry	24	Y	NN		x	G/F	L		Drought stress, some dieback
79	<i>Acer pseudoplatanus</i>	Sycamore maple	22	Y	NN		x	F	L		Branch dieback
80	<i>Platanus occidentalis</i>	American sycamore	28	Y	NN		x	G	L		
81	<i>Ulmus spp.</i>	Elm	25	Y	NN		x	F	L		Dieback on the crown. Surrounded by dense invasive species.
82	<i>Aesculus hippocastanum</i>	Horse chestnut	17.5	Y	NN		x	F	L		Dieback on the crown.
83	<i>Acer pseudoplatanus</i>	Sycamore maple	28	Y	NN		x	G	L		Multistem
84	<i>Acer platanoides</i>	Norway maple	22	Y	IM		x	G	L		
85	<i>Acer pseudoplatanus</i>	Sycamore maple	25	Y	NN		x	G/F	L		Some crown dieback
86	<i>Acer pseudoplatanus</i>	Sycamore maple	35	Y	NN		x	G	L		Multistem
87	<i>Acer pseudoplatanus</i>	Sycamore maple	40	Y	NN		x	G	L		7 leaders
88	<i>Acer pseudoplatanus</i>	Sycamore maple	35	Y	NN		x	G	L		6 leaders
89	<i>Acer pseudoplatanus</i>	Sycamore maple	15	Y	NN		x	G	L		2 leaders
90	<i>Acer pseudoplatanus</i>	Sycamore maple	35	Y	NN		x	G	L		5 leaders
91	<i>Aesculus hippocastanum</i>	Horse chestnut	17	Y	NN		x	G	L		Invasive species in WA.
92	<i>Acer macrophyllum</i>	Bigleaf maple	39	Y	N		x	G	L		3 leaders
93	<i>Aesculus hippocastanum</i>	Horse chestnut	17	Y	NN		x	G	L	Located in dog park.	Invasive species in WA.

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
94	<i>Platanus occidentalis</i>	American sycamore	38	Y	NN		x	G	L	Located in dog park.	
95	<i>Aesculus hippocastanum</i>	Horse chestnut	18.5	Y	NN		x	G	L	Located in dog park.	Invasive species in WA.
96	<i>Quercus rubra</i>	Northern red oak	24.5	Y	NN		x	G/F	L	Located in dog park.	Small branch dieback
97	<i>Quercus rubra</i>	Northern red oak	24	Y	NN		x	G/F	L	Located in dog park.	Small branch dieback. Recommend pruning to reduce risk of branches falling in dog park.
98	<i>Platanus occidentalis</i>	American sycamore	20	Y	NN		x	G	L	Located in dog park.	
99	<i>Platanus occidentalis</i>	American sycamore	34	Y	NN		x	G	L	Located in dog park.	
100	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	26	Y	N		x	G	L	Located in dog park.	
101	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	26	Y	N		x	F	L	Located in dog park.	Interior branches are dead (close to other tree)
102–104	Missed using these numbers in the field										
105	<i>Thuja plicata</i>	Western redcedar	24	Y	N		x	G	L		
106	<i>Acer platanoides</i>	Norway maple	12.5–30	Y	IM	x		G	L	NE Corner of the property	
	<i>Acer platanoides</i>	Norway maple		Y	IM						
	<i>Chamaecyparis cultivar</i>	Yellow-leaved cypress		Y	NN						
	<i>Picea sylvestris</i>	Scots pine		Y	NN						
	<i>Prunus emarginata</i>	Bitter cherry		Y	N						
107	<i>Ilex aquifolium</i>	English holly	~18–23	Y	IM	x		G	L	NE Corner of the property	Understory: <i>Corylus cornuta</i> , <i>Pteridium aquilinum</i> , <i>Gaultheria shallon</i>
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pinus sylvestris</i>	Scots pine		Y	NN						
	<i>Prunus emarginata</i>	Bitter cherry		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
108	<i>Acer platanoides</i>	Norway maple	~18–27	Y	IM	x		G	L	NE Corner of the Property	Understory: <i>Rubus armeniacus</i> , <i>Pteridium aquilinum</i>
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Crataegus monogyna</i>	Common hawthorn		Y	I						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
109	<i>Arbutus menziesii</i>	Pacific madrone	23	Y	N		x	G	L		
110	<i>Pseudotsuga menziesii</i>	Douglas fir	10	N	N		x	G	L		
	<i>Pinus ponderosa</i>	Ponderosa pine	25-Nov	Y	N		x	G	L		
111	<i>Acer platanoides</i>	Norway maple	12–30	Y	IM	x		G	L	Back strip along road	Understory: <i>Rubus ursinus</i> , <i>Hedera helix</i> , <i>Rubus armeniacus</i> , <i>Gaultheria shallon</i> , <i>Oemleria cerasiformis</i>
	<i>Thuja plicata</i>	Western redcedar		Y	N						

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
112	<i>Tsuga heterophylla</i>	Western hemlock	20	Y	N		x	G	L		
113a	<i>Pseudotsuga menziesii</i>	Douglas fir	32	Y	N	x		G	L		Duplicate entry of 113 in the field. Have been
113b	<i>Thuja plicata</i>	Western redcedar	36.5	Y	N	x		G	L		Duplicate entry of 113 in the field. Have been relabeled as 113a and 113b to differentiate groups.
	<i>Pinus monticola</i>	Western white pine	20–36	Y	N			G	L		
	<i>Alnus rubra</i>	Red alder		Y	N			G	L		
114	<i>Arbutus menziesii</i>	Pacific madrone	22	Y	N	x		G	L	Back fence	Understory: <i>Gaultheria shallon</i>
	<i>Thuja plicata</i>	Western redcedar	12+	Y	N			G	L		
	<i>Pinus ponderosa</i>	Ponderosa pine		Y	N			G	L		
115	<i>Thuja plicata</i>	Western redcedar	15–24	Y	N	x		G	L	Woodshed area	Understory: <i>Vaccinium parvifolium</i> , <i>Pteridium aquilinum</i> , <i>Mahonia nervosa</i> , <i>Polystichum</i>
	<i>Tsuga heterophylla</i>	Western hemlock		Y	N			G	L		
116	<i>Arbutus menziesii</i>	Pacific madrone	8–25	Y	N	x		G	L		Understory: <i>Mahonia nervosa</i> , <i>Gaultheria shallon</i>
	<i>Ilex aquifolium</i>	English holly		N	IM						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
	<i>Tsuga heterophylla</i>	Western hemlock		Y	N						
117	<i>Cedrus deodara</i>	Deodar cedar	20	Y	NN		x	G	L		
118	<i>Tsuga heterophylla</i>	Western hemlock	25	Y	N		x	G	L		
119	<i>Pseudotsuga menziesii</i>	Douglas fir	25	Y	N		x	G	L		
120	<i>Pinus monticola</i>	Western white pine	9–14	Y	N	x		G/F	L	North of Blg 56	Planted too close together and scraggly
	<i>Pinus monticola</i>	Western white pine		N	N						
	<i>Pinus monticola</i>	Western white pine		N	N						
	<i>Pinus monticola</i>	Western white pine		N	N						
	<i>Pinus monticola</i>	Western white pine		Y	N						
121	<i>Pinus sylvestris</i>	Scots pine		Y	NN						
122	<i>Acer platanoides</i>	Norway maple	14–25	Y	IM	x				West of Blg 55	About 35 trees. Understory: <i>Gaultheria shallon</i> , <i>Pteridium aquilinum</i>
	<i>Populus balsamifera ssp. trichocarpa</i>	Black cottonwood		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
123	<i>Arbutus menziesii</i>	Pacific madrone		Y	N	x				NW of Blg 55	Understory: <i>Gaultheria shallon</i>
	<i>Pinus sylvestris</i>	Scots pine		Y	NN						
	<i>Pseudotsuga menziesii</i>	Douglas fir			N						
124	<i>Pinus sylvestris</i>	Scots pine	30	Y	NN		x	G	L		Around 10 leaders
125	<i>Prunus serrulata 'Kwanzan'</i>	Kwanzan cherry	15	Y	NN						
126	<i>Alnus rubra</i>	Red alder	~8–28	N	N	x				NW of Blg 59	Madrones are in good condition. Large conifers. Understory: <i>Gaultheria shallon</i> , <i>Pteridium aquilinum</i>
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
127	<i>Arbutus menziesii</i>	Pacific madrone	~8–25	Y	N	x		F/P	M	North of Blg 60	Pines not doing well. Branch dieback around 30' up. Very large madrone.
	<i>Pinus monticola</i>	Western white pine		Y	N						
128	<i>Acer macrophyllum</i>	Bigleaf maple	~8–25	Y	N	x		G	L	Many large ARME at the base of the hill	Understory: <i>Crataegus monogyna</i> , <i>Rubus armeniacus</i> , <i>Pteridium aquilinum</i> , <i>Gaultheria shallon</i> , <i>Prunus laurocerasus</i>
	<i>Aesculus hippocastanum</i>	Horse chestnut		N	NN						
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Ilex aquifolium</i>	English holly		N	IM						
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
129	<i>Prunus laurocerasus</i>	English laurel	24	N	IM		x				4 leaders. Invasive species.
130	<i>Cercis canadensis</i>	Eastern redbud	12	Y	NN	x		G/F	L	South of Blg 60	1 dead, 4 live POTR.
	<i>Picea pungens</i>	Colorado blue spruce		Y	NN						
	<i>Populus tremuloides</i>	Quaking aspen		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		~31	Y		N				
131	<i>Arbutus menziesii</i>	Pacific madrone	~10–30+	Y	N	x		G	L		
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
132	<i>Arbutus menziesii</i>	Pacific madrone	~15–30	Y	N	x		G	L	Blg 65	Adjacent to the largest grove (176). No understory.
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
133	<i>Acer pseudoplatanus</i>	Sycamore maple	8–22	N	NN	x				Field	Maple is dead
	<i>Aesculus hippocastanum</i>	Horse chestnut		N	NN						
	<i>Platanus occidentalis</i>	American sycamore		Y	NN						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
134	<i>Quercus rubra</i>	Northern red oak	27.5	Y	NN		x			Field	
	<i>Platanus occidentalis</i>	American sycamore	12–24	Y	NN		x			Field	
135	<i>Platanus occidentalis</i>	American sycamore	25	Y	NN						
	<i>Acer platanoides</i> 'Crimson King'	Crimson King Norway maple	20	Y	IM						
	<i>Pinus sylvestris</i>	Scots pine	21	Y	NN						
	<i>Pinus ponderosa</i>	Ponderosa pine	20	Y	N						
136	<i>Abies concolor</i>	White fir	12	Y	NN		x	F/P	L	Planting median	Declining
	<i>Pinus strobus</i>	Eastern white pine	15	Y	NN	x		G	L	Planting median	4 trees
137	<i>Arbutus menziesii</i>	Pacific madrone	12	Y	N		x	G	L		
	<i>Betula pendula</i>	Weeping silver birch	12	Y	NN		x	G	L		
	<i>Betula pendula</i>	Weeping silver birch	12	Y	NN		x	G	L		
	<i>Pinus monticola</i>	Western white pine	24–30	Y	N	x		G	L		3 trees

Fircrest Tree Survey – 2018

Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
138	<i>Pinus sylvestris</i>	Scots pine	11.5	N	NN		x	G	L	Parking median	
	<i>Pinus sylvestris</i>	Scots pine	11	N	NN		x	G	L		
	<i>Pinus sylvestris</i>	Scots pine	11	N	NN		x	G	L		
139	<i>Pinus contorta</i>	Shore pine	24	Y	N		x	F/P	L/M		Declining
140	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	20	Y	N			G	L	Little grove	
141	<i>Pinus monticola</i>	Western white pine	38	Y	N		x	G	L		
142	<i>Pseudotsuga menziesii</i>	Douglas fir	~8-25	N/Y	N	x		G	L		18 trees
	<i>Aesculus hippocastanum</i>	Horse chestnut	~22-24	Y	NN	x		G	L		3 trees
143	<i>Liquidambar styraciflua</i>	Sweetgum	22	Y	NN		x	G	L		
	<i>Pinus ponderosa</i>	Ponderosa pine	25	Y	N		x	G	L		
144	<i>Pinus ponderosa</i>	Ponderosa pine	26	Y	N		x	G	L		
145	<i>Acer macrophyllum</i>	Bigleaf maple	23	Y	N		x	G	L	Edge hedge	
	<i>Acer macrophyllum</i>	Bigleaf maple	30+	Y	N	x		G	L		4 trees
	<i>Aesculus hippocastanum</i>	Horse chestnut	20	Y	NN		x	G	L		Invasive species in WA
	<i>Platanus occidentalis</i>	American sycamore	15	Y	NN		x	G	L		
	<i>Pseudotsuga menziesii</i>	Douglas fir	12-25	Y	N	x		G	L		40+ trees
146	<i>Thuja plicata</i>	Western redcedar	18	Y	N		x	G	L		
147	<i>Aesculus hippocastanum</i>	Horse chestnut	16	Y	NN		x	G	L		Invasive species in WA
148	<i>Abies sp.</i>	Fir	24	Y	N		x	F	L	No access, end of site	Declining
	<i>Acer platanoides 'Crimson King'</i>	Crimson King Norway maple	15	Y	IM		x	G	L		1 dead tree in 148 grove
	<i>Aesculus hippocastanum</i>	Horse chestnut		Y	N		x	G	L		
	<i>Betula pendula</i>	European white birch		Y	N		x	G	L		
	<i>Pinus monticola</i>	Western white pine		Y	N		x	G	L		
	<i>Platanus occidentalis</i>	American sycamore	26.5	Y	NN		x	G	L		Significant tree, 3 trees total
149	<i>Platanus occidentalis</i>	American sycamore	41.5	Y	NN		x	G	L		Significant tree
150	<i>Acer pseudoplatanus</i>	Sycamore maple		Y	NN	x		G	L		13 total
	<i>Aesculus hippocastanum</i>	Horse chestnut	12	Y	NN		x	G	L		
	<i>Platanus occidentalis</i>	American sycamore	26.5	Y	NN		x	G	L		Significant tree
	<i>Ulmus spp.</i>	Elm		Y	NN		x	F/P	L		Dead leader, declining
151	<i>Acer rubrum</i>	Red maple	33	Y	NN		x	G	L		
	<i>Platanus occidentalis</i>	American sycamore	14	Y	NN		x	G/F	L		Branch dieback
	<i>Platanus occidentalis</i>	American sycamore	30	Y	NN		x	G	L		
	<i>Platanus occidentalis</i>	American sycamore	30	Y	NN		x	G	L		
	<i>Quercus rubra</i>	Northern red oak	22	Y	NN		x	G/F	L		Branch dieback
152	<i>Betula pendula</i>	European white birch	15	Y	NN		x	G	L		
153	<i>Pseudotsuga menziesii</i>	Douglas fir	13	Y	N		x	G	L	at stairs	
	<i>Arbutus menziesii</i>	Pacific madrone	12	Y	N		x	G	L		
154	<i>Acer macrophyllum</i>	Bigleaf maple	30	Y	N		x	G	L		Understory: <i>Hedera helix</i> , <i>Cistus scoparius</i>
155	<i>Robinia pseudoacacia</i>	Black locust	28	Y	NN		x	G	L		Invasive species in WA

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
156	<i>Aesculus hippocastanum</i>	Horse chestnut	16	Y	NN		x	G	L	lot	
	<i>Arbutus menziesii</i>	Pacific madrone	25	Y	N		x	G	L		
	<i>Juniperus virginiana</i>	Eastern red cedar	30	Y	NN		x	G	L		
	<i>Malus spp.</i>	Fruiting apple		N	NN		x	G	L		
	<i>Pseudotsuga menziesii</i>	Douglas fir	25	Y	N		x	G	L		
	<i>Robinia pseudoacacia</i>	Black locust		N	NN		x	G	L		
157	<i>Populus balsamifera ssp. trichocarpa</i>	Black cottonwood	~90	Y	N		x	G	L	retaining wall	
158	<i>Acer pseudoplatanus</i>	Sycamore maple	17	Y	NN		x	G	L		
159	<i>Pinus monticola</i>	Western white pine	26	Y	N		x	G	L		
160	<i>Acer macrophyllum</i>	Bigleaf maple	25	Y	N		x	G	L		
161	<i>Arbutus menziesii</i>	Pacific madrone	22	Y	N		x	G	L		
162	<i>Aesculus hippocastanum</i>	Horse chestnut	23	Y	NN		x	G	L		
163	<i>Pseudotsuga menziesii</i>	Douglas fir	9.5–10	N	N	x		G	L		4 trees
164	<i>Pseudotsuga menziesii</i>	Douglas fir	23	Y	N		x	G	L	Small path median	
165	<i>Thuja plicata</i>	Western redcedar	16–21	Y	N	x		G	L		7 trees
	<i>Tsuga heterophylla</i>	Western hemlock		Y	N						
166	<i>Pinus monticola</i>	Western white pine		Y	N	x		G	L		Understory: <i>Rubus armeniacus</i> , <i>Gaultheria shallon</i>
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
167	<i>Pseudotsuga menziesii</i>	Douglas fir	22	Y	N		x	G	L		
168	<i>Tsuga heterophylla</i>	Western hemlock	26.5	Y	N		x	G	L		
169	<i>Pinus monticola</i>	Western white pine	38	Y	N		x	G	L		
170	<i>Pseudotsuga menziesii</i>	Douglas fir	18–24	Y	N	x		G	L		3 trees
	<i>Thuja plicata</i>	Western redcedar	24	Y	N		x	G	L		
	<i>Prunus serrulata 'Kwanzan'</i>	Kwanzan cherry	19	Y	NN		x	G	L		
171	<i>Arbutus menziesii</i>	Pacific madrone	20	Y	N						
	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	20	Y	N						
	<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	18	Y	N						
	<i>Paulownia tomentosa</i>	Princess tree	12	Y	NN		x				
	<i>Pinus sylvestris</i>	Scots pine	12	Y	NN						
	<i>Pinus sylvestris</i>	Scots pine	10	N	NN						
	<i>Pseudotsuga menziesii</i>	Douglas fir	12	Y	N	x					3 trees
	<i>Thuja plicata</i>	Western redcedar	41	Y	N						
	<i>Tsuga heterophylla</i>	Western hemlock	23	Y	N		x				
	<i>Tsuga heterophylla</i>	Western hemlock	37	Y	N		x				
	<i>Zelkova serrata</i>	Japanese zelkova	12	Y	NN		x	G	L		

Fircrest Tree Survey – 2018											
Tree ID Number	Species	Common Name	Diameter at Breast Height (DBH)	Significant Tree?	Native, Nonnative, Invasive Monitor*, Invasive	Tree Grove	Tree Specimen	Health (Good, Fair, Poor)	Risk (Low, Medium, High)	Location (By Building [Blg] Number)	Notes
172	<i>Populus tremuloides</i>	Quaking aspen	24	Y	N		x	G	L		multi-stem
	<i>Populus tremuloides</i>	Quaking aspen	20	Y	N		x	G	L		multi-stem
	<i>Populus tremuloides</i>	Quaking aspen	18	Y	N		x	G	L		
	<i>Populus tremuloides</i>	Quaking aspen	14	Y	N		x	G	L		
	<i>Populus tremuloides</i>	Quaking aspen	12	Y	N		x	G	L		
	<i>Populus tremuloides</i>	Quaking aspen	12	Y	N		x	G	L		
173	<i>Populus tremuloides</i>	Quaking aspen	14	Y	N		x	G	L		
174	<i>Pinus monticola</i>	western white pine	37	Y	N		x	G	L		
175	<i>Thuja plicata</i>	Western redcedar	36	Y	N		x	G	L		
176	<i>Acer macrophyllum</i>	Bigleaf maple	12–30+	Y	N	x		G	L	Very large grove, around chapel/ Blg 64. Pacific madrones of significant size.	Understory: <i>Pteridium aquilinum</i> , <i>Rubus armeniacus</i> , <i>Gaultheria shallon</i> , <i>Sorbus sp.</i> , <i>Vaccinium parvifolium</i> , <i>Polystichum munitum</i>
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						
177	<i>Acer macrophyllum</i>	Bigleaf maple	12–30+	Y	N	x		G	L	Along Blg 66	Understory: <i>Pteridium aquilinum</i> , <i>Rubus armeniacus</i> , <i>Gaultheria shallon</i> , <i>Polystichum munitum</i>
	<i>Arbutus menziesii</i>	Pacific madrone		Y	N						
	<i>Pinus monticola</i>	Western white pine		Y	N						
	<i>Pseudotsuga menziesii</i>	Douglas fir		Y	N						
	<i>Tsuga heterophylla</i>	Western hemlock		Y	N						
	<i>Thuja plicata</i>	Western redcedar		Y	N						

* **Invasive Monitor (IM)** refers to WA State Noxious Weed Guidelines for species that should be monitored for invasive tendencies, but it not yet listed as noxious.

APPENDIX C

Photographic Log

CRITICAL AREAS REPORT: FIRCREST SCHOOL CAMPUS MASTER PLAN— PHOTOGRAPHIC LOG

Photo Number	Photo Description
1	Fircrest campus overview
2	East Hamlin Creek site investigation
3	East Hamlin Creek site investigation
4	Typical specimen tree—London planetree (<i>Platanus x acerifolia</i>) on campus
5	Typical tree grove—mix of species and sizes with an understory
6	Example of a specimen tree growing close to campus buildings
7	Typical tree grove with Pacific madrone (<i>Arbutus menziesii</i>) and Scotch pine (<i>Pinus sylvestris</i>)
8	Population of domesticated rabbits that are feral on campus
9	Typical specimen trees adjacent to buildings
10	Specimen trees and tree groves in the outer campus



