Urban Forest Management Plan

HAZELWOOD PARK
CITY OF NEWCASTLE

September 16, 2019

Prepared for:

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THE WATERSHED COMPANY

Title-page image: Bigleaf maple-dominant forest overstory in Hazelwood Park.

The information contained in this report is based on the application of technical guidelines currently accepted as the best available science and in conjunction with the manuals and criteria outlined in the Methods section. All discussions, conclusions and recommendations reflect the best professional judgment of the author(s) and are based upon information available at the time the study was conducted. All work was completed within the constraints of budget, scope, and timing. The findings of this report are subject to verification and agreement by the appropriate local, state and federal regulatory authorities. No other warranty, expressed or implied, is made.

Although the information in this report is based on sound methodology, internal physical flaws (such as cracking or root rot) or other conditions that are not visible cannot be detected with this limited basic visual screening. Trees are inherently unpredictable. Even vigorous and healthy trees can fail due to high winds, heavy snow, ice storms, or rain.

Tree size and condition vary with time. The attributes presented in this study represent a snapshot at the time of the field work and may not be accurate in the future.

The condition of any trees remaining after the proposed development will ultimately be affected by root disturbance, new wind exposure (windthrow), and other factors. The health condition ratings indicated in the supporting material and report attachments represent the condition at the time of field work and do not claim to represent the condition of the tree during or following restoration. Follow-up monitoring may be required to ensure changing site conditions do not result in hazardous trees or tree components.

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Executive Summary

The Watershed Company (Watershed) was retained by the City of Newcastle (City) to prepare an Urban Forest Management Plan (UFMP) for Hazelwood Park. Hazelwood park is a 7.3-acre park with a deciduous-dominated forest association comprised of primarily early-successional species. The purpose of this UFMP is to provide recommendations to improve the forest health of Hazelwood Park. This UFMP has been prepared as a reference guide for the City to direct immediate and long-term management of the urban forest. This plan was developed based on current site conditions, considerations of external factors like climate change and wildfire danger, and components of a healthy and resilient forest.

The Watershed Company conducted a field-based tree inventory June 19 - 21 and June 25, 2019, collecting data and tagging a total of 215 trees. Additional forest attributes were also collected, including invasive species presence and healthy forest areas. While performing the tree inventory, The Watershed Company also screened for and identified one jurisdictional wetland.

The goal of this UFMP is to turn Hazelwood Park into a thriving urban forest by utilizing four objectives established in the City's 2035 Comprehensive Plan, including community engagement, hazard tree mitigation, improving plant species diversity in the park, and preserving and restoring natural park systems. Specific management actions prescribed include removal of hazardous trees, removal of invasive species and debris, and installation of native plants, among others. This plan also describes recommended maintenance and monitoring protocols and includes an implementation plan, which outlines project phasing and possible future funding sources and partnership opportunities.

Finally, a prioritized list and description of immediate management activities is provided to direct management efforts immediately, and over the next 10 years. The management priority section and accompanying materials could be provided to a contractor to begin forest management work following adoption of this plan as funds become available.

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1. Overview

Hazelwood Park is a 7.3-acre resource park, located in the Newport Hills neighborhood in the City of Newcastle, which features a boardwalk through a forested wetland, soft surface trails, a knoll with a viewing area, and views of Lake Washington, Mercer Island, and Seattle (Figure 1). The park is in the north half of Section 28, Township 24 North, Range 5 East in west central King County and is surrounded by developed single-family residential neighborhoods and Hazelwood Elementary School (Figure 2). Park visitors can access the trails through a number of entrances, including from 121st Pl. SE, SE 74th St., 121st Ave. SE, and SE 73rd Pl. There is parking for three cars at the 121st Pl. SE entrance.

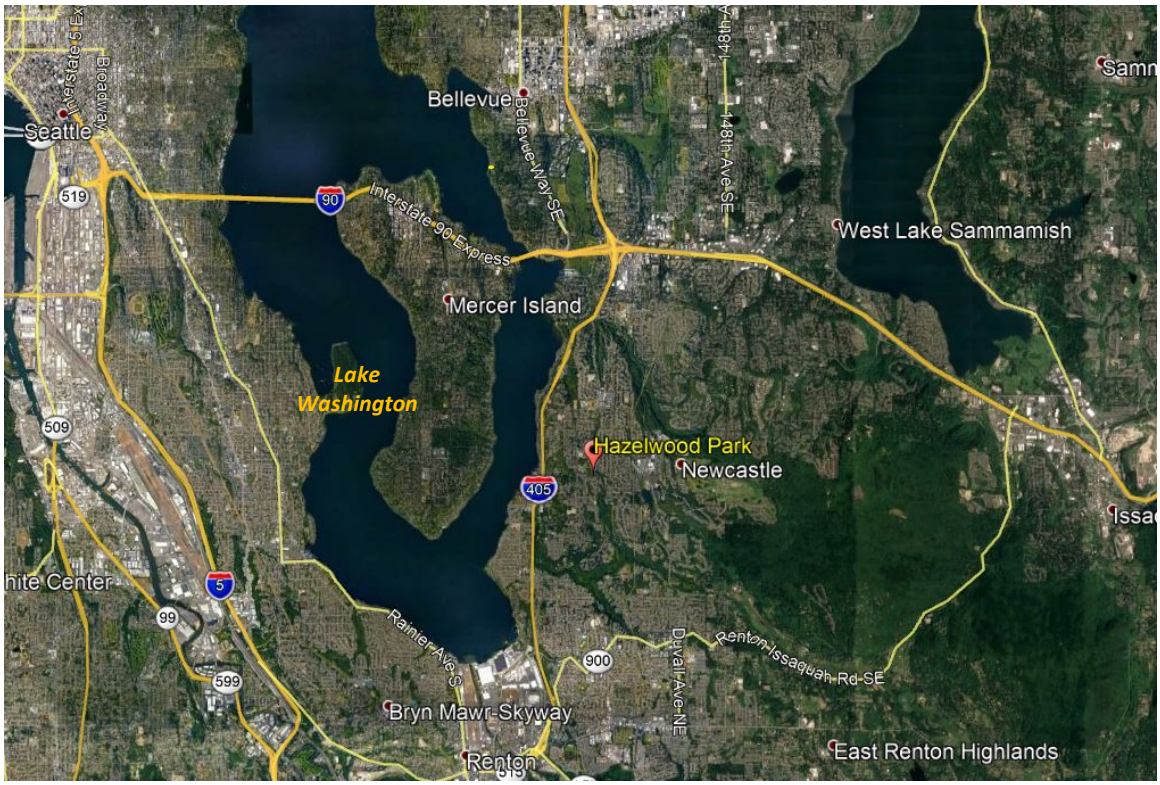

Figure 1. Vicinity map of Hazelwood Park *(Source: Google Earth).*

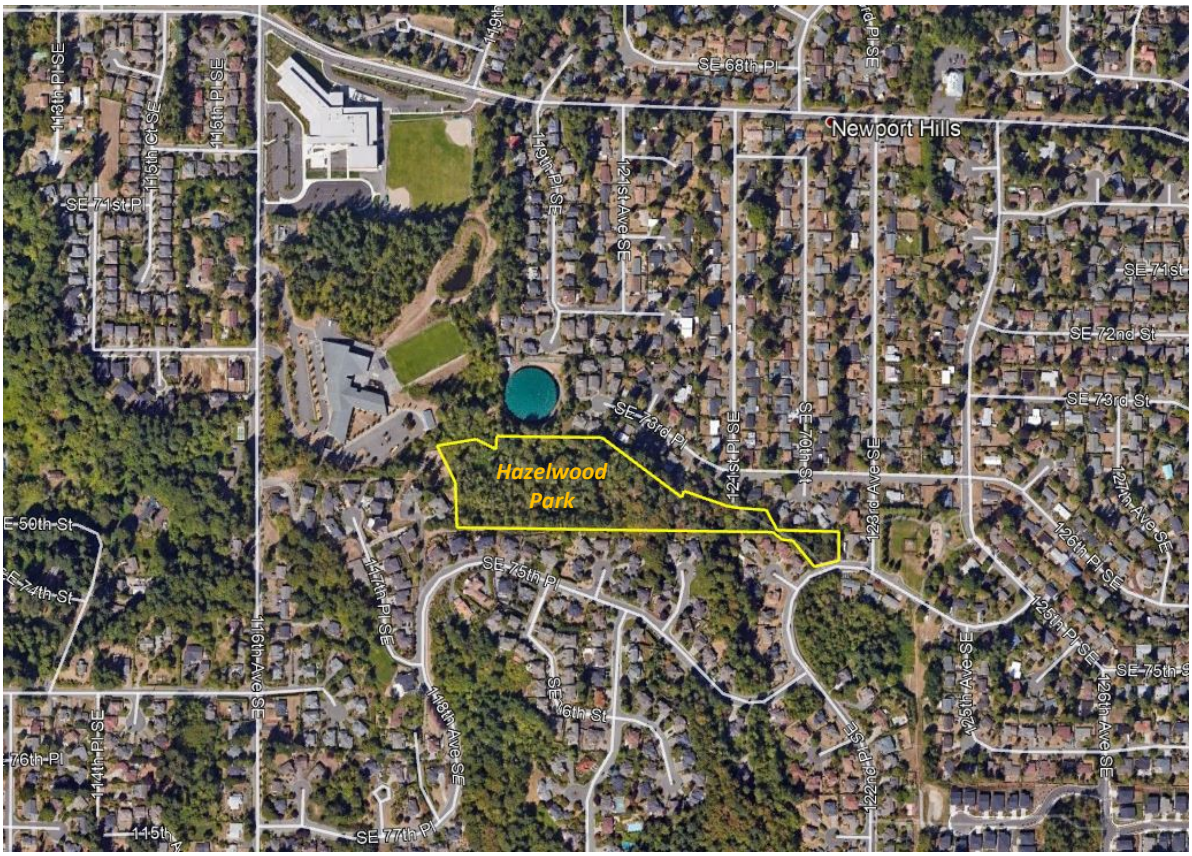

Figure 2. Study area map; approximate parcel boundaries indicated in yellow *(Source: Google Earth).*

Two City of Newcastle trails travel through the park. The Hazelwood Trail comes into Hazelwood Park from the west and ends at the junction with the CrossTown Trail. The CrossTown Trail comes into the park from the north and travels east-west through the park (Figure 3).

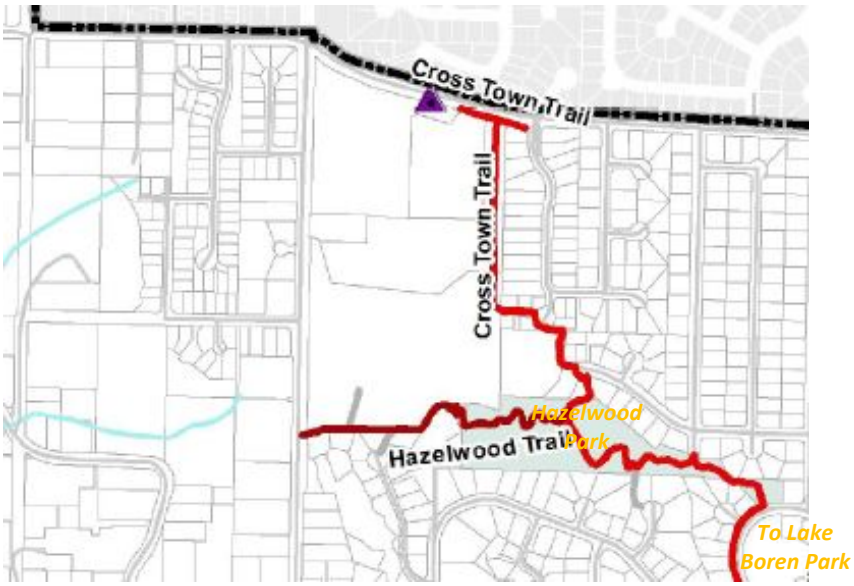

Figure 3. City of Newcastle trails map through Hazelwood Park, showing CrossTown Trail (red) and Hazelwood Trail (burgundy) *(Source: Figure PTR-3, City of Newcastle).*

Hazelwood Park is a predominately deciduous forest. The forest overstory is dominated by mature, early successional species including black cottonwood (*Populus trichocarpa*), red alder (*Alnus rubra*), and bigleaf maple (*Acer macrophyllum*), with some Douglas-fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), Pacific madrone (*Arbutus menziesii*), and Oregon ash (*Fraxinus latifolia*). The midstory has a similar association of beaked hazelnut (*Corylus cornuta*) and osoberry (*Oemleria cerasiformis*). The understory is dominated by sword fern (*Polystichum munitum*) and dull Oregon-grape (*Mahonia nervosa*). Invasive English ivy (*Hedera helix*), Himalayan blackberry (*Rubus armeniacus*), and English holly (*Ilex aquifolium*) are present in patches throughout the site.

The park is located approximately three-quarters-mile east of Lake Washington. It is within the upper portion of a drainage basin that feeds two streams which ultimately flow into Lake Washington due west of the park (see the City of Newcastle's Hydrological Features map in Appendix A). One jurisdictional wetland exists within the park.

Hazelwood Park is defined as a resource park in the City of Newcastle 2035 Comprehensive Plan (2018). Resource parks are primarily intended for the preservation of natural, cultural, or visual resources, with some passive recreational opportunities. These areas can be visually unique open spaces or environmentally sensitive areas unsuitable for development. Resource parks can accommodate some passive recreation opportunities– namely, low-impact uses such as nature viewing and soft surface trails. Development is kept to a level that preserves and protects the integrity of the resource.

The primary resources in Hazelwood Park are the native forest and forested wetland, which offer significant benefits to both people and wildlife. Because of fragmentation and the prevalence of invasive species, the species composition and age classes lack adequate diversity to sustain a healthy forest or provide resilience to climate change. As the early successional trees—such as black cottonwood, alder, and bigleaf maple—continue to fail, the result will be an increase in gaps in the canopy, which will increase invasive species competition with the native forest species. An unmanaged forest could also affect risk associated with hazardous trees. Both threats would affect the community's enjoyment of this resource park; therefore, the succession of the park's forest should be managed.

2. Background

2.1 Site History

The City of Newcastle has commissioned this plan as a result of numerous tree failure reports and removal requests from citizens. These requests are primarily associated with trees rooted along the perimeter of the park at the forest edge, and that are within striking distance of adjacent single-family homes or park trails. The City has received more than ten such requests associated with actual or potential failures over the last two years.

The number of requests is likely due to species composition of this forest. Before Euro-American settlement, this forest was presumably a mature, coniferous forest with pockets of deciduous trees. However, the stand is now dominated by deciduous trees, most of which are early-successional species prone to limb drop. Additionally, the age of the stand is now mature to over-mature, meaning limb failure or complete tree failure are going to continue.

To understand the forest in its current state, one must understand the history of Pacific Northwest logging. Following Euro-American settlement, much of the old-growth coniferous forests were quickly seen as significant natural resources and were subsequently clear-cut. This logging occurred over the next century and resulted in the forests being logged for a second and sometimes a third time (see Figure 4).

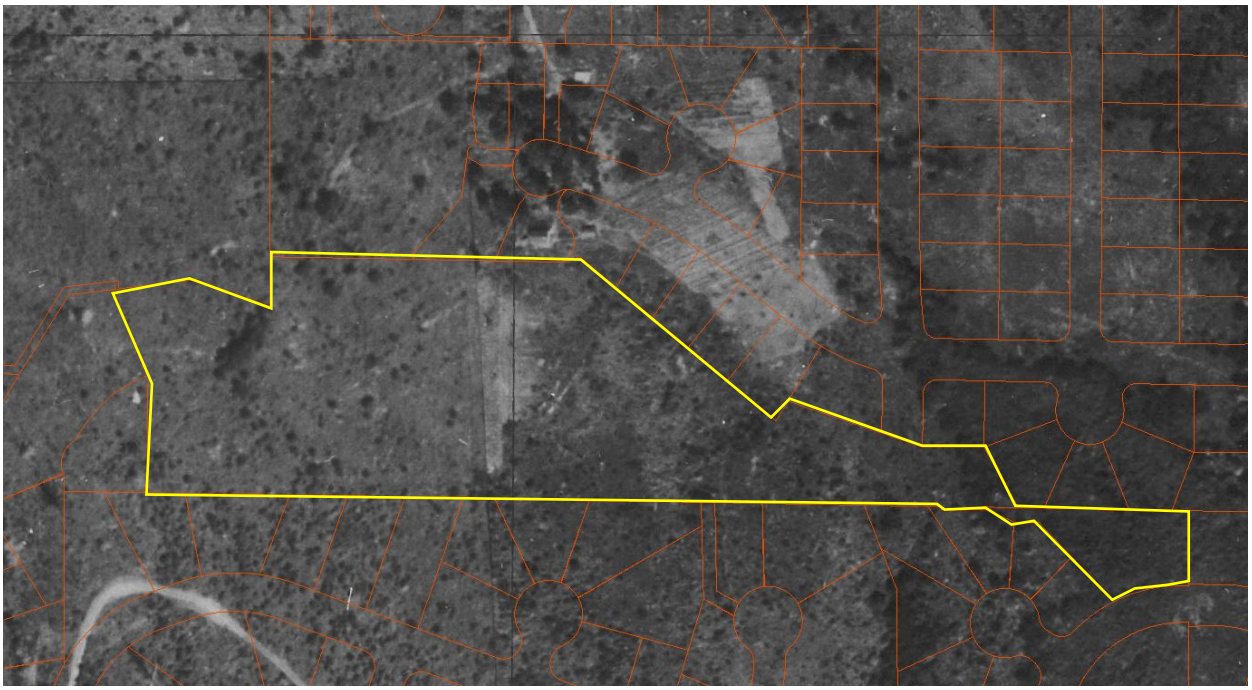

Figure 4. 1937 King County aerial photo, showing logged forest. Approximate 2019 park parcel boundary shown in yellow (*Source: King County iMap)*.

Once the King County region experienced significant growth in the later part of the twentieth century, much of this timber land was developed, except for land containing critical area features protected under the Growth Management Act. The forested land at Hazelwood Park has remained largely undeveloped but features an early successional forest that grew naturally following the disturbance of logging; however, the land lacked a coniferous seed source to renew the native coniferous forest to a more mature successional stage. As the current early-successional trees decline in health, they create gaps in the forest canopy which allow sunlight into the understory, producing ideal conditions for many non-native, invasive species, such as Himalayan blackberry and English ivy.

Based on field observations, the current forest stand is between 35 and 45 years old.

2.2 Community Values and Opportunities

Hazelwood Park is a thread of greenspace weaving through the suburban neighborhood. It is wonderful for wildlife and people, complete with 7.3 acres of urban forest and a depressional wetland. Animals can get away from people, traffic, light pollution, and noise. Visitors can close their eyes and listen to birds singing or hear the deer trotting. A growing body of research suggests that submerging oneself in, and connecting with nature, called forest bathing, has appreciable health benefits.

This park is walkable for people living in the vicinity and is an amenity for nearby neighborhoods. Residents in nearby neighborhoods are car-dependent, meaning most errands require a car. In car-dependent areas, having a safe, quiet place to exercise outside is valuable. There are two City of Newcastle trails that travel through the park. These trails connect to the larger City of Newcastle trail network and provide opportunities for Hazelwood Park neighbors to access adjacent parks and greenspace and for other neighborhoods to visit Hazelwood Park.

A number of bird species utilize Newcastle Park habitat for some portion of their life history needs. Live trees provide platforms to build nests, while dead trees provide holes for cavity nesting birds. Dense vegetation is used for cover from potential predators. Native plants produce fruits, nuts, and seeds foraged by resident and migrating species. Birds of prey may benefit from the edge habitat characteristics. As such, birding is a passive recreation opportunity at the park.

There are currently several native species with edible plant parts growing in the park. This provides an opportunity for urban foraging. This plan also calls for planting additional native species with edible attributes. Foraging is a great way to connect people with the landscape, though it does require skill in plant identification. Off-trail use is often necessary when foraging, which could cause detrimental effects to the forest floor if foraging gains popularity.

Hazelwood Park is less than a quarter mile away from both Hazelwood Elementary School and Risdon Middle School. Within both schools are opportunities to incorporate ecological restoration into the course curriculum and use Hazelwood park as a living laboratory.

3. Existing Conditions

The study area for this project includes the entirety of Hazelwood Park (parcels #4113810440 and #2824059131). The property is zoned R-6. R-6 zoning designation is considered high-density single family residential and allows for six to eight dwelling units per acre. The City of Newcastle is considering rezoning the park property to a more appropriate designation as of the writing of this report.

3.1 Soils

The Natural Resources Conservation Service has mapped two different soil types in Hazelwood Park: Alderwood gravelly sandy loam and Ovall gravelly loam (see the soil distribution map in Appendix B) (NRCS 2019).

The dominant soil type is Ovall gravelly loam; it covers the western 85-percent of the park. Ovall gravelly loam is a well-drained, gravelly soil consisting of glacial drift materials mixed with volcanic ash. The soil layer is typically less than 40-inches deep and is underlain with a restrictive layer of lithic bedrock. This well-drained soil has low water-holding potential and generally supports vegetation that can withstand summer drought.

The secondary soil type is Alderwood gravelly sandy loam; it covers the eastern 15-percent of the park. Alderwood gravelly sandy loam is a moderately well-drained soil consisting of glacial outwash and drift materials. Although it has a very low water holding capacity, the depth to the water table is typically between 18 and 37 inches. Depending on the topography and the actual depth of the water table, vegetation can range from plants that can withstand summer drought where the water table is deeper, to plants that have higher moisture requirements where the water table is shallower (for example, in the eastern area with mapped wetlands).

3.2 Wetland

3.2.1 Wetland Determination Methods

The study area was evaluated for wetlands using methodology from the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0* (U.S. Army Corps of Engineers 2010). Adjacent private property was screened from the edge of the parcel or from the nearest accessible location. Presence or absence of wetlands was determined based on an examination of vegetation, soils and hydrology. These parameters were sampled at several locations along the wetland boundary to determine the wetland edge. Wetlands were rated using the Department of Ecology's 2014 rating system (Hruby 2014) into one of four categories, determined by adding the scores of three different function types – improving water quality, hydrologic functions, and habitat functions.

Characterization of climatic conditions for precipitation in the Wetland Determination Data Forms was determined using the WETS table methodology (USDA, NRCS 2015). The "Seattle Tacoma Intl AP" station from 1981-2010 was used as a source for precipitation data (http://agacis.rcc-acis.org/). The WETS table methodology uses climate data from the three months prior to the site visit month to determine if normal conditions are present in the study area region.

The study area was also evaluated for streams based on the presence or absence of an ordinary high water mark (OHWM) as defined by Section 404 of the Clean Water Act, the Washington Administrative Code (WAC) 220-660-030, and the Revised Code of Washington (RCW) 90.58.030.

Public-domain information on the subject properties was reviewed for this delineation study including the following sources:

- Natural Resources Conservation Service (NRCS) Web Soil Survey
- United States Fish and Wildlife Service (USFWS) National Wetland Inventory
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) mapper and SalmonScape
- Washington Department of Natural Resources Forest Practices Activity Mapping Tool
- King County iMap
- City of Newcastle GIS Map Viewer

3.2.2 Wetland Determination Results

One wetland (Wetland A) has been identified within Hazelwood Park as summarized in Table 1. Wetland buffers are established based on a combination of the wetland category, habitat scores, and intensity of surrounding land use. Per Newcastle Municipal Code (NMC) 18.24.315, Wetland A has a standard buffer of 40 feet, based on a wetland rating of Category III, a habitat score of four, and low impact land use intensity (for low intensity open space). See Figure 5 for the wetland boundaries and buffer location. Supplemental documents, including wetland determination data forms, rating forms, and rating figures, are provided in Appendix C.

No streams were identified within the study area. The property lacks bed and bank characteristics, scour, sorted sediments, drainage patterns, or other OHWM indicators.

Table 1. Wetland A assessment summary.

WETLAND A – Assessment Summary

Location:	Hazelwood Park eastern area
WRIA / Sub-basin:	Cedar-Sammamish (WRIA 8) / Coal Creek sub-basin

2014 Western WA Ecology Rating:	Category III
Buffer Width and Buffer Setback:	40 feet, based on low impact land use
Wetland Size:	Approx. 0.25 acres
Cowardin Classification(s):	Palustrine forested and scrub-shrub
HGM Classification(s):	Depressional
Wetland Data Sheet(s):	DP-1
Upland Data Sheet (s):	DP-2
Flag Color:	Pink and black stripe
Flag Numbers:	A-1 through A-29

Vegetation	Tree stratum:	Pacific willow, Scouler's willow, black cottonwood, Oregon ash, red alder
	Shrub stratum:	Red-osier dogwood, ninebark, Himalayan blackberry, Douglas spiraea
	Herb stratum:	Reed canarygrass, creeping buttercup
Soils	Soil survey:	Alderwood gravelly sandy loam
	Field data:	Hydrogen sulfide (A4)
Hydrology	Source:	Groundwater, runoff, precipitation
	Field data:	Surface water, water table, saturation, hydrogen sulfide

Wetland Functions

	Improving Water Quality			Hydrologic			Habitat			
Site Potential	H	**M**	L	H	**M**	L	H	M	**L**	
Landscape Potential	H	**M**	L	H	**M**	L	H	M	**L**	
Value	H	**M**	L	**H**	M	L	H	**M**	L	**TOTAL**
Score Based on Ratings	6			7			4			17

Description and Comments

Wetland A is a depressional wetland in Hazelwood Park that is bisected by a boardwalk trail. It is very densely vegetated with a forest and shrub community. The wetland appears to largely support seasonal ponding and drains through an intermittently flowing culvert on the southeastern end.

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Figure 5. Hazelwood Park wetland map.

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3.3 Forest

3.3.1 Forest Inventory Methodology

International Society of Arboriculture (ISA) Certified Arborists® with Tree Risk Assessment Qualifications (TRAQ) conducted a field-based tree inventory on June 19 – 25, 2019, using the methods detailed below. The methodology was developed to identify, describe, and map all applicable trees within the study area.

For the purposes of this study, all alder and cottonwood, and, other species that had both a health rating of poor, very poor, or dead and were within striking distance of a target, and that meet the City of Newcastle's definition of significant, were inventoried. A significant tree is defined in the NMC 18.06.598 as "an existing healthy tree which, when measured four feet above grade, has a minimum diameter of eight inches for evergreen trees; or twelve inches for deciduous trees". Inventoried trees were tagged with a round one-and-one-quarter-inch wide, numbered aluminum tag which was affixed to the west-side of each trunk (1501 - 1715). Additionally, large stands of trees not meeting the inventory criteria described above were captured in groups and sketched as polygons using high-resolution aerial photography and GPS-located in the field.

3.3.2 Attribute Data Collection

Attributes documented for all inventoried trees include a unique identification number, species name (scientific and common), number of stems, diameter, estimated height, estimated canopy radius, condition, crown class, and general assessment notes.

In general, tree diameter was measured at four feet above the ground surface (diameter at breast height, or "DBH") using a graduated metal logger's DBH tape. Methodology for measuring diameter of trees with major leans, on steep slopes, and with multiple trunks or stems generally followed those outlined in the *Guide for Plant Appraisal* (CTLA 2018). For trees with multiple trunks, the total diameter was calculated by taking the square root of the sum of each diameter squared, allowing for comparison to other single-stemmed trees and for more accurate permitting and tree retention calculations. When the DBH resulted in a fraction, it was rounded to the nearest whole number.

Canopy radius, also known as dripline, was measured from the trunk to the outermost branch tips by estimating a vertical line to the ground. For trees with uneven crowns, the average of two opposite radii was recorded.

A Level 1: Limited Visual Assessment was used to evaluate the health and condition of trees within the study area in accordance with ISA and Council of Tree and Landscape Appraisers (CTLA) standards. Each tree was given a rating from 1-6 (Excellent – Dead) as summarized below in Table 2.

Table 2. Assessment of plant condition considers health, structure, and form. Each may be described in rating categories that will be translated into a percent rating (CTLA 2018).

Rating Category	Condition Components			Percent Rating
	Health	Structure	Form	
Excellent – 1	High vigor and nearly perfect health with little or no twig dieback, discoloration, or defoliation.	Nearly ideal and free of defects.	Nearly ideal for the species. Generally symmetric. Consistent with the intended use.	81% to 100%
Good – 2	Vigor is normal for species. No significant damage due to diseases or pests. Any twig dieback, defoliation, or discoloration is minor.	Well-developed structure. Defects are minor and can be corrected.	Minor asymmetries/deviations from species norm. Mostly consistent with the intended use. Function and aesthetics are not compromised.	61% to 80%
Fair – 3	Reduced vigor. Damage due to insects or diseases may be significant and associated with defoliation but is not likely to be fatal. Twig dieback, defoliation, discoloration, and/or dead branches may compromise up to 50% of the crown.	A single defect of a significant nature or multiple moderate defect. Defects are not practical to correct or would require multiple treatments over several years.	Major asymmetries/deviations from species norm and/or intended use. Function and/or aesthetics are compromised.	41% to 60%
Poor – 4	Unhealthy and declining in appearance. Poor vigor. Low foliage density and poor foliage color are present. Potentially fatal pest infestation. Extensive twig and/or branch dieback.	A single serious defect or multiple significant defects. Recent change in tree orientation. Observed structural problems cannot be corrected. Failure may occur at any time.	Largely asymmetric/abnormal. Detracts from intended use and/or aesthetics to a significant degree.	21% to 40%
Very Poor – 5	Poor vigor. Appears to be dying and in the last stages of life. Little live foliage.	Single or multiple severe defects. Failure is probable or imminent.	Visually unappealing. Provides little or no function in the landscape.	6% to 20%
Dead – 6				0% to 5%

Crown class describes the position of each tree within the surrounding canopy and paints a picture of the structure and stand density within the forest. The crown class determination ratings are summarized below in Table 3.

Table 3. Assessment of crown class describes the position of each tree within the surrounding canopy (USDA 2018).

Value	Description
Open Grown – (OPG)	Trees with crowns that receive full light from above and from all sides throughout most of their lives, particularly during their early developmental periods.
Dominant – (DOM)	Trees with crown extending above the general level of the crown canopy and receiving full light from above and partly from the sides. These trees are taller than the average trees in the stand and their crowns are well developed, but they could be somewhat crowded on the sides. Also, trees whose crowns have received full light from above and from all sides during early development and most of their life. Their crown form or shape appears to be free of influence from neighboring trees.
Co-dominant – (COD)	Trees with crowns at the general level of the crown canopy. Crowns receive full light from above but little direct sunlight penetrates their sides. Usually they have medium-sized crowns and are somewhat crowded from the sides. In stagnated stands, co-dominant trees have small-sized crowns and are crowded on the sides.
Intermediate – (INT)	Trees that are shorter than dominants and co-dominants, but their crowns extend into the canopy of co-dominant and dominant trees. They receive little direct light from above and none from the sides. As a result, intermediate trees usually have small crowns and are very crowded from the sides.
Overtopped – (OVT)	Trees with crowns entirely below the general level of the crown canopy that receive no direct sunlight either from above or the sides.

3.3.3 Data Management

Tree data and geospatial locations were collected in the field using an iPad with the ArcGIS Collector application. Descriptions of the attributes collected during the field survey are summarized in Appendix D.

3.3.4 Forest Inventory Results

A total of 215 trees in Hazelwood Park met the scope of this inventory analysis and were assessed. The dominant species inventoried were red alder and black cottonwood; their diameters range in size from four to 40 inches, with an average diameter of 15 inches. The trees are between 20 and 85 feet tall, with an average height of 52 feet. See Figure 6 for a map displaying inventoried trees in Hazelwood Park. A tree inventory table and location map can be found in Appendix E.

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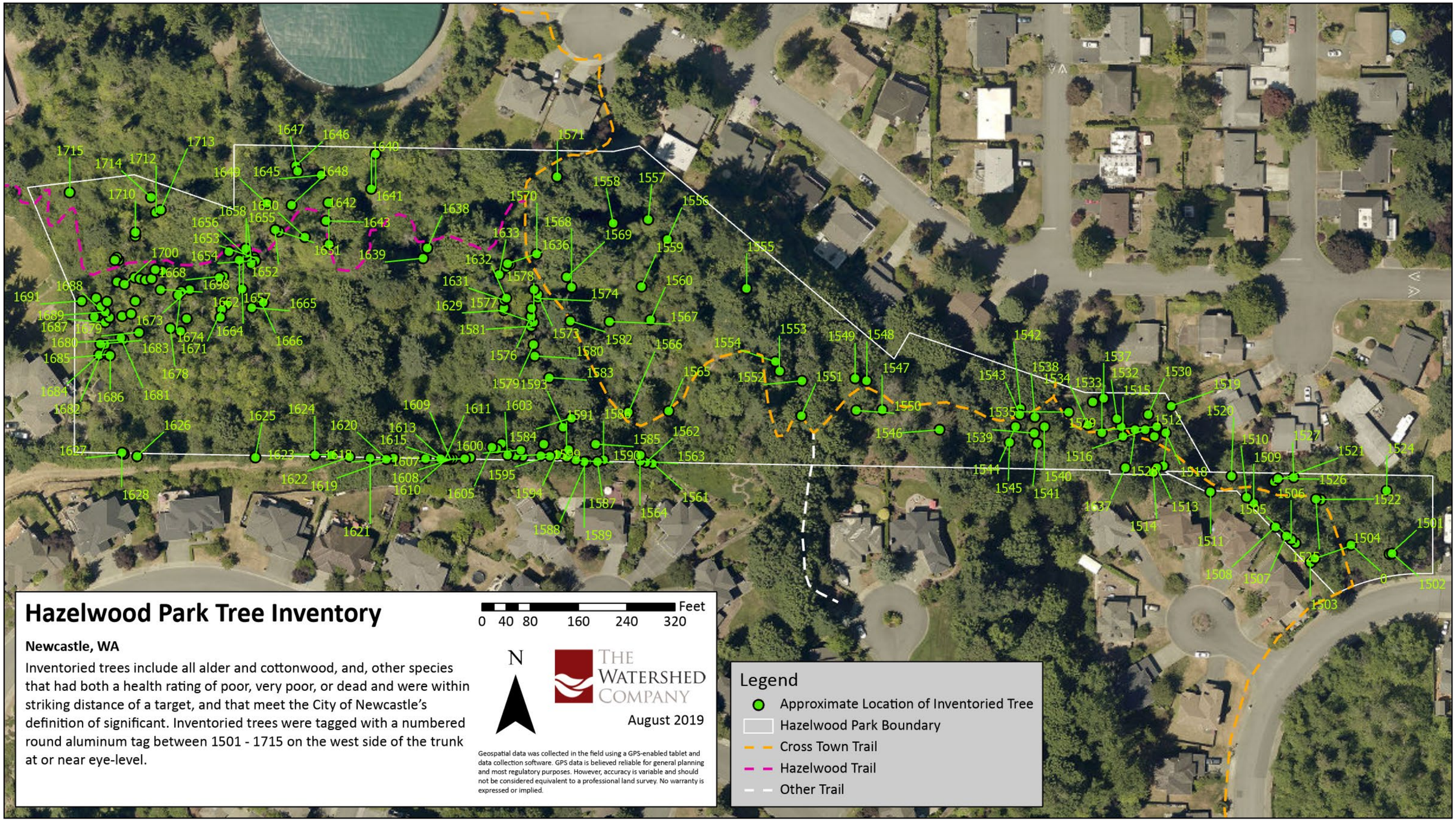

Figure 6. Hazelwood Park tree inventory map.

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3.3.5 Tree Risk Assessment

During the field work, Watershed Tree Risk Assessment Qualified (TRAQ) ISA Certified Arborists® acted as Tree Risk Assessors and used Level 1: Limited Visual Assessment methodology according to *Best Management Practices: Tree Risk Assessment* prepared by ISA (Smiley, et. al 2011). The City of Newcastle is the Tree Risk Manager. The tree worker arborist for this project has yet to be retained by the City. Guidance on the intended roles of the tree risk manager, tree risk assessor, and tree worker arborist are provided in Appendix F.

A Level 1: Limited Visual Assessment is a visual assessment from a specified perspective of an individual tree or a population of trees near specified targets, conducted to identify obvious defects or specified conditions. For the assessment at Hazelwood Park, trees within the project scope were assessed from the ground and primarily from a vantage point near the trunk of each tree. The assessor performed a visual assessment, looking for obvious defects such as dead trees, large cavity openings, large dead or broken branches, fungal fruiting structures, large cracks, or severe leans. When a tree of concern within the project scope was identified, attribute information about that tree was recorded as outlined in Appendix D.

An informal estimate of total trees within Hazelwood Park predicts that 50% of the trees within the park were included as part of the Level 1: Limited Visual Assessment. Of the trees inventoried on-site, 165 have a heath rating of poor, very poor, or dead. Of these, 69 are dead. The tree risk assessment analysis map in Figure 7 shows the locations of these trees and their estimated fall distances based upon height.

For a tree or tree part to be hazardous, it must be assessed and found likely to fail and cause an unacceptable degree of injury, damage, or disruption – that is, it poses a high or extreme risk. Risk is the combination of the likelihood of an event and the severity of the potential consequences.

The City of Newcastle has established their level of acceptable risk as removing all trees within striking distance of the trail that are dead or in very poor condition. Additionally, any tree within striking distance of a house—and with a health rating of poor, very poor, or dead—should be removed. Ninety-four inventoried trees meet the requirements for high or extreme risk (see Figure 8). The City plans to address these removals in three phases, based on funds available and site access.

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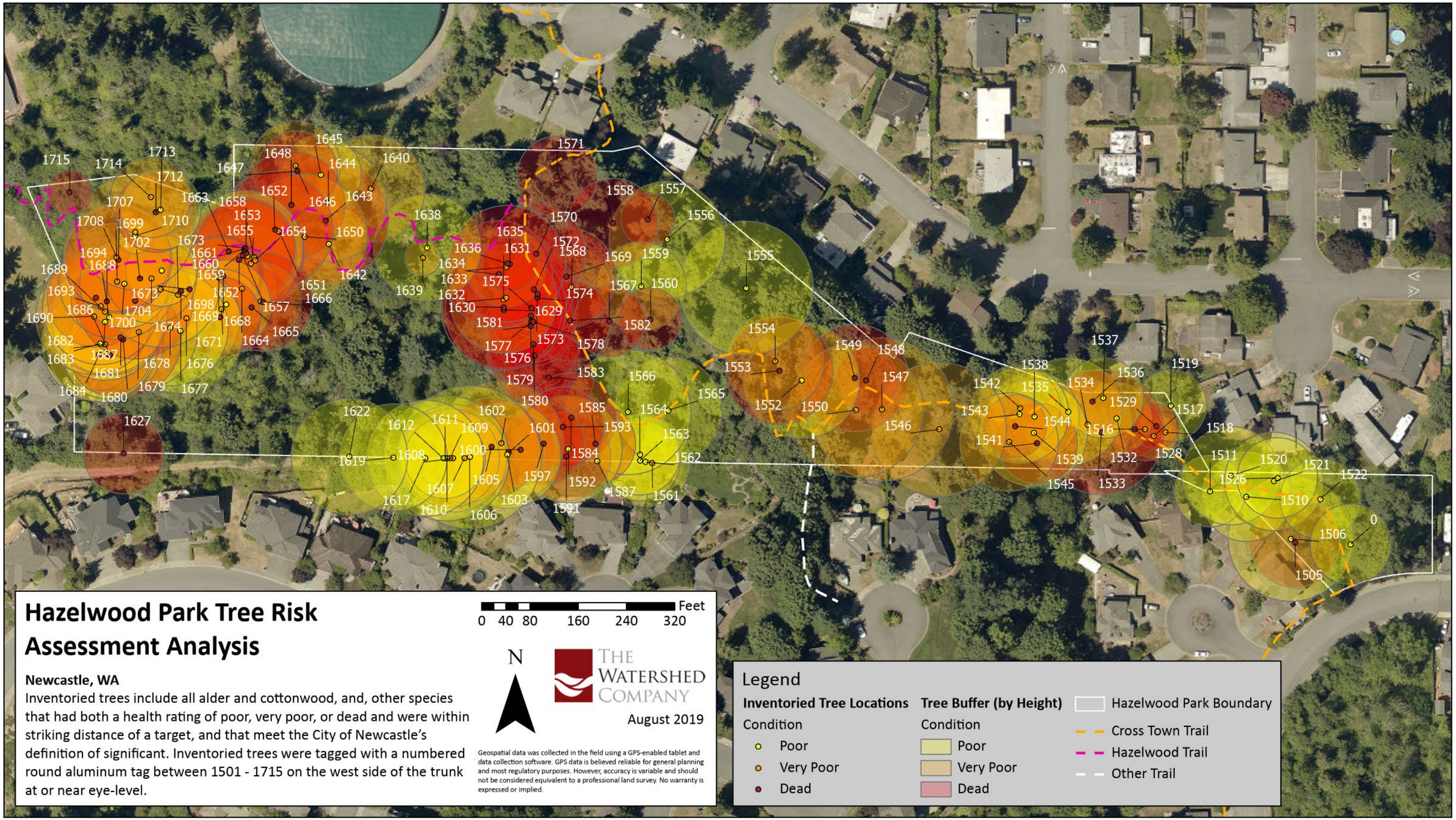

Figure 7. Hazelwood Park tree risk assessment analysis map, showing tree locations and approximate fall distance based upon tree height.

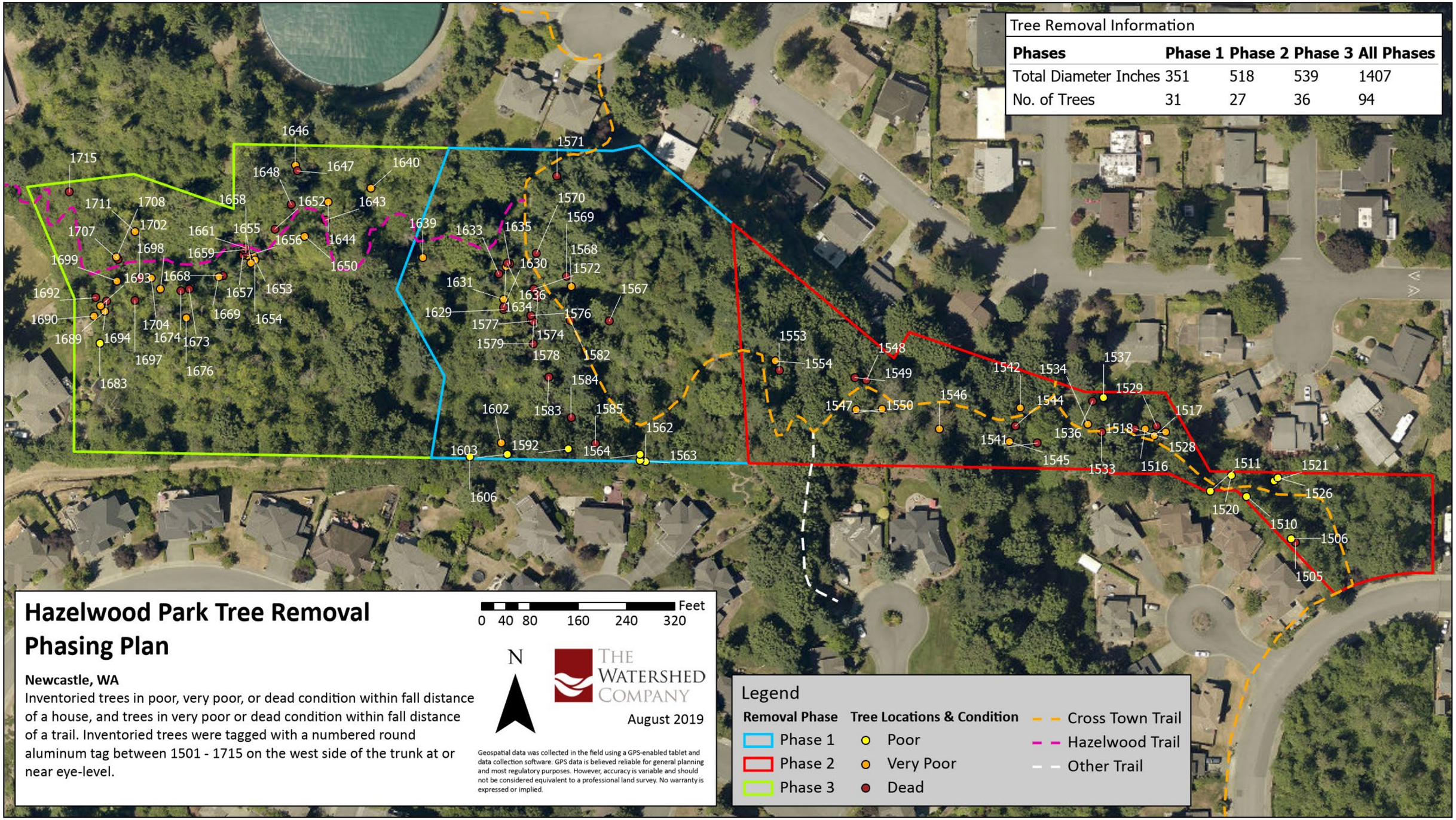

Figure 8. Trees determined to be a high or extreme risk in Hazelwood Park, based upon the results of the August 2019 assessment and analysis

3.3.6 Tree Diseases

Fungi are a natural component of a healthy forest, and they affect trees to varying degrees. Within forests of the Pacific Northwest, fungi form parasitic, symbiotic, and commensalistic relationships with other organisms in the forest, and are essential to ecosystem success. Those species that form parasitic relationships (i.e., tree diseases) are the focus when discussing tree health and risk assessment.

The extent to which fungi have detrimental effects on tree health depend upon species of fungi; the age, condition, and vigor of the tree; the tree's ability to compartmentalize decay; as well as site and climatic factors. High tree species diversity within a forest is an important site factor in increasing forest resilience to tree disease. Forest restoration needs to consider species resiliency to common pests and pathogens, and the restoration plan must provide species diversity. Without these considerations, forest fungi can be detrimental.

During the tree inventory, many common urban forest fungi were identified, including hoof fungus (*Fomes fomentarius*), weeping conk (*Inonotus dryadeus*), madrone canker (*Neofusicoccum arbuti*), and artist's conk (*Ganoderma applanatum*). At the time of the inventory, these species did not appear to be causing significant adverse effects to the urban forest and are deemed a natural part of the forest's composition and life cycle.

3.3.7 Forest Composition

The forest contains an overstory dominated by trees, a midstory dominated by large shrubs, and an understory dominated by short shrubs and herbaceous plants (see Figure 9).

The forests in Hazelwood Park were broken down into seven forest typologies—areas with similar characteristics, such as slope, aspect, and species composition. These named forested areas include the Lowland Mixed Forest, Lowland Deciduous Forest, Dry Upland Forest, The Knoll, Steep Forest, Bigleaf Maple Grove, and Forested Wetland (see Figure 10). Species observed during the forest inventory can be found in Appendix G.

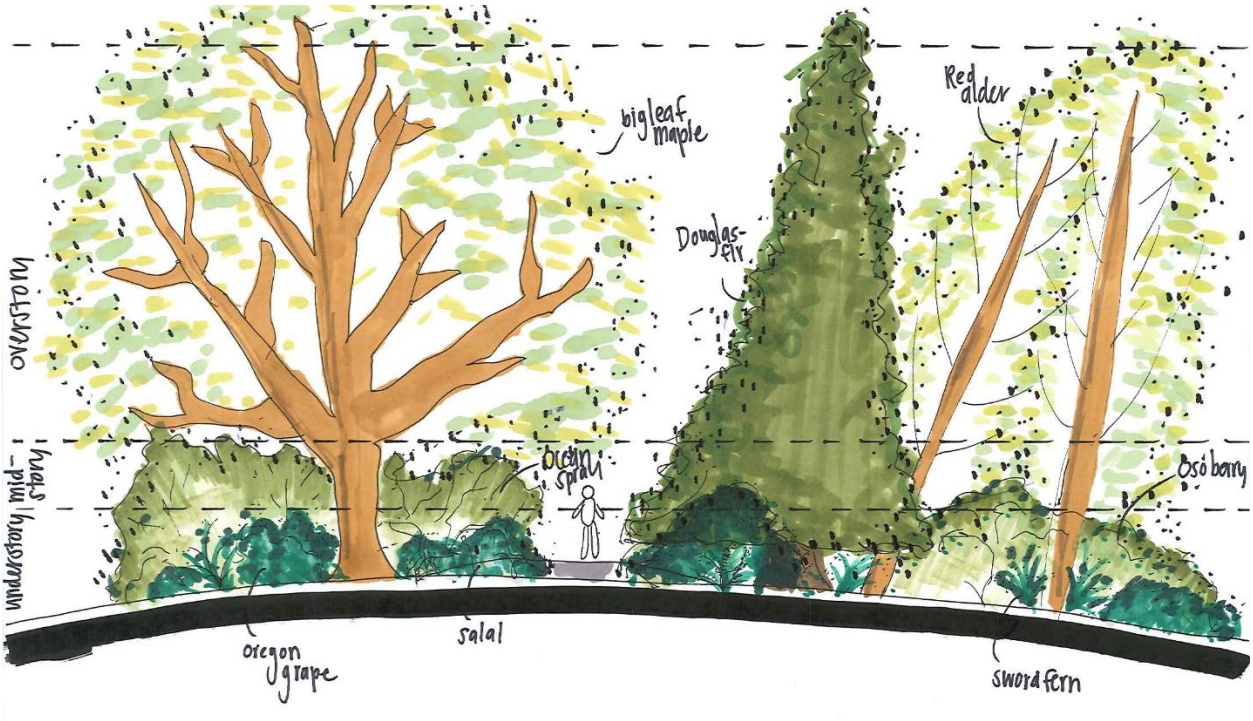

Figure 9. Typical forest composition showing overstory, midstory, and understory.

Each forested area is characterized below:

Lowland Mixed Forest

The predominant trees in the western-most forest at Hazelwood Park are Douglas-fir and red alder. Additional species include bigleaf maple, cascara (*Frangula purshiana*), and the non-native common hawthorn (*Crataegus monogyna*) and English holly. This section of forest contains many dead alder snags, as well as English ivy growing up the trunks of mature trees. The midstory contains extensive Himalayan blackberry thickets, as well as native thimbleberry (*Rubus parviflorus*) and oceanspray (*Holodiscus discolor*); the midstory also contains red elderberry (*Sambucus racemose*), snowberry (*Symphoricarpos albus*), osoberry, beaked hazelnut, and the invasive cutleaf blackberry (*Rubus laciniatus*). The understory is dominated by English ivy, bracken fern (*Pteridium aqulinum*), and stinging nettle (*Urtica dioica*), but also contains trailing blackberry (*Rubus ursinus*) and sword fern, as well as nipplewort (*Lapsana communis*), herb Robert (*Geranium robertianum*), and creeping buttercup (*Ranunculus repens*) along the trail.

Lowland Deciduous Forest

The deciduous forest primarily contains bigleaf maples and red alders, although black cottonwoods can be found growing along the southern edge of the park. Additional species include bitter cherry (*Prunus emarginata*), Pacific madrone, Douglas-fir, common hawthorn, and English holly. The midstory is dominated by beaked hazelnut, snowberry, and patches of

Himalayan blackberry. Other midstory species include osoberry and red huckleberry (*Vaccinium parvifolium*). English ivy has smothered out all other understory vegetation in a large section of the lowland deciduous forest, in addition to growing up numerous mature tree trunks. The understory also contains dull Oregon-grape, as well as salal (*Gaultheria shallon*), sword fern, bracken fern, Pacific bleedingheart (*Dicentra formosa*), largeleaved avens (*Geum macrophyllum*), trailing blackberry, and stinging nettle. Nipplewort is growing along the trail.

Dry Upland Forest

The Dry Upland Forest has a moderately-steep, west-facing slope and supports trees such as Pacific madrone, Douglas-fir, bigleaf maple, bitter cherry, and red alder; the forest contains trace amounts of Pacific crabapple (*Malus fusca*) and cascara. The midstory is dominated by oceanspray, snowberry, and beaked hazelnut, but also contains baldhip rose (*Rosa gymnocarpa*) and a few non-native cherry laurels (*Prunus laurocerasus*). The understory has dull Oregon-grape and sword fern, as well as some smaller patches on English ivy. Nipplewort, oxeye daisy (*Leucanthemum vulgare*), curly dock (*Rumex crispus*), and herb Robert are growing along the trail.

The Knoll

The Knoll is the highest elevation in the park and contains a ring of ornamental hazel shrubs and an open meadow. The dominant tree on The Knoll is the Pacific madrone; however, Douglas-fir and bigleaf maple are growing on the fringes of the peak. In addition to the native beaked hazelnut, numerous other ornamental hazel shrubs have been planted on The Knoll, in addition to cotoneaster (*Cotoneaster* sp.). The midstory contains numerous, large western serviceberry (*Amelanchier alnifolia*) shrubs, as well as oceanspray and small amounts of Himalayan blackberry. The understory contains a meadow with various grasses and non-native wildflowers, such as nipplewort, oxeye daisy, and tansy ragwort (*Senecio jacobaea*). Shinyleaf spiraea (*Spiraea lucida*) and salal also carpet the understory.

Steep Forest

This section of forest contains the steepest topography in the park and has an east-facing slope. The overstory canopy is dominated by bigleaf maple, but also contains some red alder. The midstory contains primarily osoberry, and also has some oceanspray, hairy honeysuckle (*Lonicera hispidula*), and beaked hazelnut. The understory is dominated by dull Oregon-grape and intermixed with sword fern. A large patch of nipplewort is growing toward the bottom of the slope where the native understory vegetation is sparse.

Bigleaf Maple Grove

The Bigleaf Maple Grove is a moderately steep, northeast facing slope that contains numerous large bigleaf maples, as well as scattered Douglas-fir, alder, Pacific madrone, and common hawthorn. The midstory contains osoberry and beaked hazelnut, in addition to a few vine

maples (*Acer circinatum*). Although the understory is growing sword fern and common bedstraw (*Galium aparine*), much of the understory is dominated by non-native species including a large extent of herb Robert on the slope, yellow archangel (*Lamium galeobdolon*), nipplewort, and English ivy growing on the ground and up tree trunks. Near the park entrance at 121st Place SE, turf lawn is maintained around beds of tall Oregon-grape (*Mahonia aquifolium*) and red-flowering currant (*Ribes sanguineum*).

Forested Wetland

The Forested Wetland sits in a depression and collects water from the surrounding areas. The wetland overstory is dominated by Oregon ash, Pacific willow (*Salix lasiandra*), Scouler's willow (*Salix scouleriana*), black cottonwood, Pacific crabapple, and red alder. Additional trees present in the fringes of the wetland include bigleaf maple and western red cedar. The midstory is dominated by red-osier dogwood (*Cornus stolonifera*), Pacific ninebark (*Physocarpos capitatus*), black twinberry (*Lonicera involucrata*), and Douglas spiraea (*Spiraea douglasii*). Some patches of Himalayan blackberry and stinging nettle are also growing in the wetland or on its fringes. The understory contains slough sedge (*Carex obnupta*), and small patches of reed canarygrass (*Phalaris arundinacea*) and bittersweet nightshade (*Solanum dulcamara*).

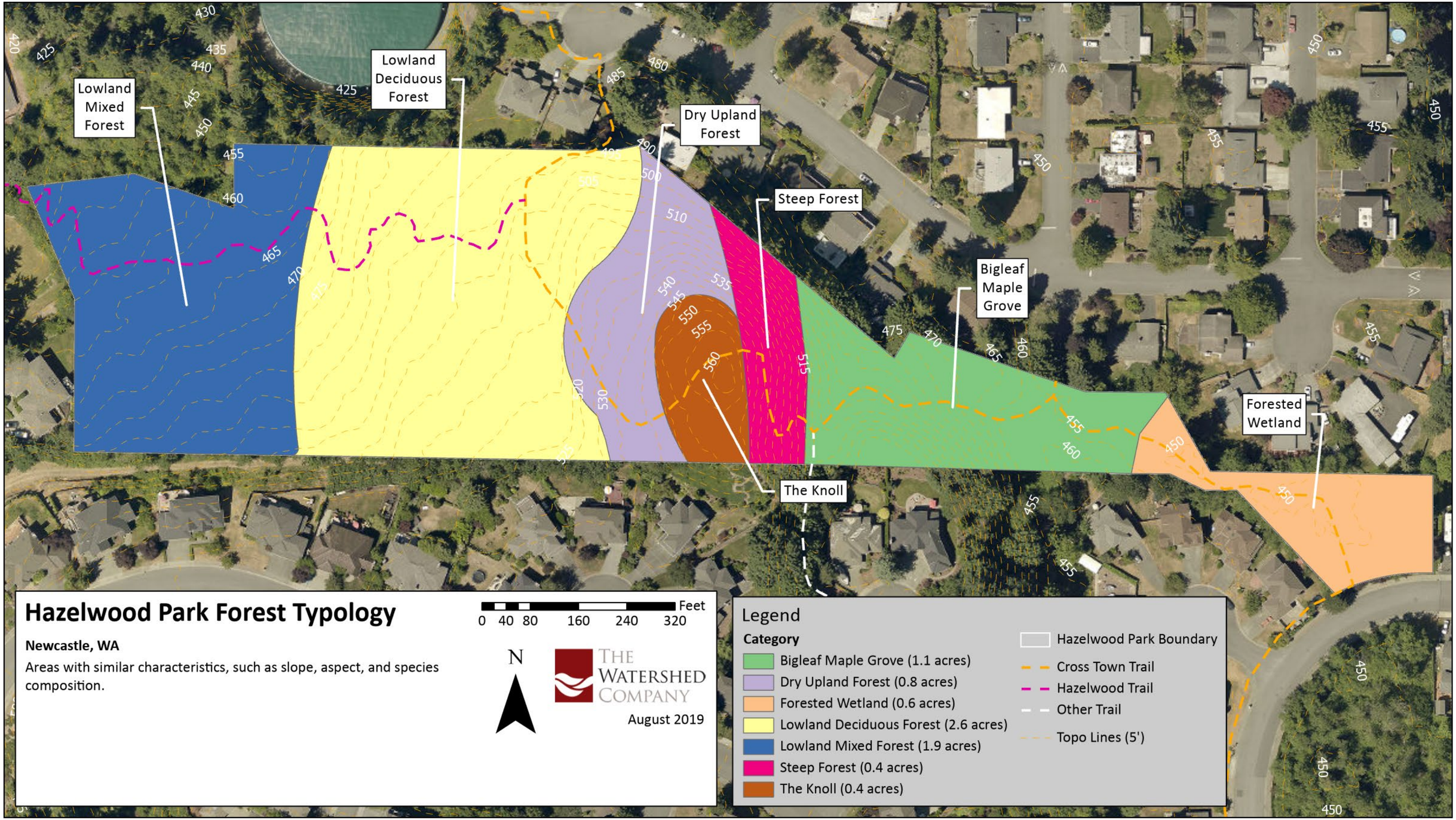

Figure 10. Forest typology map.

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3.3.8 Influences from Landscape Structure

The structural pattern of a landscape describes the arrangement of elements—such as patches, corridors, edges, and matrix—and is useful in determining how flora and fauna move within and between different ecological niches and how the arrangement of elements impacts the ecology of a space (Dramstad, et. al 1996).

Hazelwood Park contains a patch of forest in a matrix of suburban development and other patches of forest. The park is surrounded by a considerable amount of edge habitat. Nearly all the boundaries of the linear forest are adjacent to single-family residences, which are open and sunny, and dominated by turf lawns. In multiple locations throughout the forest edge, adjacent residents have dumped yard waste and construction debris in the park. The forest edges are already subject to exposure and urban conditions; dumping residential debris exacerbates the struggle to maintain a healthy forest. Yard waste can contain invasive or weedy plants that easily spread through the forest understory, smothering native plants and changing the composition of the forest. The sheer weight and size of the debris piles also smothers native plants and creates unnatural conditions.

A pedestrian trail runs through the center of the park and has become a corridor for weedy, low-growing plants. Seeds are spread easily via the soles of shoes or by clinging to clothing or the fur of animals. The following weedy species are growing along much of the trail: nipplewort, herb Robert, and creeping buttercup.

3.4 Habitat

Hazelwood Park offers local wildlife species both upland and wetland forested habitats within a suburban landscape matrix. Deer and raccoons make use of the park's available upland habitat, along with many other birds and small mammals. Frogs and salamanders may utilize seasonally ponded areas of the forested wetland.

Individual on-site trees, which collectively create the landscape-defining forests in the park, provide valuable habitat functions to wildlife. Standing snags and dead parts of live trees (especially those that are large in diameter) are types of special habitat features that are particularly important to many wildlife species.

One primary ecological function of trees is to provide habitat to wildlife. This can be particularly important in urban settings, where natural areas are replaced with development. Forests located in Puget Sound urban areas trend toward younger tree stands with limited amounts of standing dead material. However, standing snags and dead parts of live trees (especially those that are large in diameter) provide valuable habitat to many wildlife species.

Numerous standing snags (i.e., dead trees) are present in Hazelwood Park; 69 were inventoried in the field investigations. Snags are typically red alder or black cottonwood trees and range in size from four to 32 inches DBH, with an average size of 14 inches DBH. Some snags have been created (retained) after removal of large cottonwood trees. Other snags do not exhibit signs of management. Several large, live bigleaf maples also contained large dead stems with excavated cavities present. In addition to natural cavities, a number of constructed bird houses have been installed on live tree trunks throughout Hazelwood Park.

Species that could be expected to utilize these types of habitat features in urban settings range from a variety of birds to bats and other mammals. Chickadees, nuthatches, woodpeckers, flickers, swallows, wrens, owls, and some ducks all utilize tree cavities during the breeding season. Bats rely on snags and tree cavities for roosting; and squirrels and raccoons may also nest in cavities.

Not only do snags offer wildlife species a place to live, but the decaying wood supports populations of insects on which many species may forage. Once fallen, decaying downed wood provides wildlife with yet another habitat type and contributes nutrients to the soil.

The risks and benefits of retaining habitat features like standing snags and dead tree parts should be carefully considered during management activities. Factors to consider for management may include tree size, extensiveness of decay, proximity to public areas, current wildlife use, and timing of management activities. See Section 5.2.7 for detailed management recommendations.

3.5 Existing Management Activities

The City of Newcastle currently manages the trails at Hazelwood Park on an as-needed basis, without regular maintenance intervals. To fund management of the urban forest at Hazelwood Park, primary funding is received from the fee-in-lieu for retention or replacement outlined in NMC 18.16.171. Fee-in-lieu funds have specific requirements for how they can be used and fluctuate year-to-year with development. Fee-in-lieu funds can be used for:

1. Cost of removing invasive plants where the tree will go
2. Cost of new tree
3. Cost of woodchips to suppress invasive species from returning
4. Watering the new tree through the establishment period
5. Ongoing maintenance to remove invasive plants around the trees through the establishment period

Eagle Scout projects have also been a source of park management activities. Past projects have included installation of nesting boxes, repair of the viewing platform, and ivy removal.

4. Forest Management Factors

4.1 Species Analysis

Tree species have differing inherent characteristics, which are important to consider when managing forest stands. The following species are the predominant trees in Hazelwood Park; their descriptions are adapted from Julian Dunster's *Preliminary Species Profiles for Tree Failure Assessment* (Dunster 2003).

4.1.1 Red Alder (*Alnus rubra*)

Red alder are fast growing pioneer species in the lowland Puget Sound forests. They have short life spans, typically between 60 and 80 years. Red alder is not shade or drought tolerant but can grow in poor soils as they fix atmospheric nitrogen, thus improving the soil for later successional species. After maturing and entering a state of decline, alder generally have crown dieback and shed lateral limbs, but are not typically subject to windthrow unless affected by root disease or changing edge conditions (such as the removal of adjacent trees). Alder trunks can remain standing with extensive trunk decay and provide excellent habitat for nesting birds.

4.1.2 Black Cottonwood (*Populus trichocarpa*)

Black cottonwoods are vigorously growing, pioneer trees with open canopies and large lateral limbs. They are short lived, typically less than 100 years, but begin to decline between 60 and 80 years. Black cottonwoods are intolerant of shade and drought; they require consistent moisture and fertile, well-oxygenated soil. In ideal soil, they can have deep root systems; in wet areas, they develop shallow roots and are subject to windthrow. Cottonwoods are known to drop large lateral limbs at any time of the year. Co-dominant trunks are more prone to trunk failure, as are smaller, suppressed trees with root disease. Declining cottonwood trunks provide ideal habitat for nesting birds.

4.1.3 Bigleaf Maple (*Acer macrophyllum*)

Bigleaf maples are large, shade-intolerant trees with well-rounded crowns and forked lateral branches. They grow best in well-drained soil but can tolerate short periods of flooding. Bigleaf maples generally live between 50 and 200 years. After reaching maturity, limbs often die back and remain attached to the tree for several years before dropping. Bigleaf maples are not typically subject to windthrow, but they are prone to trunk failure at the junction of multiple co-

dominant trunks or at the base due to root rot. Old trees may collapse; warning signs include the presence of fungal fruiting bodies and extensive columns of decay.

4.1.4 Douglas-fir (*Pseudotsuga menziesii*)

Douglas-fir are large, dominant coniferous trees in the Puget Lowland forests. They are tolerant of light shade and have broad, conical canopies with long, lateral branches. In dense canopy conditions, they are self-pruning and shed lateral branches, especially during windstorms. In general, Douglas-fir prefer well-aerated soils that are not too wet or compacted. In wet, shallow soils, they are prone to windthrow during wind events. Whole tree failure can occur due to heart rot; warning signs include top dieback, sparse foliage, and bulging on the lower trunk.

4.2 Climate Change

As a result of climate change, overall warming and potentially increased winter precipitation and decreased summer precipitation are predicted for the Pacific Northwest. Increased winter precipitation is projected to shift seasonal water flow patterns to earlier in the season. Potential impacts of these changes are essential to managing Hazelwood Park in the future. According to the United States Forest Service, native tree species vary in likely resiliency to climate change. Some species show ability to adapt, while others are extremely vulnerable. A tree's vulnerability to climate change is the result of a variety of stress factors, including susceptibility to pest infestations, disease, and drought.

With climate change in mind, this plan recommends native species that show adaptability and resiliency to a changing landscape. The plant recommendations in this plan focus on increasing forest stand diversity to increase resistance to stress. As a result, some species recommended are not commonly planted on restoration projects in the Puget Sound, nor considered native to the Puget Sound (Burke Museum Herbarium 2019). According to the Forest Service, the following species are native to the West Coast and rated as having a lower vulnerability to the effects of climate change (Devine, et al. 2012):

- Shore pine (*Pinus contorta*)
- Black cottonwood (*Populus trichocarpa*)
- Red alder (*Alnus rubra*)
- Sitka spruce (*Picea sitchensis*)
- Paper birch (*Betula papyrifera*)
- Western red cedar (*Thuja plicata*)
- Incense-cedar (*Calocedrus decurrens*)
- Western white pine (*Pinus monticola*)
- Bigleaf maple (*Acer macrophyllum*)

- Douglas-fir (*Pseudotsuga menziesii*)
- Western hemlock (*Tsuga heterophylla*)

4.3 Wildfire Danger

Due to the prevalence of structures around Hazelwood Park and a changing climate, urban forest fires that cause damage to life and property are an increasing possibility. It is recommended that the City of Newcastle develop a wildfire protection plan for the park using guidance from Washington State Department of Natural Resources (DNR) and the Firewise USA program through the National Fire Protection Association (NFPA).

In the short-term, felled trees from risk tree removal operations left on the forest floor could serve as a fuel load for potential fires. On the contrary, leaving some of the felled trees as large woody debris is beneficial for habitat and is a natural component of the Puget Lowland forests. To provide habitat opportunities without adding too much fuel load, felled trees within 200 feet of adjacent residential structures should have their limbs removed from the main trunk(s), hauled to the nearest access point, and chipped. The woodchips from the branches can be placed on trails or used to protect restoration plantings (DNR 2019, NFPA 2019).

4.4 Consistency with Regulations, Policies, and Guidelines

This UFMP has been designed in accordance with the Newcastle Municipal Code (NMC), Newcastle Comprehensive Plan, and Tree City USA status.

Actions recommended in this UFMP are not expected to require City permits. Per NMC 14.15.080.A.5.g, clearing and grading by a public agency for "normal and routine maintenance of parks and trails" is exempt from a clearing and grading permit. Furthermore, since no development is proposed, the landscaping and tree retention standards in NMC Chapter 18.16 would not apply. Finally, removal of hazard trees from wetland and buffers is a permitted alteration provided a certified arborist determines that the trees are classified as hazards. This plan provides the necessary documentation to report on hazard status of trees within the park. It is the City's responsibility to determine level of acceptable risk, thus informing which trees should be removed.

This UFMP has been prepared to align directly with the City's 2035 Comprehensive Plan through incorporation of specific comprehensive plan objectives.

The City of Newcastle has been a Tree City USA for the past ten years. To be a Tree City USA, the City has committed to sound urban forestry management through four core standards including:

1. Maintaining a tree board or department;
2. Having a community tree ordinance;
3. Spending at least $2 per capita on urban forestry; and
4. Celebrating Arbor Day.

5. Urban Forest Management Plan

5.1 Goals, Objectives, and Performance Standards

The Hazelwood Park Urban Forest Management Plan is focused on four primary objectives that align with the City's comprehensive plan and are centered on the goal of a thriving urban forest resource, both now and into the future. Below is a list of these objectives, with Parks, Trails, and Recreation (PTR) reference numbers from the 2035 Comprehensive Plan, followed by recommended performance standards (PS) as a means by which success of the UFMP may be measured following implementation.

1. Engage the community and promote volunteerism to assist with the maintenance of this park (PTR-G6).
    - PS-a. Establish friends of program by 2020.
    - PS-b. Support at least one Eagle Scout Project per year that benefits the park and its natural environment consistent with this UFMP.
    - PS-c. Organize four volunteer events per year.
2. Apply best management practices to reduce hazard trees and associated complaints (PTR-G8).
    - PS-a. Have an ISA Certified and TRAQ Arborist assess trees that may pose risk (City to determine acceptable risk threshold) to public safety or property on an annual basis and/or after severe weather and provide management recommendations based on the annual site evaluation consistent with this UFMP.
3. Restore broken forest ecology through retaining existing native vegetation, while managing species diversity (PTR-P13).
    - PS-a. Employ recommended tree protection measures when conducting work near trees.
    - PS-b. Retain standing snags at safe height and condition at a target density between six to ten snags per acre.
    - PS-c. Increase tree diversity by planting five new species by year 2022.
    - PS-d. Maintain or improve understory native or naturalized species diversity in all monitoring years.

4. Continue to provide a resource amenity for the community through preserving and restoring the site's natural systems (PTR-P16).
    PS-a. Reduce invasive, noxious weed presence to less than 20 percent by year 2024.
    PS-b. Reduce invasive, noxious weed presence to less than 10 percent by year 2029.
    PS-c. Install and maintain educational and informational signage.

5.2 Management Actions

5.2.1 Tree Risk Mitigation

Periodic management of significant trees that become hazardous will be a necessary part of long-term site management. Removal of significant trees, as defined by Newcastle Municipal Code, requires consultation from a certified arborist. Depending on the arborist's recommendations, hazard tree management may involve pruning, bracing or cabling, complete removal, or snag creation. While no formal permit approval is anticipated to be necessary, forest management work should not proceed without communication, coordination, and approval form None of this should occur without approval from the City of Newcastle.

Significant Trees

Level 1: Limited Visual Assessments should be conducted periodically by the City or consulting arborist. For the purposes of this activity, hazard trees include those significant trees that are at risk of failure (including branches), and that are an imminent threat to public safety or are posing an imminent risk of damage to an existing structure, roadway, parking area, walkway, or other permanent improvement. Hazard trees may include groups of trees that are currently healthy but growing in a way that jeopardizes their health, such as overly dense stands of trees.

If the City or public is concerned that a significant tree poses a hazard, an arborist shall be consulted to confirm the hazard level and determine mitigation actions. Tree replacement can occur where the previous tree was removed. If an arborist determines that conditions are not favorable for tree replacement in the same location, native shrubs and/or groundcovers can be substituted, or tree replacement can occur where invasive species are removed in the park. For every four-inches DBH of significant trees removed, approximately one tree should be replanted at nine feet on center.

Alternatively, it may be more beneficial to leave a snag, rather than removing the entire tree, if the snag does not pose an ongoing hazard. In this case, an arborist shall be consulted to determine if leaving a snag is appropriate under existing conditions, or whether on-site tree replacement is advised. If on-site tree replacement is advised, the arborist should advise on the

proper ratio. Felled or snagged hazard trees should generally be left on-site to function as habitat features unless otherwise advised by an arborist. A record of ongoing tree removal and management should be kept by the City and/or the City's consulting arborist.

Non-Significant Trees

Non-significant trees (less than eight-inches diameter for evergreen trees and less than 12-inches diameter for deciduous trees, measured four feet above existing grade under current regulations) may be managed without approval of an arborist. Removal of non-significant trees may only be done to reduce overcrowding of vegetation and should only include non-native species. Small tree removal shall be the minimum necessary to accomplish the objectives described above.

Within the park, tree removal shall constitute cutting trees flush with the ground surface and shall not entail removal of the rootball or other ground disturbance. Removal of non-significant trees shall be mitigated through replanting at a 1:1 ratio with appropriate native species, described in the Section 5.2.4. Tree replacement can occur elsewhere on the property in a location that is not expected to result in future risk to utilities or structures.

5.2.2 Invasive Species Management

This plan recommends removal of non-native species for the purposes of promoting the successful establishment of native plantings that might otherwise have difficulty competing with aggressive invasive plants. Site-wide locally dominant patches of invasive weeds are targeted for eradication. Weeds listed on the King County or Washington State noxious weeds lists should be selectively removed over time, unless immediate control is mandated by the weed control boards.

Dominant Invasive Species

The predominant invasive species in the park are English ivy and Himalayan blackberry. The following descriptions are adapted from King County's Noxious Weed Control Program (2019):

English ivy: English ivy is an evergreen, woody perennial plant; although not native to the Pacific Northwest, it is well-adapted to this climate and has no natural controls. It spreads by vegetative growth—developing roots at stem nodules—and growing from seed spread by birds. English ivy grows up tree trunks and along the ground. It can grow up to 90-feet high; trees with ivy growing up into their canopies have an increased chance of becoming hazards as the additional weight makes them more prone to falling in windstorms. English ivy also grows

along the ground, outcompeting native plants and forming monocultures; not only is native species diversity reduced, but the carpets of ivy are also known to house Norway rats.

Himalayan blackberry: Himalayan blackberry is a non-native, thicket-forming shrub, which can create impassable conditions for both people and wildlife. It is a semi-evergreen plant with arching canes that can reach 13-feet tall and 20- to 40-feet long. Blackberry spreads by developing roots at stem tips and root buds, and is seeded into new areas by birds. It smothers existing vegetation, reduces native plant diversity, and prevents the establishment of trees.

Invasive Species Control Recommendations

The contractor or community group selected to complete this work must be familiar with native and non-native plant species in our region to avoid inadvertent damage to native plants.

An integrated pest management (IPM) approach should be used to control invasive weeds throughout the management area. IPM is a sustainable approach to weed control that considers budget restrictions, environmental impacts, and health risks. IPM employs cultural, mechanical, biological, and chemical modes of control. A qualified site manager, crew leader, or restoration specialist should determine when pesticide use (chemical control) is appropriate. Manual removal is the preferred control method for Himalayan blackberry and English ivy.

Any pesticides (e.g. herbicide, insecticide, fungicide) must be applied by a State licensed applicator in accordance with product labeling. Due to the wetland on-site, any herbicide product used at this site should be limited to those approved for aquatic areas.

All invasive species should be removed from the park and disposed in the municipal yard waste. However, qualified and experienced restoration crews may pile invasive species onsite to decompose, if they commit to turning the piles periodically until the plant material breaks down and turns into compost.

All invasive plant species observed in the park and recommended control measures are listed in Table 4. The distribution of invasive species at Hazelwood Park can be found in Figure 11.

Table 4. Invasive species within Hazelwood Park and recommended control measures.

Common Name	Botanical Name	Control Measures*
Bittersweet nightshade	*Solanum dulcamara*	Loosen soil and grub out vines by the root.
Blackberry, cutleaf	*Rubus laciniatus*	Manual control is recommended. Cut vines back, then grub out by the root. Repeat as new sprouts emerge. Pesticide may be applied to large/problematic infestations.
Blackberry, Himalayan	*Rubus armeniacus*	
Common hawthorn	*Crataegus monogyna*	Small plants: grub out by the root.
		Large plants: herbicide stem injection or cut at the base and apply herbicide to the freshly cut stump to control resprouting.
Creeping buttercup	*Ranunculus repens*	Manually dig out, removing roots and runners.
English holly	*Ilex aquifolium*	Small plants: grub out by the root.
		Large plants: herbicide stem injection or cut at the base and apply herbicide to the freshly cut stump to control resprouting.
English ivy	*Hedera helix*	Manual removal is highly effective. Cut any vines growing up trees near ground level. Loosen soil with a shovel or weed fork and pull vines out by the roots. Dispose of uprooted plant material off-site. Repeat as new sprouts emerge.
English laurel	*Prunus laurocerasus*	Small plants: grub out by the root.
		Large plants: herbicide stem injection or cut at the base and apply herbicide to the freshly cut stump to control resprouting.
Hedge bindweed	*Calystegia sepium*	Apply herbicide in summer or fall. Avoid digging the roots as fragments resprout.
Herb Robert	*Geranium robertianum*	Pull out by the root.
Nipplewort	*Lapsana communis*	Hand pull before flowers set seed.
Oxeye daisy	*Leucanthemum vulgare*	Hand pull and prevent flowers from producing seed.
Reed canarygrass	*Phalaris arundinacea*	Cut back and keep shaded.
Tansy ragwort	*Senecio jacobaea*	Pull plants. Wear gloves Dispose of all plant parts.
Yellow archangel	*Lamiastrum galeobdolon*	Hand pull, removing all roots in fall through spring. Apply herbicide to new growth in the spring if needed.

*Chemical controls may be used on a case-by-case basis at the direction of the City.

Figure 11. Invasive species map.

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5.2.3 Naturalized Species

A few ornamental hazel shrubs have been planted at the top of The Knoll; retaining these non-native shrubs is recommended to celebrate the namesake of the park and prior community involvement. If the hazels or any other naturalized species are not aggressive or invasive, they could remain in the forest.

5.2.4 Species Recommended for Planting

Risk trees and invasive species should be replaced with a combination of native trees, shrubs, and groundcover plants. Species recommendations are broken down into forest typology areas in Table 5. (see Figure 10: Forest typology map).

Table 5. Species Recommendations by Forest Type.

	Species	Lowland Mixed Forest	Lowland Deciduous Forest	Dry Upland Forest	The Knoll	Steep Forest	Bigleaf Maple Grove	Forested Wetland
Trees	Bigleaf maple	x	x	x		x	x	
	Bitter cherry		x	x				
	Cascara	x	x	x		x	x	
	Douglas-fir	x	x	x	x	x	x	
	Incense-cedar	x	x	x	x			
	Oregon ash							x
	Pacific crabapple							x
	Pacific madrone		x	x	x			
	Pacific willow							x
	Paper birch							x
	Red alder	x	x			x	x	x
	Scouler's willow							x
	Shore pine				x			
	Sitka spruce						x	x
	Western red cedar						x	x
	Western white pine	x	x	x		x	x	
	Western hemlock	x	x				x	

	Species	Lowland Mixed Forest	Lowland Deciduous Forest	Dry Upland Forest	The Knoll	Steep Forest	Bigleaf Maple Grove	Forested Wetland
Shrubs	Baldhip rose			x	x			
	Beaked hazelnut	x	x	x	x	x	x	
	Black twinberry							x
	Clustered rose (*Rosa pisocarpa*)							x
	Mock orange (*Philadelphus lewisii*)	x	x					
	Oceanspray	x	x	x	x	x		
	Osoberry	x	x	x		x	x	
	Pacific ninebark							x
	Red elderberry	x	x				x	
	Red-osier dogwood							x
	Salmonberry							x
	Snowberry	x	x	x	x	x	x	
	Tall Oregon grape						x	
	Thimbleberry	x	x				x	
	Vine maple					x	x	
	Western serviceberry	x	x	x	x			
Groundcovers	Dull Oregon-grape	x	x	x		x	x	
	Sword fern	x	x	x		x	x	
	Slough sedge							x
	Small-fruited bulrush (*Scirpus macrocarpus*)							x
	Salal	x	x	x		x	x	
	Wildflowers				x			
	Native meadow grasses				x			

5.2.5 Existing Tree Protection

Trees to be retained must be protected during forest management and restoration activities. The two greatest threats to existing native vegetation are compaction and disturbance associated with tree removal. Manual labor is the recommended removal method for trees. However, if a machine is necessary, it should not be operated within the critical root zone of trees to remain.

When felling trees recommended for removal, operations should not disturb the canopy of remaining trees.

5.2.6 Debris Removal

Managing debris piles around the edge of the park is important for maintaining the health of the forest. Because yard waste piles can contain weed seeds and smother native plants, the existing piles should be removed; and, neighbors should be discouraged from dumping waste material in the park. Reaching out to adjacent landowners with letters citing the code and violation penalties, in addition to describing the value of the native forest and wetland, could help curb this problem in the future.

5.2.7 Special Habitat Feature Creation and Retention

Special habitat features, like standing snags, stumps, downed logs, and cavities in live trees, should be managed to maximize habitat value while minimizing risk to public health and welfare. Wildlife would benefit most from retention or creation of snags in the largest size classes available. This UFMP seeks to create or retain six to 10 snags per acre to support urban wildlife use. Snags in varying states of decomposition – from decaying soft wood to hard wood – are preferred.

When possible, removal of hazard trees and tree parts should take place in the non-breeding season for most Washington birds, which is generally February to August. If a hazard tree poses an extreme risk, removal should be prioritized regardless of time of year.

5.3 Materials and Specifications

5.3.1 Signs

All urban forest restoration projects are recommended to have signs that explain the goals of the project and contact information. These signs should be placed at strategic locations that are visible to park users at least one week prior to the beginning of on-site project work. These signs can be informational and temporary, or can be more permanent interpretive signs.

Interpretive signage throughout the park—telling the story of urban forest reforestation and the importance of healthy ecosystems—would educate and engage park visitors. Additionally, these signs could be a collaboration with the adjacent schools as a component of outdoor curriculum in environmental education.

5.3.2 Soils

Site soils are generally nutrient-rich and soil amendments, such as compost, are not needed in most cases. If compost is required in the future to improve plant health and vigor, the compost

should meet the WSDOT standard specifications for road, bridge, and municipal construction, 9-14.4(8) for fine compost. Compost should be free of weed seeds, garbage, or other contaminants.

Within the delineated wetland boundary, do not add additional soil or compost, or change the existing grade, as these actions could trigger the need for a permit from either the U.S. Army Corps of Engineers or the Washington State Department of Ecology.

Mycorrhizal fungi are a key component to a healthy forest, as they form symbiotic relationships with root systems of plants and trees. The presence of these fungi should be evaluated in the native soils, as urban soils often lack such fungi. If tests reveal that mycorrhizal fungi are lacking, apply a fungus additive to introduce mycorrhizal fungi to replenish and revitalize the soil.

5.3.3 Mulch

Woodchips may be applied as a blanket-layer or ring around newly installed plants as needed to suppress weed growth and retain soil moisture. Mulch applications should be three to four inches deep before settling; mulch rings should be approximately 18 inches in diameter. Mulch should not be piled up at the base of stems or trunks.

Arborist woodchips (i.e. chipped woody material) are the recommended mulch material; the chips can be either imported or chipped from onsite material and are approximately one to three inches in maximum dimension. The woodchip mulch shall not contain appreciable quantities of garbage, plastic, metal, soil, weed seeds, dimensional lumber, or construction/demolition debris. When using arborist woodchips, ensure that chipped material does not contain chipped weed parts (like bindweed) that could spread through the site and be detrimental to native plants.

The placement of woodchip mulch is not needed within the wetland boundary, as seasonal inundation will cause the woodchips to dissipate. However, applying woodchips around restoration plantings in the wetland buffer is encouraged. Prior to the start of any work in the wetland area, the wetland boundary in Figure 5 should be reviewed and approximated on the ground.

5.3.4 Plant Material

Plant material for forest restoration plantings should be native plant species outlined in Section 5.2.4; plants should be locally grown in nurseries in accordance with good horticultural practices, under climatic conditions similar to, or more severe, than those in the park.

Plant material can be obtained as container grown or bare root (or via native seed to enhance the meadow on The Knoll). If container grown, the following container sizes would be appropriate for restoration in the park: trees (one gallon), shrubs (one gallon), and groundcovers (four inches). The local conservation district sells bareroot trees and shrubs beginning in January of each year, offering a lower cost option for plant procurement. Large orders may be placed with the conservation district in advance of the sale. Ideally, container grown native plants should be installed during the dormant season (October 15 – March 1). Bareroot plants should be installed as soon as possible after procurement and should be kept cool, dark, and moist until installation.

In restoration areas, the tree, shrub, and groundcover layers should overlap each other. Trees should be planted nine feet on center. Shrubs should be planted six feet on center. Groundcovers should be planted three feet on center.

5.4 Maintenance of Installed Plants

After clearing invasive plants and planting with natives, restoration areas should be demarcated for the convenience of future maintenance crews. Stakes with flagging attached can be placed around the boundary of the restoration area, or each newly installed plant can have a small piece of flagging loosely tied to a side branch.

New plantings will have the highest chance of survival if they receive supplemental irrigation during their first two summers: one inch of water per week from June 1 through September 30.

At least twice yearly, remove all competing weeds and weed roots within 18 inches of installed plants. Frequent weeding will result in lower plant mortality. More frequent weeding may be necessary depending on the weed conditions that develop after plant installation. Do not weed the area near plant bases with a string trimmer (also known as weed whacker or weed eater). Native plants are easily damaged or killed, but weeds easily recover after trimming. Selective applications of herbicide may be needed to control invasive weeds, especially when intermixed with native species. Herbicide application, when necessary, shall be conducted only by a state-licensed applicator.

Replace woodchip mulch as necessary to maintain a three- to four-inch thick layer, which helps retain soil moisture and limit weeds.

Preventing herbivory from deer—which have been observed in the park—is important to ensure the survival of newly installed plants. Applying a product, such as Plantskydd® (or equivalent), at the time of planting should help deter deer from eating the young plants. The effectiveness of this product is reported to last six months overwinter and three to four months

during the active growing season. After the plants have become established, they should be able to handle occasional visits from deer.

5.5 Evaluation and Record Keeping

The performance standards should be revisited and documented annually to inform progress and future management actions.

5.6 Adaptive Management / Contingency Plan

This section outlines procedures to follow in instances of inadvertent or unforeseen urban forest management impacts that are not covered in this plan. These circumstances are variable as climate change presents an uncertain future. During these instances, as soon as an impact is identified, all work should stop except that which is needed to immediately stabilize the site for safety or erosion control concerns. A qualified, professional ISA Certified Arborist® shall be contacted to make an immediate site inspection. During the inspection, the following information will be collected by the arborist:

1. The extent of the impact will be sketched onto an appropriate site plan or map of the area.
2. The impact area will be photographed from several locations and perspectives sufficient to capture the nature and extent.
3. The nature and extent of the impact will be summarized in writing.
4. A short-term plan for stabilization, erosion control, etc., will be developed, if needed.

Following the site visit, the arborist shall furnish a summary of the impacts in memorandum format to the City. The memo may contain recommendations for repair or mitigation. However, the final plan for rectifying the impact will require approval from the City prior to implementation. Once the City has approved the general strategy for repair or mitigation, the qualified restoration professional shall develop a draft restoration plan and distribute to the City.

5.6.1 Potential Threats to the Urban Forest

The greatest ongoing threat to the urban forest is from invasive plant species. Additional threats include unauthorized encampments, dogs running off-trail, and over-foraging. Should foraging become a passive recreational use promoted in the future, it needs to be done in a way which does not disturb off-trail areas. All threats to the urban forest should be promptly identified and addressed to reduce significant impacts.

6. Implementation Plan

6.1 Project Phasing

For the 2019 fiscal year, there is $55,000 available from the fee-in-lieu program to use on procuring trees to plant, labor to plant the trees, and associated maintenance efforts including watering, installing wood chips, and suppression of invasive species. In the coming years, a total of $80,000 to $90,000 will be available through the fee-in-lieu program for additional phases of forest management.

The initial hazard tree removal will not be covered under the fee-in-lieu program and will require funding from another source. This scope of work is divided into three phases based on site access and funding available. Additionally, groundcover and shrub restoration planting are not covered under the fee-in-lieu program. On-going maintenance in future years may be achievable through the King County Community Work Program (CWP). Through this program, the City can get work crews to assist with specific maintenance tasks.

See Appendix H for a cost estimate.

6.2 Potential Funding Sources and Partnerships

DNR's Urban and Community Forestry Program partners with the United States Department of Agriculture (USDA) Forest Service's Urban and Community Forestry Program to offer grant opportunities to Washington cities, towns, counties, tribal governments, educational institutions, and 501(c)(3) non-profit organizations in Washington State. Two forms of financial assistance available to the City of Newcastle include Community Forestry Assistance Grants and Arbor Day Tree Reimbursements.

Partnering with local non-profits and community groups is also a great opportunity for assistance. Organizations such as Washington Conservation Corps, King Conservation District, Mid Sound Fisheries Enhancement Group, EarthCorps, or Weed Warriors may be able to assist in management of this forest.

Regular monitoring and maintenance, such as by a group of passionate neighbors and Newcastle citizens caring for and overseeing the restoration of Hazelwood Park, is critical for this urban forest management plan to be effective. One way to achieve this is through establishing a "Friends of Hazelwood Park" group devoted to the care and maintenance of the space. This group would oversee the activities within the park and could reach out to the adjacent schools to coordinate programming centered around restoration.

The Boy Scouts of America have completed previous work within Hazelwood Park, constructing the viewing platform at top of the knoll. Additional restoration projects in the park could be completed with the assistance of the Boy Scouts.

The Washington State Recreation and Conservation Office (RCO), offers funding to help communities build parks, protect and restore habitats, and provide outdoor education. Land and Water Conservation Fund (LWCF) and Puget Sound Acquisition and Restoration Fund (PSAR), are two grants offered through the RCO that are available for Hazelwood Park.

6.3 Immediate Management Priorities

The following tasks have been identified as immediate management priorities in order of importance. These priorities are intended to direct management efforts immediately following adoption of this plan, but are also important management actions encompassed by the UFMP that could be relevant on an ongoing basis. Specific management tasks and associated areas in Hazelwood Park, as of 2019, are identified in Appendix I.

6.3.1 Priority #1: Risk Tree Removal

Remove or snag the trees identified in Section 3.3.5. with a risk threshold exceeding the tolerable risk established by the City.

6.3.2 Priority #2: Remove English Ivy from Trunks

Cut all ivy growing up the trunks of trees. The ivy can be cut with pruning shears or saw near the base of each tree. Severed vines can be left on the tree to die for several months before being removed. Smaller vines can be pried off the trunks immediately. Remove a ring of ivy from the base of each trunk to prevent it from climbing the tree again. Avoid inadvertent damage to the tree trunk to the extent possible.

6.3.3 Priority #3: Remove English Ivy and Blackberry from Understory

Remove all infestations of English ivy and blackberry (both Himalayan and cutleaf) from the understory. Grub out roots and treat with herbicide if necessary. Replant the areas with native plants and apply mulch rings: plant native trees per the ratios outlined in Section 5.2.1 to replace felled trees from Priority #1. Treatment areas should be monitored for ivy or blackberry that have re-sprouted and should be promptly removed. When planting, attention should be given to a water main that runs under the northwest portion of the park. This water main has a 15’ easement, and is marked in the park with a blue marker stating “Caution Water Pipeline”. Before planting any restoration plants in this area, coordinate with Coal Creek Utility District.

6.3.4 Priority #4: Remove Invasive Trees

All non-native, invasive trees should be removed from the park, such as English holly, common hawthorn, and English laurel. These plants were seeded in Hazelwood Park by birds. These trees will continue to spread throughout the park and compete with native plants for space and resources until they are eradicated.

6.3.5 Priority #5: Remove Other Invasive Species

Other non-native, invasive plants should be targeted for control, such as herb Robert, nipplewort, yellow archangel, Tansy ragwort, and bittersweet nightshade. See Table 4 in Section 5.2.2 for treatment recommendations. After removal, these areas should be replanted with native plants and monitored for re-growth of invasive species.

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Appendix A

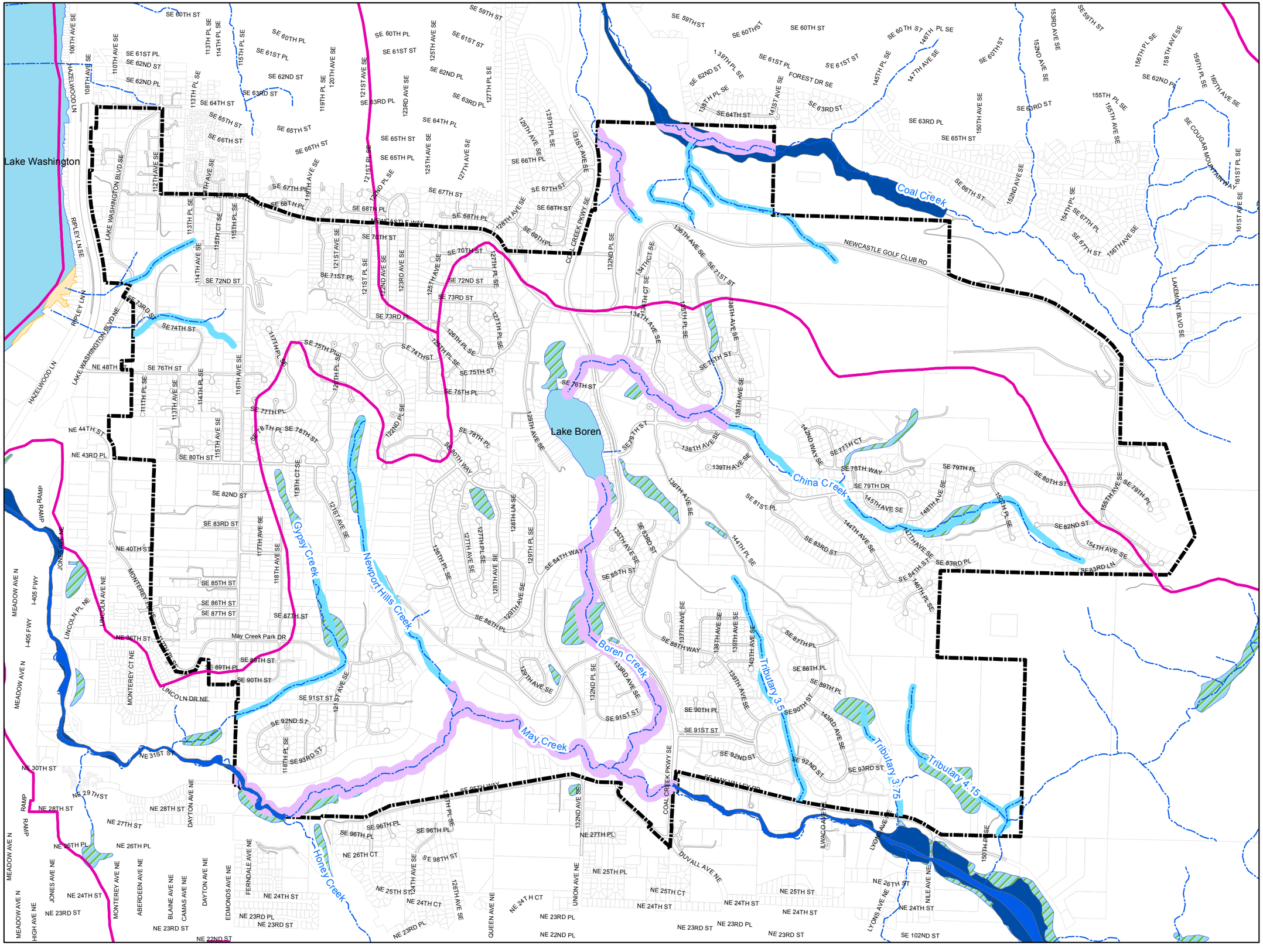
DRAINAGE BASIN BOUNDARY MAP

City of Newcastle Comprehensive Plan

Amended March 23, 2016

Figure LU-8

Hydrological Features



N

1:16,000

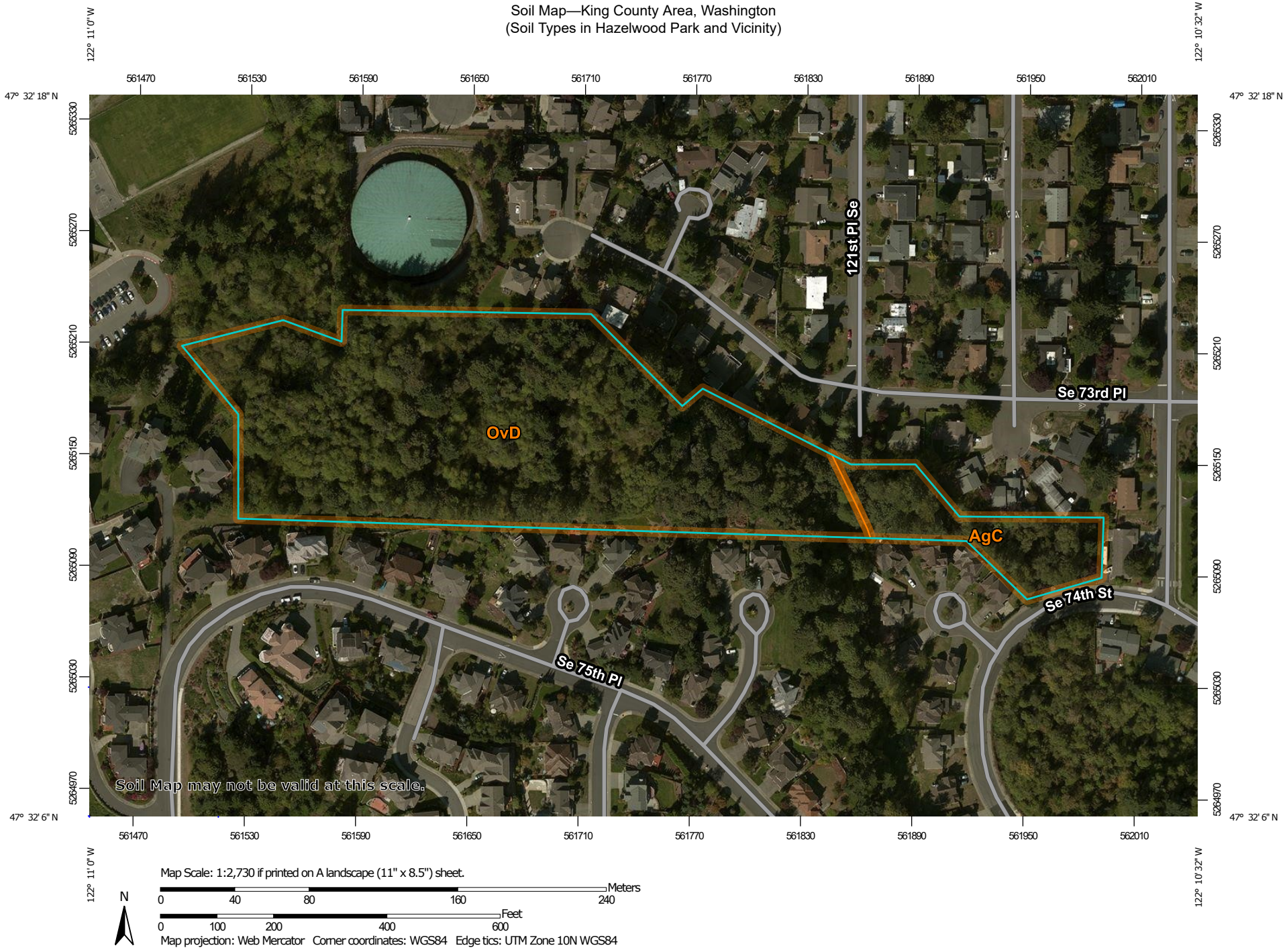
0 1,100 2,200 Feet

Source: King County and City of Newcastle.
DISLCLAIMER: No claims are made as to the accuracy or the completeness of the data contained herein. The information is presented solely for reference purposes and is based on varied sources. Exact Locations of all property lines, structures, or site conditions should be field verified.

Appendix B

SOIL DISTRIBUTION MAP

Soil Map—King County Area, Washington
(Soil Types in Hazelwood Park and Vicinity)



Map Scale: 1:2,730 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 14, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 31, 2013—Oct 6, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	1.1	12.4%
OvD	Ovall gravelly loam, 15 to 25 percent slopes	7.9	87.6%
Totals for Area of Interest		**9.0**	**100.0%**

Appendix C

WETLAND DETERMINATION AND RATING FORMS

THE WATERSHED COMPANY

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

DP-1

Project/Site: Newcastle Hazelwood Park City/County: Newcastle / King Sampling date: 6/25/2019

Applicant/Owner: City of Newcastle State: WA Sampling Point: DP-1

Investigator(s): Sam Payne, Roen Hohlfeld Section, Township, Range: S28, T24N, R05E

Landform (hillslope, terrace, etc): depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): A Lat: - Long: - Datum: -

Soil Map Unit Name: Alderwood gravelly sandy loam, 8 to 15 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (If no, explain in remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present on the site? ☒ Yes ☐ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	☒	No	☐	**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐
Hydric Soils Present?	Yes	☒	No	☐	
Wetland Hydrology Present?	Yes	☒	No	☐	

Remarks: **Wetland A in-pit**

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5-m diameter)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 3-m diameter)			
1. *Cornus stolonifera*	45	Y	FACW
2. *Salix scouleriana*	15	Y	FAC
3. *Rubus armeniacus*	1	N	FAC
4.			
5.			
	60	= Total Cover	
Herb Stratum (Plot size: 1-m diameter)			
1. *Phalaris arundinacea*	1	N	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	1	= Total Cover	
Woody Vine Stratum (Plot size: 3-m diameter)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum:

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is > 50%
- ☐ 3 – Prevalence Index is ≤ 3.0[1]
- ☐ 4 – Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 – Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☒ **No** ☐

Remarks:

SOIL

Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Loc: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☒ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric soil present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required: check all that apply)

- ☐ Surface water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☒ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ ~~Water-Stained Leaves (**except MLRA 1, 2, 4A & 4B**) (B9)~~
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☒ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (explain in remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A & 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (in):

Water Table Present? Yes ☒ No ☐ Depth (in): **6”**

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (in): **0”**

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

THE WATERSHED COMPANY

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

DP-2

Project/Site: Newcastle Hazelwood Park City/County: Newcastle / King Sampling date: 6/25/2019

Applicant/Owner: City of Newcastle State: WA Sampling Point: DP-2

Investigator(s): Sam Payne, Roen Hohlfeld Section, Township, Range: S28, T24N, R05E

Landform (hillslope, terrace, etc): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5

Subregion (LRR): A Lat: - Long: - Datum: -

Soil Map Unit Name: Alderwood gravelly sandy loam, 8 to 15 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (If no, explain in remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present on the site? ☒ Yes ☐ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	☒	No	☐	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒
Hydric Soils Present?	Yes	☐	No	☒	
Wetland Hydrology Present?	Yes	☐	No	☒	

Remarks: **Wetland A out-pit**

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5-m diameter)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	60	Y	FACU
2. *Populus trichocarpa*	50	Y	FAC
3. *Salix scouleriana*	5	N	FAC
4.			
	115	= Total Cover	
Sapling/Shrub Stratum (Plot size: 3-m diameter)			
1. *Cornus stolonifera*	10	Y	FACW
2. *Rubus armeniacus*	15	Y	FAC
3.			
4.			
5.			
	25	= Total Cover	
Herb Stratum (Plot size: 1-m diameter)			
1. *Phalaris arundinacea*	25	Y	FACW
2. *Ranunculus repens*	10	Y	FAC
3. *Rubus ursinus*	1	N	FACU
4. *Calystegia sepium*	1	N	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	37	= Total Cover	
Woody Vine Stratum (Plot size: 3-m diameter)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum: 63

Dominance Test worksheet:

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is > 50%
- ☐ 3 – Prevalence Index is ≤ 3.0[1]
- ☐ 4 – Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 – Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☒ **No** ☐

Remarks:

SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5Y 3/3	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Loc: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric soil present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required: check all that apply)

- ☐ Surface water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ ~~Water-Stained Leaves (**except MLRA 1, 2, 4A & 4B**) (B9)~~
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (explain in remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A & 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (in):

Water Table Present? Yes ☐ No ☒ Depth (in):

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (in):

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland name or number: Wetland A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: June 25, 2019

Rated by: Sam Payne and Roen Hohlfeld Trained by Ecology? ☐Y ☐N Date of training: June 2017

HGM Class used for rating: Depressional Wetland has multiple HGM classes? ☐Y ☒N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map: King County iMap

OVERALL WETLAND CATEGORY (based on functions ☒ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

- ☐ **Category I** – Total score = 23 - 27
- ☐ **Category II** – Total score = 20 - 22
- ☒ **Category III** – Total score = 16 - 19
- ☐ **Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H **M** L	H **M** L	H M **L**	
Landscape Potential	H **M** L	H **M** L	H M **L**	
Value	H **M** L	**H** M L	H **M** L	TOTAL
Score Based on Ratings	6	7	4	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I** **II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I** **II**
Interdunal	**I** **II** **III** **IV**
None of the above	☒

Wetland name or number: Wetland A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	1
Hydroperiods	D 1.4, H 1.2	2
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	2
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	2
Map of the contributing basin	D 4.3, D 5.3	3
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	6

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

   ☒NO – go to 2 ☐**YES** – the wetland class is **Tidal Fringe** – go to 1.1

   1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   ☒NO – go to 3 ☐**YES** – The wetland class is **Flats**
   *If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   ☐The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   ☐At least 30% of the open water area is deeper than 6.6 ft (2 m).

   ☒NO – go to 4 ☐**YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ☐The wetland is on a slope (*slope can be very gradual*),
   ☐The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   ☐The water leaves the wetland **without being impounded**.

   ☒NO – go to 5 ☐**YES –** The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ☐The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ☐The overbank flooding occurs at least once every 2 years.

☒NO – go to 6 ☐**YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐NO – go to 7 ☒**YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐NO – go to 8 ☐**YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: ☐ Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 ☒ Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing. points = 1 ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* ☐Yes = 4 ☒ No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): ☒ Wetland has persistent, ungrazed, plants > 95% of area points = 5 ☐ Wetland has persistent, ungrazed, plants > 1/2 of area points = 3 ☐ Wetland has persistent, ungrazed plants > 1/10 of area points = 1 ☐ Wetland has persistent, ungrazed plants < 1/10 of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* ☒ Area seasonally ponded is > ½ total area of wetland points = 4 ☐ Area seasonally ponded is > ¼ total area of wetland points = 2 ☐ Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	11

Rating of Site Potential If score is: ☐**12-16 = H** ☒**6-11 = M** ☐**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? ☐Yes = 1 ☒ No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? ☒Yes = 1 ☐ No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? ☐Yes = 1 ☒ No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source: Extensive dog use and defecation ☒Yes = 1 ☐ No = 0	1
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ☐**3 or 4 = H** ☒**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? ☐Yes = 1 ☒ No = 0	0 1.15 miles to May Creek
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? ☒Yes = 1 ☐ No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? ☐Yes = 2 ☒ No = 0	0
Total for D 3 Add the points in the boxes above	1

Rating of Value If score is: ☐**2-4 = H** ☒**1 = M** ☐**0 = L** *Record the rating on the first page*

Wetland name or number: Wetland A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?

D 4.1. Characteristics of surface water outflows from the wetland:

- ☐ Wetland is a depression or flat depression with no surface water leaving it (no outlet). points = 4
- ☒ Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2
- ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1
- ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing. points = 0

2

D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.*

- ☐ Marks of ponding are 3 ft or more above the surface or bottom of outlet. points = 7
- ☐ Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet. points = 5
- ☒ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet. points = 3
- ☐ The wetland is a "headwater" wetland. points = 3
- ☐ Wetland is flat but has small depressions on the surface that trap water. points = 1
- ☐ Marks of ponding less than 0.5 ft (6 in). points = 0

3

D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.*

- ☐ The area of the basin is less than 10 times the area of the unit. points = 5
- ☒ The area of the basin is 10 to 100 times the area of the unit. points = 3
- ☐ The area of the basin is more than 100 times the area of the unit. points = 0
- ☐ Entire wetland is in the Flats class. points = 5

3

Total for D 4	Add the points in the boxes above	8

Rating of Site Potential If score is: ☐**12-16 = H** ☒**6-11 = M** ☐**0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges?	☐Yes = 1 ☒ No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	☒Yes = 1 ☐ No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	☒Yes = 1 ☐ No = 0	1
Total for D 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ☐**3 = H** ☒**1 or 2 = M** ☐**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?

D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.*
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):

- ☒ Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2
- ☐ Surface flooding problems are in a sub-basin farther down-gradient. points = 1

☐ Flooding from groundwater is an issue in the sub-basin. points = 1

☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.

Explain why: ___ points = 0

☐There are no problems with flooding downstream of the wetland. points = 0

2

D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	☐Yes = 2 ☒ No = 0	0
Total for D 6	Add the points in the boxes above	2

Rating of Value If score is: ☒**2-4 = H** ☐**1 = M** ☐**0 = L** *Record the rating on the first page*

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

- ☐ Aquatic bed
- ☐ Emergent
- ☒ Scrub-shrub (areas where shrubs have > 30% cover)
- ☒ Forested (areas where trees have > 30% cover)

4 structures or more: points = 4
3 structures: points = 2
2 structures: points = 1
1 structure: points = 0

If the unit has a Forested class, check if:

- ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

- ☐ Permanently flooded or inundated
- ☒ Seasonally flooded or inundated
- ☐ Occasionally flooded or inundated
- ☒ Saturated only

4 or more types present: points = 3
3 types present: points = 2
2 types present: points = 1
1 type present: points = 0

- ☐ Permanently flowing stream or river in, or adjacent to, the wetland
- ☐ Seasonally flowing stream in, or adjacent to, the wetland
- ☐ **Lake Fringe wetland** **2 points**
- ☐ **Freshwater tidal wetland** **2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

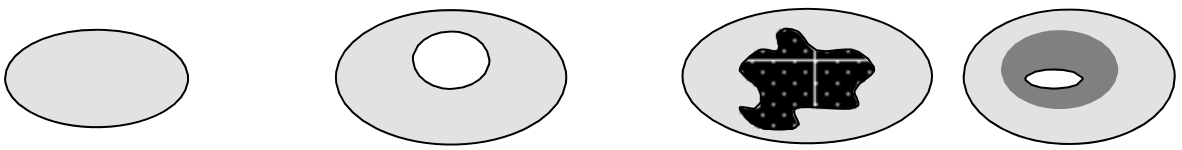
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted:
- ☐ > 19 species — points = 2
- ☒ 5 - 19 species — points = 1
- ☐ < 5 species — points = 0

1

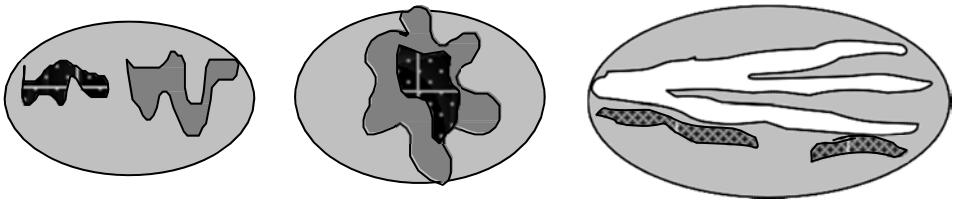
H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



☐ **None** = 0 points ☒ **Low** = 1 point ☐ **Moderate** = 2 points

All three diagrams in this row are
☐ **HIGH** = 3points



1

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☒ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ☐ Standing snags (dbh > 4 in) within the wetland. ☒ Undercut banks are present for at least 6.6 ft (2 m) **AND/OR** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m). ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) **OR** signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed).* ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians).* ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*).	2
Total for H 1 Add the points in the boxes above	6

Rating of Site Potential If score is: ☐**15-18 = H** ☐**7-14 = M** ☒**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat + [(%moderate and low intensity land uses)/2] = **0% + (2%/2) = 1%** If total accessible habitat is: ☐ > 1/3 (33.3%) of 1 km Polygon points = 3 ☐ 20-33% of 1 km Polygon points = 2 ☐ 10-19% of 1 km Polygon points = 1 ☒ < 10% of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat + [(%moderate and low intensity land uses)/2 **= 12% + (4%/2) = 14%** ☐ Undisturbed habitat > 50% of Polygon points = 3 ☐ Undisturbed habitat 10-50% and in 1-3 patches points = 2 ☒ Undisturbed habitat 10-50% and > 3 patches points = 1 ☐ Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If ☒ > 50% of 1 km Polygon is high intensity land use points = (- 2) ☐ ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ☐**4-6 = H** ☐**1-3 = M** ☒**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan ☒ Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 ☐ Site does not meet any of the criteria above points = 0	1

Rating of Value If score is: ☐**2 = H** ☒**1 = M** ☐**0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

☐ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

☐ **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi- layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

☐ **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

☐ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

☐ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

☐ **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

☒ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐Yes –Go to **SC 1.1** ☒No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐Yes = **Category I** ☐No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un- mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐Yes = **Category I** ☐No= **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☒Yes – Go to **SC 2.2** ☐No – Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? http://www.dnr.wa.gov/NHPwetlandviewer ☐Yes **= Category** I ☒No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://file.dnr.wa.gov/publications/amp_nh_wetlands_trs.pdf ☐Yes **– Contact WNHP/WDNR and go to SC 2.4** ☐No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐Yes **= Category I** ☐No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐Yes – Go to **SC 3.3** ☒No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐Yes – Go to **SC 3.3** ☒No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐Yes = **Is a Category I bog** ☐No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐Yes = **Is a Category I bog** ☐No = **Is not a**	**Cat. I**

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** ☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. ☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). ☐Yes **= Category I** ☒No **= Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐Yes – Go to **SC 5.1** ☒No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un- mowed grassland. ☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) ☐Yes = **Category I** ☐No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: ☐ Long Beach Peninsula: Lands west of SR 103 ☐ Grayland-Westport: Lands west of SR 105 ☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109 ☐Yes – Go to **SC 6.1** ☒No = **not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ☐Yes = **Category I** ☐No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? ☐Yes = **Category II** ☐No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? ☐Yes = **Category III** ☐No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	NA

WETLAND A (DEPRESSIONAL)

Figure 1. Cowardin plant classes – D1.3, H1.1, H1.4

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

Figure 2. Hydroperiods, outlet(s), and 150-ft area – D1.1, D1.4, H1.2, D2.2, D5.2

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

Figure 3. Map of the contributing basin – D4. 3, D5.3

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

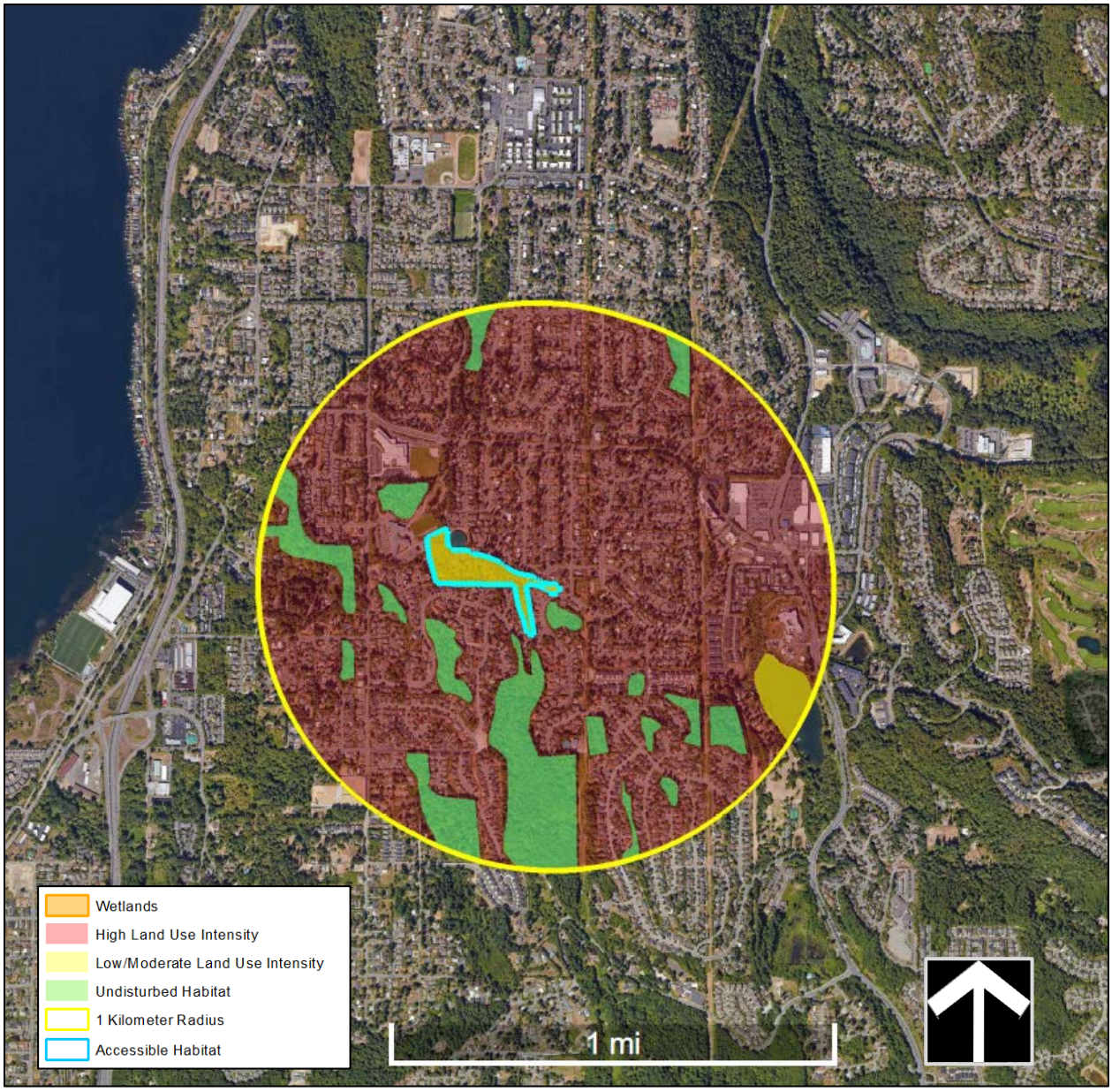


Figure 4. Undisturbed habitat and moderate-low intensity land uses within 1 km from wetland edge including polygon for accessible habitat – H2.1, H2.2, H2.3

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

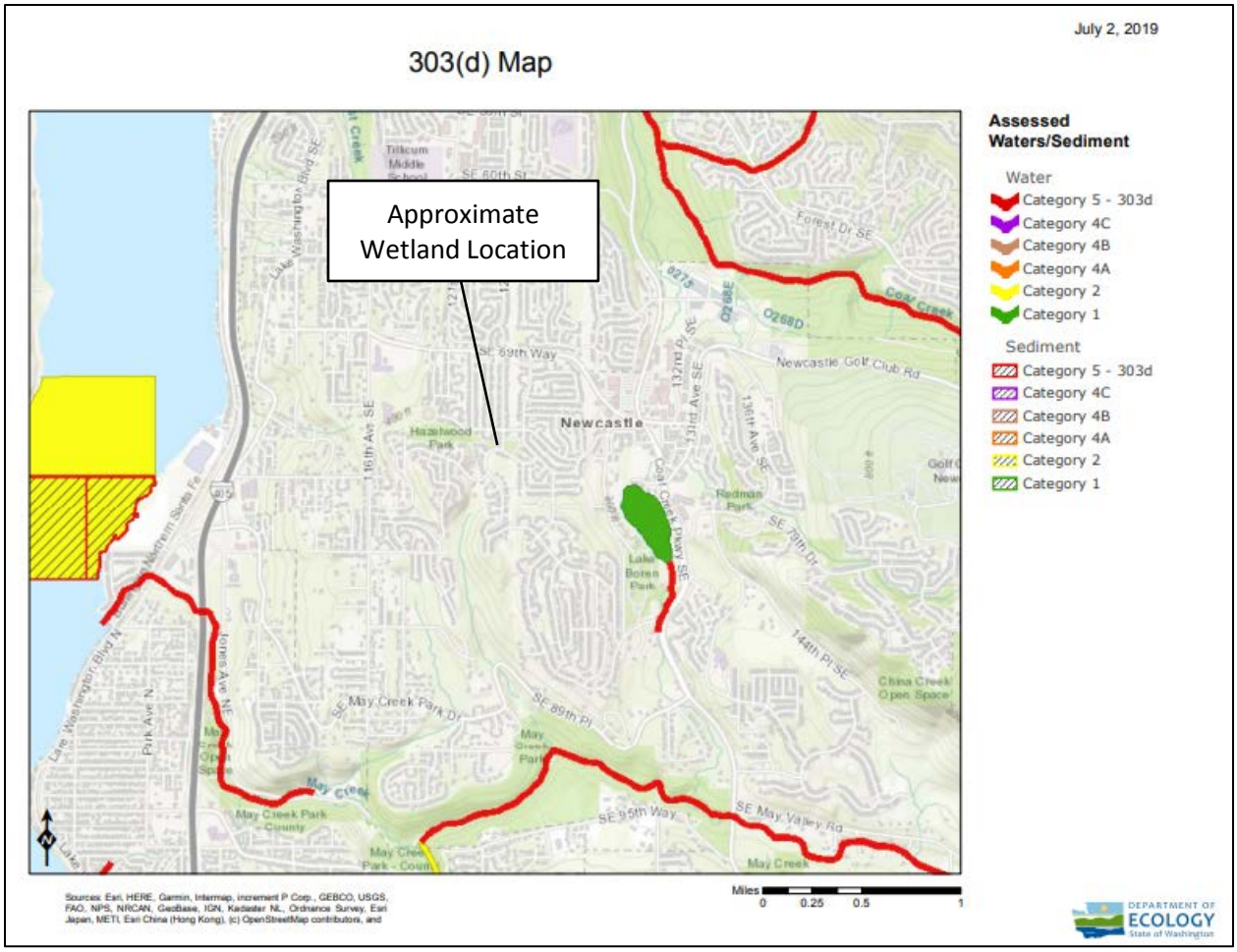


Figure 5. Screen-capture of 303(d) listed waters in basin – D3.1, D3.2

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

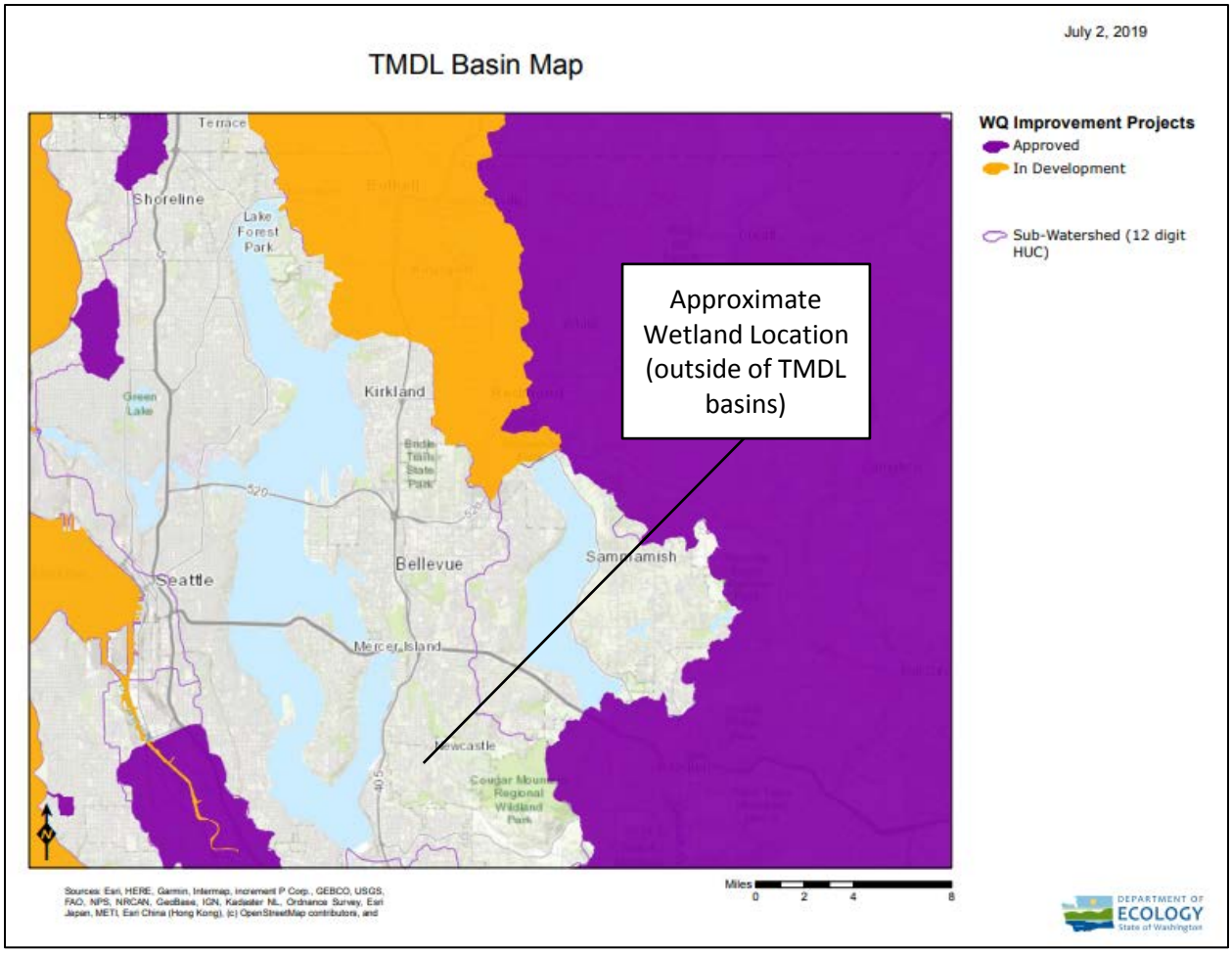


Figure 6. Screen-capture of TMDL basin map for WRIA in which unit is found – D3.3

Features depicted are not to scale. Sketches are based on available data and best professional judgment.

Appendix D

ATTRIBUTES COLLECTED IN GIS

Attributes recorded for all inventoried trees and displayed in the spreadsheet database.

Attribute	Description of Attribute
DATE OF ASSESSMENT	Date that the Watershed Company field crew tagged and assessed the tree or shrub.
ID NUMBER	Unique number assigned to an assessed tree. This number corresponds to the tag number in the field.
SCIENTIFIC NAME	Formal scientific name conforming to the International Code of Nomenclature.
COMMON NAME	Name that is based on normal or common language of the Pacific Northwest.
DECIDUOUS/EVERGREEN	Notes whether a tree is considered deciduous or evergreen.
STEMS	Number of trunks or shoots that contribute significantly to the canopy.
DBH	Diameter at Breast Height; or 4.5 feet from the ground surface.
DBH2	DBH of secondary and other minor stems.
HEIGHT	Approximate distance from the ground surface at the trunk to the highest point of the subject tree as visually estimated.
CANOPY RADIUS	Measurement from the stem to the average drip line, or end of branches. Critical root zone.
CONDITION	Health rating of an assessed tree using a 6-tier system as follows: 1 – Excellent 2 – Good 3 – Fair 4 – Poor 5 – Very Poor 6 – Dead
CROWN CLASS	OPG – Open Grown DOM – Dominant COD – Co-dominant INT – Intermediate OVT – Overtopped
NOTES	Notes pertaining to each tree.

Appendix E

TREE INVENTORY TABLE AND MAP

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1501	Populus trichocarpa (Black cottonwood)	D	1	27	60	20	3	DOM	
1502	Populus trichocarpa (Black cottonwood)	D	1	12	60	17	3	COD	
1503	Populus trichocarpa (Black cottonwood)	D	1	22	65	25	3	DOM	
1504	Populus trichocarpa (Black cottonwood)	D	2	21	55	15	3	COD	Elephant conk on side trunk, codominant base.
1505	Populus trichocarpa (Black cottonwood)	D	1	13	50	15	6	COD	
1506	Populus trichocarpa (Black cottonwood)	D	1	20	70	18	4	DOM	
1507	Populus trichocarpa (Black cottonwood)	D	2	18	55	17	3	INT	
1508	Populus trichocarpa (Black cottonwood)	D	1	15	50	15	3	COD	
1509	Populus trichocarpa (Black cottonwood)	D	1	13	50	14	2	COD	
1510	Populus trichocarpa (Black cottonwood)	D	1	19	50	15	4	COD	Dead scaffold branches 1-4”.
1511	Alnus rubra (Red alder)	D	2	14	40	18	4	COD	Lean towards houses, leader dieback.
1512	Populus trichocarpa (Black cottonwood)	D	1	26	80	20	3	COD	
1513	Populus trichocarpa (Black cottonwood)	D	1	13	65	15	3	INT	
1514	Populus trichocarpa (Black cottonwood)	D	1	21	85	20	3	COD	
1515	Populus trichocarpa (Black cottonwood)	D	1	23	70	25	3	COD	Lean.
1516	Populus trichocarpa (Black cottonwood)	D	1	23	35	10	5	N/A	Snag, trunk sprouts.
1517	Populus trichocarpa (Black cottonwood)	D	1	24	25	5	5	N/A	Snag, trunk sprouts.
1518	Populus trichocarpa (Black cottonwood)	D	1	24	20	3	5	N/A	Snag, trunk sprouts.
1519	Alnus rubra (Red alder)	D	1	13	40	20	4	COD	Lean towards house.
1520	Alnus rubra (Red alder)	D	1	15	55	18	4	COD	Leader dieback.
1521	Tsuga heterophylla (Western hemlock)	E	1	14	55	20	4	COD	Conk on base of trunk. Sparse canopy. Leader dieback. 3 feet yard debris near trunk.
1522	Salix lasiandra (Pacific willow)	D	5	21	45	50	4	COD	Lean/horizontal stems. Previous branch/stem failures - approx. 5-10”. Near trail.
1524	Salix lasiandra (Pacific willow)	D	2	23	65	0	3	OPG	One stem leans towards home and private fence. Previous branch failure. Conch on failed branch.
1525	Salix lasiandra (Pacific willow)	D	3	24	50	15	3	DOM	Growing into boardwalk.
1526	Alnus rubra (Red alder)	D	1	7	45	15	4	COD	Lean towards house. Broken leader. Cracks in stem.
1527	Alnus rubra (Red alder)	D	1	12	50	15	3	COD	
1528	Populus trichocarpa (Black cottonwood)	D	1	29	30	0	6		Cut at 25. Snagged.
1529	Populus trichocarpa (Black cottonwood)	D	1	33	25	0	6		Cut at 20. Snagged.
1530	Populus trichocarpa (Black cottonwood)	D	1	26	30	0	6		Cut at 25. Snagged.
1531	Populus trichocarpa (Black cottonwood)	D	1	11	45	8	3	COD	
1532	Prunus emarginata (Bitter cherry)	D	1	7	40	10	4	INT	Dead leader.
1533	Populus trichocarpa (Black cottonwood)	D	1	22	70	0	6	DOM	Bird nest box on tree.
1534	Acer macrophyllum (Bigleaf maple)	D	1	14	50	20	5	COD	
1535	Pseudotsuga menziesii (Douglas-fir)	E	1	13	60	12	4	DOM	Sparse canopy, kinks in trunk.
1536	Acer macrophyllum (Bigleaf maple)	D	2	10	35	0	6		Standing dead.
1537	Thuja plicata (Western red cedar)	E	1	10	45	15	4	INT	Leader and foliage dieback. Near property boundary and house.
1538	Alnus rubra (Red alder)	D	1	18	50	15	4	COD	Cavity in stem, corrected lean towards trail, lost leader.
1539	Alnus rubra (Red alder)	D	1	17	60	18	4	COD	Cavity at base, broken top.
1540	Alnus rubra (Red alder)	D	1	11	50	15	3	COD	Lean towards trail.

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1541	Acer macrophyllum (Bigleaf maple)	D	1	7	45	0	6		
1542	Acer macrophyllum (Bigleaf maple)	D	3	12	45	15	5	COD	Peeling bark, leader dieback, asymmetrical crown, two stems dead or nearly.
1543	Acer macrophyllum (Bigleaf maple)	D	1	12	55	12	4	COD	Dead leaders and branches, black fungus at base.
1544	Alnus rubra (Red alder)	D	1	19	35	0	6		Dead, lean adjacent to trail.
1545	Acer macrophyllum (Bigleaf maple)	D	1	24	55	10	5	COD	Within fall distance of trail, main stem mostly dead, one branch live.
1546	Acer macrophyllum (Bigleaf maple)	D	6	40	75	18	5	COD	Two large stems dead, asymmetrical canopy, above trail, ivy.
1547	Acer macrophyllum (Bigleaf maple)	D	1	32	80	20	5	DOM	Previous codominant stem failure, next to trail, ivy.
1548	Alnus rubra (Red alder)	D	1	21	35	0	6		Extensive ivy.
1549	Alnus rubra (Red alder)	D	1	17	60	0	6		Lean towards trail.
1550	Acer macrophyllum (Bigleaf maple)	D	1	30	75	12	5	DOM	Majority of crown dead.
1551	Acer macrophyllum (Bigleaf maple)	D	2	25	70	20	3	COD	Lean over trail stairs, 10 to 12 in dead leader in canopy, 15 ft.
1552	Acer macrophyllum (Bigleaf maple)	D	3	35	65	25	4	COD	Dead leader 12 in diam, wildlife cavities, decay at base.
1553	Acer macrophyllum (Bigleaf maple)	D	1	21	60	0	6		Fallen and leaning on maple downslope, significant decay.
1554	Acer macrophyllum (Bigleaf maple)	D	2	16	55	0	5	INT	
1555	Pseudotsuga menziesii (Douglas-fir)	E	1	18	75	15	4	COD	Major trunk wound on south side.
1556	Pseudotsuga menziesii (Douglas-fir)	E	1	12	65	12	4	COD	Conchs, 30 deg lean.
1557	Alnus rubra (Red alder)	D	1	14	30	0	6		House downslope.
1558	Prunus emarginata (Bitter cherry)	D	3	14	50	0	6		Near private property.
1559	Alnus rubra (Red alder)	D	1	17	50	18	4	COD	Dead leader, corrected lean, canopy dieback.
1560	Alnus rubra (Red alder)	D	1	10	35	0	6		
1561	Pseudotsuga menziesii (Douglas-fir)	E	1	9	35	10	5	INT	Ivy on entire trunk, 20% canopy remain.
1562	Salix scouleriana (Scouler's willow)	D	2	21	50	25	4	COD	Ivy .
1563	Salix scouleriana (Scouler's willow)	D	1	12	45	15	4	COD	Ivy covered.
1564	Salix scouleriana (Scouler's willow)	D	2	7	45	15	4	COD	Ivy up most of trunk.
1565	Arbutus menziesii (Pacific madrone)	E	2	36	60	30	4	DOM	Cankers significant, previous branch failures.
1566	Arbutus menziesii (Pacific madrone)	E	2	31	70	30	4	DOM	Stem near trail completely dead, cankers not apparent.
1567	Prunus emarginata (Bitter cherry)	D	1	8	40	0	6		Standing/leaning towards trail.
1568	Prunus emarginata (Bitter cherry)	D	1	7	45	8	5	INT	
1569	Prunus emarginata (Bitter cherry)	D	1	7	55	0	6	N/A	Two previous stem failures of similar diameter.
1570	Alnus rubra (Red alder)	D	1	9	55	0	6		
1571	Arbutus menziesii (Pacific madrone)	E	2	11	45	0	6		Standing dead for a while.
1572	Alnus rubra (Red alder)	D	1	10	45	0	6		Lean across trail.
1573	Alnus rubra (Red alder)	D	1	6	35	0	6		Lean across trail.
1574	Alnus rubra (Red alder)	D	1	10	45	0	6		
1575	Alnus rubra (Red alder)	D	1	9	25	0	6		
1576	Alnus rubra (Red alder)	D	1	10	45	0	6		
1577	Alnus rubra (Red alder)	D	1	12	50	0	6		Ivy.
1578	Alnus rubra (Red alder)	D	1	12	45	0	6		Ivy.
1579	Alnus rubra (Red alder)	D	1	13	50	0	6		

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1580	Alnus rubra (Red alder)	D	3	20	50	0	6		
1581	Alnus rubra (Red alder)	D	1	12	25	0	6		Ivy.
1582	Pseudotsuga menziesii (Douglas-fir)	E	1	4	45	0	6		Lean towards trail.
1583	Alnus rubra (Red alder)	D	1	7	50	0	6		Trail within fall distance.
1584	Alnus rubra (Red alder)	D	1	11	50	0	6		Fall distance of fence.
1585	Alnus rubra (Red alder)	D	1	11	45	0	6		Fence within fall.
1586	Populus trichocarpa (Black cottonwood)	D	1	22	80	15	3	COD	
1587	Alnus rubra (Red alder)	D	1	9	0	0	4	INT	Lean toward house with 10 degrees.
1588	Populus trichocarpa (Black cottonwood)	D	1	28	85	20	3	DOM	
1589	Populus trichocarpa (Black cottonwood)	D	1	17	75	23	3	COD	
1590	Populus trichocarpa (Black cottonwood)	D	1	11	60	17	3	INT	Brush pile at base.
1591	Populus trichocarpa (Black cottonwood)	D	1	11	50	0	6		House within fall.
1592	Populus trichocarpa (Black cottonwood)	D	1	15	60	15	4	INT	
1593	Alnus rubra (Red alder)	D	1	13	45	0	6		Fence within fall.
1594	Populus trichocarpa (Black cottonwood)	D	1	17	70	20	3	COD	
1595	Populus trichocarpa (Black cottonwood)	D	1	29	65	20	3	COD	
1596	Populus trichocarpa (Black cottonwood)	D	1	19	75	15	3	COD	
1597	Alnus rubra (Red alder)	D	1	10	45	0	6		
1598	Populus trichocarpa (Black cottonwood)	D	1	17	60	15	3	INT	
1599	Populus trichocarpa (Black cottonwood)	D	1	15	65	12	3	COD	
1600	Populus trichocarpa (Black cottonwood)	D	1	4	40	0	6		
1601	Populus trichocarpa (Black cottonwood)	D	1	5	40	0	6		
1602	Populus trichocarpa (Black cottonwood)	D	1	12	70	12	5	COD	
1603	Populus trichocarpa (Black cottonwood)	D	2	19	60	17	4	COD	Phototropic lean west.
1604	Populus trichocarpa (Black cottonwood)	D	1	12	70	10	3	COD	Lean towards nw. Ivy on trunk.
1605	Populus trichocarpa (Black cottonwood)	D	1	11	55	0	6		
1606	Populus trichocarpa (Black cottonwood)	D	1	16	80	20	4	COD	Ivy extensive on trunk.
1607	Populus trichocarpa (Black cottonwood)	D	1	14	50	15	5		10 degree lean west.
1608	Populus trichocarpa (Black cottonwood)	D	2	20	60	20	5	COD	
1609	Populus trichocarpa (Black cottonwood)	D	1	10	55	10	5	COD	
1610	Populus trichocarpa (Black cottonwood)	D	2	15	70	12	4	COD	
1611	Populus trichocarpa (Black cottonwood)	D	1	9	45	20	4	INT	
1612	Populus trichocarpa (Black cottonwood)	D	2	15	0	18	4	COD	Small leader dead.
1613	Populus trichocarpa (Black cottonwood)	D	1	8	50	8	3	INT	
1614	Populus trichocarpa (Black cottonwood)	D	1	12	70	15	3	INT	Trunk wound, sw lean 10 degrees.
1615	Populus trichocarpa (Black cottonwood)	D	2	23	75	0	3	COD	
1616	Populus trichocarpa (Black cottonwood)	D	1	14	70	12	3	COD	
1617	Populus trichocarpa (Black cottonwood)	D	2	21	65	20	4	COD	
1618	Populus trichocarpa (Black cottonwood)	D	1	17	60	20	3	COD	
1619	Populus trichocarpa (Black cottonwood)	D	1	13	60	14	4	COD	Ivy on trunk.
1620	Populus trichocarpa (Black cottonwood)	D	1	22	75	0	3	DOM	

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1621	Populus trichocarpa (Black cottonwood)	D	1	19	65	20	2	COD	
1622	Populus trichocarpa (Black cottonwood)	D	1	17	65	10	4	COD	
1623	Populus trichocarpa (Black cottonwood)	D	2	21	65	27	3	COD	
1624	Populus trichocarpa (Black cottonwood)	D	1	14	65	20	3	COD	
1625	Populus trichocarpa (Black cottonwood)	D	1	14	50	15	3	COD	
1626	Populus trichocarpa (Black cottonwood)	D	1	17	70	20	3	DOM	
1627	Alnus rubra (Red alder)	D	2	14	45	0	6		
1628	Populus trichocarpa (Black cottonwood)	D	1	16	70	20	3	DOM	Ivy limited.
1629	Populus trichocarpa (Black cottonwood)	D	1	15	65	0	6		
1630	Alnus rubra (Red alder)	D	1	10	70	0	6		
1631	Alnus rubra (Red alder)	D	1	13	60	10	5	COD	
1632	Alnus rubra (Red alder)	D	2	22	0	0	5	DOM	
1633	Alnus rubra (Red alder)	D	1	11	60	0	6		
1634	Alnus rubra (Red alder)	D	1	11	45	15	5	COD	Broken leader.
1635	Alnus rubra (Red alder)	D	1	14	30	0	6		
1636	Alnus rubra (Red alder)	D	1	13	65	0	6		
1637	Populus trichocarpa (Black cottonwood)	D	1	11	65	15	3	COD	
1638	Acer macrophyllum (Bigleaf maple)	D	1	28	60	25	4	COD	Previous failure, fruiting body on trunk, ivy limited.
1639	Prunus emarginata (Bitter cherry)	D	1	15	20	5	5	COD	
1640	Alnus rubra (Red alder)	D	2	18	60	15	5	COD	
1641	Populus trichocarpa (Black cottonwood)	D	1	20	80	20	3	DOM	
1642	Alnus rubra (Red alder)	D	1	13	45	15	4	INT	
1643	Alnus rubra (Red alder)	D	1	17	70	0	6		
1644	Alnus rubra (Red alder)	D	2	22	65	15	5	INT	
1645	Alnus rubra (Red alder)	D	2	15	45	15	4	COD	
1646	Alnus rubra (Red alder)	D	2	18	50	15	5	COD	
1647	Alnus rubra (Red alder)	D	1	9	45	0	6		
1648	Alnus rubra (Red alder)	D	1	15	60	0	6		
1649	Alnus rubra (Red alder)	D	1	18	75	20	3	COD	
1650	Alnus rubra (Red alder)	D	3	27	70	15	5	COD	
1651	Alnus rubra (Red alder)	D	1	16	0	0	5		
1652	Alnus rubra (Red alder)	D	1	15	65	0	6		
1653	Alnus rubra (Red alder)	D	3	21	50	15	5		
1654	Alnus rubra (Red alder)	D	1	10	40	15	5	COD	
1655	Alnus rubra (Red alder)	D	1	9	45	0	5		
1656	Alnus rubra (Red alder)	D	1	11	60	10	5	COD	
1657	Alnus rubra (Red alder)	D	1	9	60	0	6		
1658	Alnus rubra (Red alder)	D	1	11	65	0	6		
1659	Alnus rubra (Red alder)	D	1	11	60	0	6		
1660	Alnus rubra (Red alder)	D	1	12	65	15	4	COD	
1661	Alnus rubra (Red alder)	D	1	10	55	0	6	COD	

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1662	Alnus rubra (Red alder)	D	1	9	0	0	6		
1663	Alnus rubra (Red alder)	D	2	15	0	0	6		
1664	Alnus rubra (Red alder)	D	1	10	40	15	5	COD	
1665	Alnus rubra (Red alder)	D	1	11	45	0	6		
1666	Alnus rubra (Red alder)	D	1	16	45	15	5	COD	
1667	Alnus rubra (Red alder)	D	1	19	55	0	6		
1668	Alnus rubra (Red alder)	D	1	7	45	0	6		
1669	Alnus rubra (Red alder)	D	2	17	45	15	5	COD	
1670	Alnus rubra (Red alder)	D	1	13	50	15	4	COD	
1671	Alnus rubra (Red alder)	D	1	7	45	15	5	COD	
1672	Alnus rubra (Red alder)	D	1	8	45	0	6		
1673	Alnus rubra (Red alder)	D	1	18	40	0	6		
1674	Alnus rubra (Red alder)	D	1	19	40	0	6		
1675	Alnus rubra (Red alder)	D	1	11	50	15	5	COD	
1676	Alnus rubra (Red alder)	D	1	12	60	15	5	COD	
1677	Alnus rubra (Red alder)	D	1	10	70	15	4	COD	
1678	Alnus rubra (Red alder)	D	1	14	65	15	4	COD	
1679	Alnus rubra (Red alder)	D	1	13	65	20	5	COD	
1680	Alnus rubra (Red alder)	D	1	15	65	0	6	COD	
1681	Alnus rubra (Red alder)	D	1	10	45	0	6		
1682	Alnus rubra (Red alder)	D	2	18	65	15	5	COD	
1683	Alnus rubra (Red alder)	D	1	18	65	20	4	COD	Ivy on trunk.
1684	Alnus rubra (Red alder)	D	2	15	40	15	5	COD	Ivy on trunk.
1685	Alnus rubra (Red alder)	D	1	8	50	15	4	COD	Ivy on trunk.
1686	Alnus rubra (Red alder)	D	1	11	45	0	6	COD	
1687	Alnus rubra (Red alder)	D	1	11	65	15	4	COD	
1688	Alnus rubra (Red alder)	D	1	14	65	0	4	COD	
1689	Acer macrophyllum (Bigleaf maple)	D	1	11	70	15	5	COD	
1690	Alnus rubra (Red alder)	D	2	18	65	15	5	COD	
1691	Alnus rubra (Red alder)	D	1	15	70	15	3	COD	
1692	Alnus rubra (Red alder)	D	1	9	55	0	6	COD	
1693	Alnus rubra (Red alder)	D	1	13	65	15	5	COD	
1694	Alnus rubra (Red alder)	D	1	14	40	0	6	COD	
1695	Alnus rubra (Red alder)	D	1	13	55	15	3	COD	Debris on trunk.
1696	Alnus rubra (Red alder)	D	1	9	45	12	3	COD	
1697	Alnus rubra (Red alder)	D	1	15	65	0	6	COD	
1698	Alnus rubra (Red alder)	D	2	19	65	15	5	COD	
1699	Pseudotsuga menziesii (Douglas-fir)	E	1	12	65	10	5	COD	Extensive ivy in canopy.
1700	Alnus rubra (Red alder)	D	1	8	50	10	4	COD	
1701	Alnus rubra (Red alder)	D	1	12	50	10	3	COD	
1702	Alnus rubra (Red alder)	D	1	9	40	0	6	COD	

TAG #	TREE NAME	EV / DEC	# STEMS	COMB DBH (IN, ROUNDED)	HEIGHT (FT)	RADIUS (FT)	CONDITION	CROWN CLASS	NOTES
1703	Alnus rubra (Red alder)	D	1	10	40	10	3	COD	
1704	Alnus rubra (Red alder)	D	1	13	50	15	5	COD	
1705	Alnus rubra (Red alder)	D	1	10	40	15	4	COD	
1706	Alnus rubra (Red alder)	D	1	8	35	15	3	COD	
1707	Alnus rubra (Red alder)	D	2	25	60	15	6	COD	
1708	Alnus rubra (Red alder)	D	1	27	60	15	5	COD	
1709	Alnus rubra (Red alder)	D	1	15	50	15	3	COD	
1710	Frangula purshiana (Cascaara)	D	4	9	20	20	4	INT	Over trail.
1711	Alnus rubra (Red alder)	D	1	22	65	20	5	DOM	
1712	Alnus rubra (Red alder)	D	3	28	45	20	6		
1713	Acer macrophyllum (Bigleaf maple)	D	1	20	45	25	4	DOM	
1714	Alnus rubra (Red alder)	D	2	26	45	15	5	COD	
1715	Alnus rubra (Red alder)	D	1	5	25	0	6	COD	
0	Salix lasiandra (Pacific willow)	D	1	14	45	30	4	COD	Crack in stem - actively splitting, 10’ long. Near trail. Lean.

Hazelwood Park Tree Inventory

Newcastle, WA

Inventoried trees include all alder and cottonwood, and, other species that had both a health rating of poor, very poor, or dead and were within striking distance of a target, and that meet the City of Newcastle's definition of significant. Inventoried trees were tagged with a numbered round aluminum tag between 1501 - 1715 on the west side of the trunk at or near eye-level.

Feet
0 40 80 160 240 320

N

THE WATERSHED COMPANY

August 2019

Geospatial data was collected in the field using a GPS-enabled tablet and data collection software. GPS data is believed reliable for general planning and most regulatory purposes. However, accuracy is variable and should not be considered equivalent to a professional land survey. No warranty is expressed or implied.

Legend

- Approximate Location of Inventoried Tree
- Hazelwood Park Boundary
- Cross Town Trail
- Hazelwood Trail
- Other Trail

Appendix F

ROLES OF TREE RISK MANAGER, ASSESSOR, AND TREE WORKER ARBORIST

Tree Risk Manager (tree owner, property manager, controlling authority)	**Tree Risk Assessor** (as defined in scope of work)	**Tree Worker Arborist** (provides requested services as defined in scope of work)
Duty of care responsibility	Identify tree and site conditions to inspect	Tree work safety review
Define and communicate tree risk management policies	Evaluate and classify the likelihood of a tree failure impacting a risk target	Pruning
Determine the need to inspect the trees in question	Estimate the potential consequences of a tree failure	Removal
Identify the geographical limits of the tree inspection	Record and explain findings to the client	Support systems
Determine target zone use	Determine and recommend advanced assessments, if needed	Lightning protection
Determine target use and occupancy rates	Determine tree risk	Tree health treatments
Specify the desired level of assessment	Provide options for treatment to mitigate risk	Transplanting
Establish the budget	Estimate residual risks after treatment	Tree replacement
Decide the level of acceptable risk	Define inspection frequency	Identify the need for follow-up treatment
Establish the inspection frequency	Develop report	
Determine scope of work	Provide specifications for selected treatments(s)	
Prioritize work		
Choose among risk mitigation		

Appendix G

SPECIES LIST

Vegetation found at Hazelwood Park (June 2019)

TREES

	Acer macrophyllum	Bigleaf maple
	Alnus rubra	Red alder
	Arbutus menziesii	Pacific madrone
**	*Crataegus monogyna*	Common hawthorn
	Frangula purshiana	Cascara
	Fraxinus latifolia	Oregon ash
**	*Ilex aquifolium*	English holly
	Malus fusca	Pacific crabapple
	Populus trichocarpa	Black cottonwood
	Prunus emarginata	Bitter cherry
	Pseudotsuga menziesii	Douglas-fir
	Salix lasiandra	Pacific willow
	Salix scouleriana	Scouler's willow
	Thuja plicata	Western red cedar
	Tsuga heterophylla	Western hemlock

SHRUBS

	Acer circinatum	Vine maple
	Amelanchier alnifolia	Western serviceberry
	Cornus stolonifera	Red-osier dogwood
	Corylus cornuta	Beaked hazelnut
*	*Corylus* sp.	Ornamental hazelnut
*	*Cotoneaster* sp.	Cotoneaster
**	*Hedera helix*	English ivy
	Gaultheria shallon	Salal
	Holodiscus discolor	Oceanspray
	Lonicera hispidula	Hairy honeysuckle
	Lonicera involucrata	Black twinberry
	Mahonia aquifolium	Tall Oregon-grape
	Mahonia nervosa	Dull Oregon-grape
	Oemleria cerasiformis	Osoberry
	Physocarpus capitatus	Pacific ninebark
**	*Prunus laurocerasus*	English laurel
	Ribes sanguineum	Red-flowering currant
	Rosa gymnocarpa	Baldhip rose
**	*Rubus armeniacus*	Himalayan blackberry
**	*Rubus laciniatus*	Cutleaf blackberry
	Rubus parviflorus	Thimbleberry
	Rubus spectabilis	Salmonberry
	Rubus ursinus	Trailing blackberry
	Sambucus racemosa	Red elderberry
	Spiraea douglasii	Douglas spiraea
	Spiraea lucida	Shinyleaf spiraea
	Symphoricarpos albus	Snowberry
	Vaccinium parvifolium	Red huckleberry

HERBS/FERNS/GRASSES

**	*Calystegia sepium*	Hedge bindweed
	Carex obnupta	Slough sedge
	Dicentra formosa	Pacific bleedingheart
	Galium aparine	Common bedstraw
**	*Geranium robertianum*	Herb Robert
	Geum macrophyllum	Largeleaved avens
**	*Lamiastrum galeobdolon*	Yellow archangel
**	*Lapsana communis*	Nipplewort
**	*Leucanthemum vulgare*	Oxeye daisy
**	*Phalaris arundinacea*	Reed canarygrass
	Polystichum munitum	Sword fern
	Pteridium aquilinum	Bracken fern
**	*Ranunculus repens*	Creeping buttercup
**	*Rumex crispus*	Curly dock
**	*Senecio jacobaea*	Tansy ragwort
**	*Solanum dulcamara*	Bittersweet nightshade
	Urtica dioica	Stinging nettle

* *Denotes non-native species*

** *Denotes non-native, invasive species*

Appendix H

ENGINEER'S ESTIMATE

Cost Estimate

City of Newcastle – Hazelwood Park
The Watershed Company – August 2019

August 2019 **IMMEDIATE MANAGEMENT PRIORITIES**	**ESTIMATED PROJECT COST**
Priority 1: Risk Tree Removal • Consulting arborist to field verify removal • Stabilized construction entrance • High visibility fence • Tree removal • Haul and dump tree branches • Mobilization and clean-up • Sales tax • Construction oversight at 5% of construction • 20% contingency	Phase 1: $ 56,860 Phase 2: $82,793 Phase 3: $88,351 All phase total: $228,004
Priority 2: Remove English Ivy from Trunks • Cut English ivy from tree trunks • Pile for decomposition • Sales tax • Construction oversight at 5% of construction • 20% contingency	$3,050.00
Priority 3: Remove English Ivy and Blackberry from Understory • TESC administration • Stabilized construction entrance • High visibility fence • Clearing and grubbing • Wood chip mulch • Tree planting • Mobilization and clean-up • Sales tax • Construction oversight at 5% of construction • 20% contingency	$30,000
Priority 4: Remove Invasive Trees • Remove non-native and invasive tree such as English holly, common hawthorn, and English laurel • Pile for decomposition	TBD
Priority 5: Remove Other Invasive Species • Remove herb Robert, nipplewort, yellow archangel, Tansy ragwort, and bittersweet nightshade • Remove and dispose of off-site	TBD
Estimated Project Cost	**$261,054**

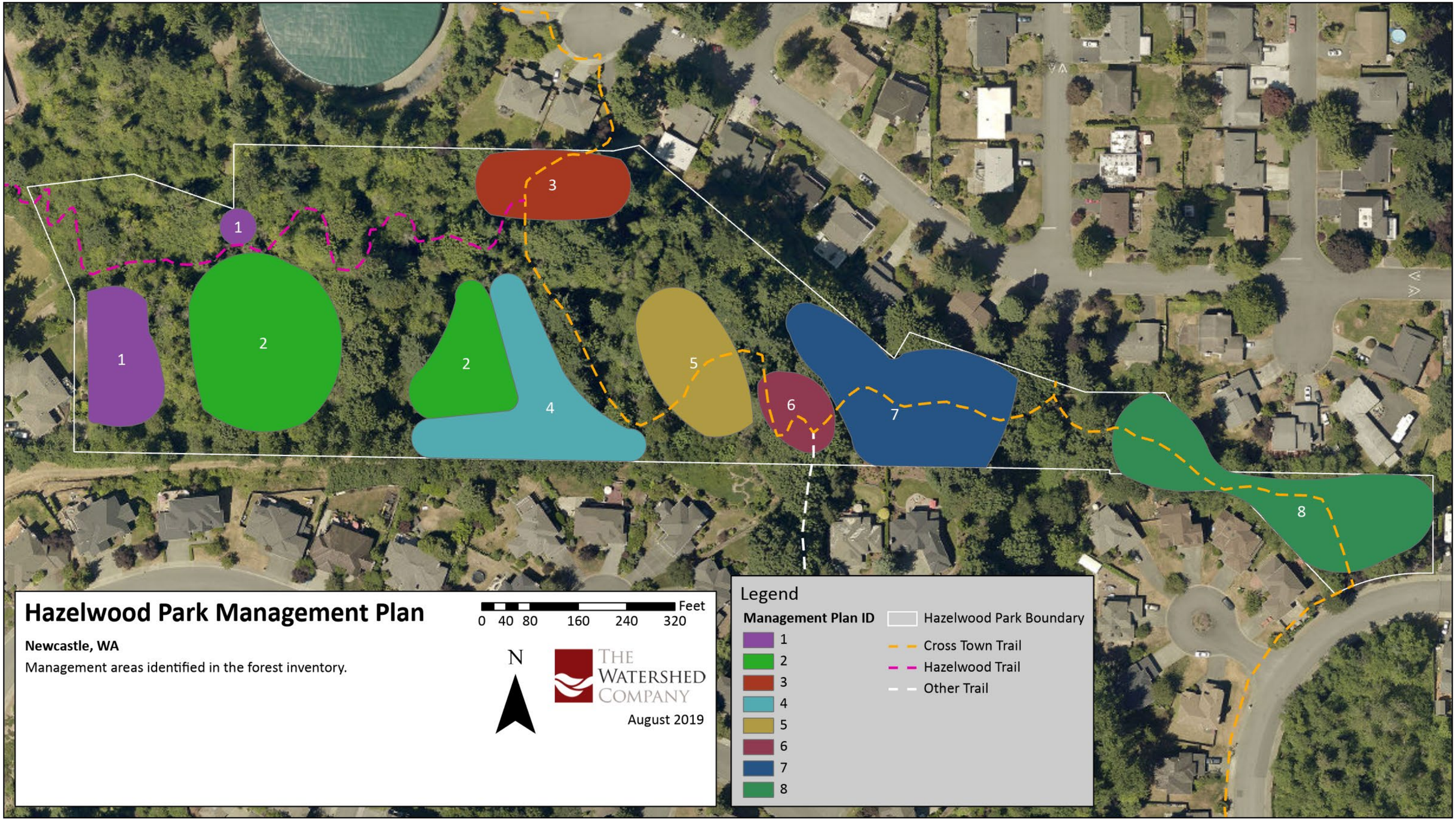
Appendix I

MANAGEMENT RECOMMENDATIONS

The following management recommendations are organized by area within Hazelwood Park; the areas are mapped on the following page (see Hazelwood Park Management Plan). For complete recommendations on species to plant, see Section 5.2.4. in the UFMP.

1. Remove patches of English ivy from the ground and tree trunks. Replace with woody shrubs and groundcovers, such as snowberry, thimbleberry, oceanspray, and salal.
2. Remove thicket of Himalayan blackberry. Grub out roots. Mulch thickly and replant with conifers and woody shrubs and groundcovers, such as beaked hazelnut, snowberry, thimbleberry, oceanspray, and salal.
3. Remove patch of Himalayan blackberry at the trail junction. Remove large common hawthorn. Remove the few English laurel and patches of English ivy. Replant with conifers and woody shrubs, such as osoberry, dull Oregon-grape, and salal.
4. Remove the large infestation of English ivy from the ground and tree canopies. Replant the understory with ferns and woody shrubs, such as sword fern, baldhip rose, salal, dull Oregon-grape, oceanspray, and snowberry.
5. Remove the large cotoneaster and patches of Himalayan blackberry. Replant with western serviceberry, oceanspray, and salal. Clear invasive plants out of the meadow, such as oxeye daisy, nipplewort, and tansy ragwort. Replant with herbaceous native meadow grasses and flowers.
6. Remove the non-native nipplewort, especially before it produces seeds; it is an annual plant that spreads prolifically. Replant with dull Oregon-grape and osoberry.
7. Remove patches of common hawthorn, English ivy, yellow archangel, and large patch of herb Robert on slope. Replant with beaked hazelnut, sword fern, dull Oregon-grape, and osoberry.
8. Remove patches of Himalayan blackberry, bittersweet nightshade, and piles of yard waste and debris in the wetland. Replant with trees, shrubs, and groundcovers, such as Pacific willow, Oregon ash, Sitka spruce, black twinberry, red-osier dogwood, clustered rose, and slough sedge.

Trails: Remove invasive species from the trail corridor, including nipplewort, oxeye daisy, herb Robert, creeping buttercup, and tansy ragwort. Periodic maintenance will be necessary to control invasive species. If using a weed-trimmer or herbicides to control non-native vegetation, use caution around patches of desirable native species that flank the trail. Trim back woody branches encroaching on the trail. Replant with native species suitable to each forest typology.



Hazelwood Park Management Plan

Newcastle, WA

Management areas identified in the forest inventory.

0 40 80 160 240 320 Feet

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THE WATERSHED COMPANY

August 2019

Legend

Management Plan ID

1
2
3
4
5
6
7
8

Hazelwood Park Boundary

Cross Town Trail

Hazelwood Trail

Other Trail