CRITICAL AREAS REPORT

BMC Rose Hill, LLC

Redmond, Washington

March 14, 2016
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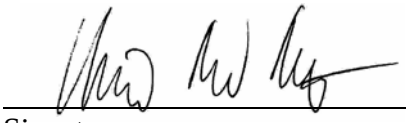

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March 14, 2016

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1.0 INTRODUCTION

1.1 PURPOSE

Raedeke Associates, Inc. was retained by BMC Rose Hill, LLC to provide a critical areas evaluation of the proposed Rose Hill project site, including a wetland reconnaissance, wildlife habitat evaluation, and delineation and evaluation of a wetland in the northern portion of the site. The report presents the findings of our background information review, August and September 2015 site investigations of the project site, and associated avoidance, minimization and mitigation measures related to the site wetland buffer. The report follows the City of Redmond critical areas reporting requirements (City of Redmond 2014).

1.2 PROJECT LOCATION

The BMC Rose Hill, LLC project site consists of two parcels totaling approximately 12.5 acres, located in the southeast quadrant of NE 100th Street and 138th Avenue NE, in the City of Redmond, Washington. The properties are identified by Tax Parcel Nos. 0325059103 and 0325059071. This places the parcels in a portion of Section 3, Township 25 North, Range 5 East, W.M. Parcel maps retrieved from King County (2014) iMap depict the property boundaries.

1.3 PROJECT DESCRIPTION

The proposed Rose Hill project would involve developing the southwestern portion of the parcel into 29 lots. Access to the lots would be provided from 138th Avenue NE which abuts the western boundary of the property. A sanitary sewer line would traverse the site from southwest to the northeast corner of the property.

2.0 METHODS

2.1 DEFINITIONS AND METHODOLOGIES

Wetlands and streams are protected by federal law as well as by state and local regulations. Federal law (Section 404 of the Clean Water Act) prohibits the discharge of dredged or fill material into "Waters of the United States," including certain wetlands, without a permit from the U.S. Army Corps of Engineers (COE 2012). The COE makes the final determination as to whether an area meets the definition of a wetland and whether the wetland is under their jurisdiction.

2.1.1 Wetland Investigation

The COE wetland definition was used to determine if any portions of the project area could be classified as wetland. A wetland is defined as an area "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Register 1986:41251).

We based our investigation upon the guidelines of the U. S. Army Corps of Engineers (COE) Wetlands Delineation Manual (Environmental Laboratory 1987) and subsequent amendments and clarifications provided by the COE (1991a, 1991b, 1992, 1994), as updated for this area by the regional supplement to the COE wetland delineation manual for the Western Mountains, Valleys, and Coast Region (COE 2010). The COE wetlands manual is required by state law (WAC 173-22-035, as revised) for all local jurisdictions, including the City of Redmond. Hydrophytic vegetation is defined as "macrophytic plant life growing in water, soil or substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Environmental Laboratory 1987). The U.S. Army Corps of Engineers National Wetland Plant List wetland indicator status (WIS) ratings were used to make this determination (Lichvar and Kartesz 2009). The WIS ratings "reflect the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetland versus non-wetland across the entire distribution of the species" (Reed 1988:8). Plants are rated, from highest to lowest probability of occurrence in wetlands, as obligate (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and upland (UPL), respectively. In general, hydrophytic vegetation is present when the majority of the dominant species are rated OBL, FACW, and FAC.

A hydric soil is defined as "a soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register 1995: 35681). The morphological characteristics of the soils in the study area were examined to determine whether any could be classified as hydric.

According to the 1987 methodology, wetland hydrology could be present if the soils were saturated (sufficient to produce anaerobic conditions) within the majority of the rooting zone (usually the upper 12 inches) for at least 5% of the growing season, which in this area is usually at least 2 weeks (COE 1991a). It should be noted, however, that areas having saturation to the surface between 5% and 12% of the growing season may or may not be wetland (COE 1991b). Depending on soil type and drainage characteristics, saturation to the surface would occur if

water tables were shallower than about 12 inches below the soil surface during this time period. Positive indicators of wetland hydrology include direct observation of inundation or soil saturation, as well as indirect evidence such as drift lines, watermarks, surface encrustations, and drainage patterns (Environmental Laboratory 1987). Hydrology was further investigated by noting drainage patterns and surface water connections between wetlands and streams within and adjacent to the project area.

2.2 BACKGROUND RESEARCH

2.2.1 Wetlands

In preparation for our site investigation, we collected and analyzed background information available for the site prior to the on-site investigation. We collected maps and information from the U.S.D.A Natural Resources Conservation Service (2015) Web Soil Survey and U.S. Fish and Wildlife Service (USFWS 2015) National Wetland Inventory on-line mapper, and the Washington State Department of Natural Resources (WDNR 2015) on-line water types map.

The USFWS (2015) NWI map shows no wetlands on the site or within at least 300 feet. The City of Redmond (2012) wetland map likewise depicts no wetlands on the site, and only shows a wetland located several hundred feet south of the site. The USDA NRCS (2014) soil survey depicts the site as having Alderwood gravelly sandy loam soils, 6-15% slopes (AgC) and Alderwood gravelly sandy loam soils, 15-30% slopes (AgD) which are a non-hydric soils (USDA SCS 1991, Federal Register 1995).

2.2.2 Wildlife

We also accessed the online priority habitats and species (PHS) database maintained by Washington Department of Fish and Wildlife (WDFW 2015a) for documented information on the potential occurrence of federal- or state-listed endangered, threatened, sensitive, candidate, other priority, or monitor wildlife species (hereafter “species of concern”), or priority habitats on the project site and vicinity. State priority species are defined as those fish and wildlife species “requiring protective measures and/or management actions to ensure their survival”, and State priority habitats are defined as habitat types “with unique or significant value to many species” (WDFW 2008). We also reviewed database information maintained by the Washington Natural Heritage Program (2015) for occurrence of endangered, threatened, and sensitive plants in the vicinity of the project site.

Reference lists maintained by WDFW (2008) were consulted for information on the status of wildlife species of concern that could use the site during at least some part of the year. Species accounts and management recommendations provided by WDFW (e.g., Rodrick and Milner 1991, Larsen 1997, Azerrad 2004, Larsen et al. 2004) were consulted to determine habitat associations of such species and to evaluate the likelihood of their occurrence on the project site. During the field investigation, we searched for the presence of these species, or signs thereof, which could be found on the property.

The WDFW (2015a) PHS database map shows no occurrences of species of concern, including endangered, threatened, sensitive, or other priority species or habitats on or adjacent to the project site. The City of Redmond’s (2012) map of core preservation areas shows no mapped

fish and wildlife habitat conservation areas on the project site or immediate vicinity other than a wetland feature to the south of the property. The Washington Natural Heritage Program (2015) database contains no records of Natural Heritage Features (e.g., listed plant species or Natural Heritage wetlands) in the section in which the project site occurs.

2.3 FIELD STUDY

2.3.1 Wetlands

An initial field reconnaissance was conducted on August 5, 2015 to search the site for the presence of wetlands and characterize general site conditions. A second field visit was conducted on September 2, 2015 to flag the wetland boundary.

Vegetation, soils, and hydrology were examined in representative portions of the study area according to the procedures described in the Regional Supplement (COE 2010). Plant communities were inventoried, classified, and described during our field investigation. We estimated the percent coverage of each species. Plant identifications were made according to standard taxonomic procedures described in Hitchcock and Cronquist (1976), with nomenclature as updated by the U.S. Army Corps of Engineers National Wetland Plant List (Lichvar and Kartesz 2009). Wetland classification follows the USFWS wetland classification system (Cowardin et al. 1992). We determined the presence of a hydrophytic vegetation community using the procedure described in the Regional Supplement (COE 2010), which requires the use of the dominance test, unless positive indicators of hydric soils and wetland hydrology are also present, in which case the prevalence index or the use of other indicators of a hydrophytic vegetation community as described in the Regional Supplement (COE 2010) may also be required.

We excavated pits to at least 18 inches below the soil surface, where possible, in order to describe the soil and hydrologic conditions throughout the study area. We sampled soil at locations that corresponded with vegetation sampling areas and potential wetland areas. Soil colors were determined using the Munsell Soil Color Chart (Munsell Color 2009). We used the indicators described in the Regional Supplement (COE 2010) to determine the presence of hydric soils and wetland hydrology.

2.3.2 Wildlife

During this field investigation, we documented wildlife presence, sign, and habitat while inventorying and describing plant communities. We recorded information regarding reproduction, habitat use, and activities of all wildlife species observed. In addition, we noted special habitat features such as large and/or hollow trees, snags [standing dead or partly dead trees at least 4 inches diameter at breast height (dbh) and 6 feet tall], and large down logs. Historic and present land-use of the site and immediate vicinity were noted from direct observations in the field and analysis of aerial photographs.

During our field surveys, we also searched specifically for the presence, sign, or habitats of any wildlife species of concern that may occur on the project site or vicinity. In particular, we

searched for the presence of large stick-type nests, hollow trees, tree cavities, and pileated woodpecker foraging sign. Large stick nests are built and used by several species of concern, including bald eagles and great blue herons. Tree cavities are created and used by woodpeckers, including species of concern such as the pileated woodpecker, and can provide habitat for a host of bird and mammal species, including species of concern such as purple martins, various cavity-nesting duck species, and various bats. Hollow trees are used as daytime roost for priority species including various bat species, as well as Vaux's swifts.

3.0 EXISTING CONDITIONS

3.1 GENERAL SITE DESCRIPTION

The BMC Rose Hill, LLC property is an undeveloped parcel that slopes down from west to east. A water line and access road forms the northern boundary of the site. The property contains a mixed deciduous and coniferous forest vegetation community.

During our site investigation on September 2, 2015 we delineated Wetland A in the northern portion of the property. The wetland occurs in ravine that slopes down from west to east. We found no evidence of wetlands occurring elsewhere on the property. A channel with evidence of flow was observed within the wetland. The channel begins near the western edge of the wetland and extends to near the eastern edge of the wetland. No flowing water was observed in the channel during our site visits.

Vegetation throughout the site consists of a mixed coniferous and deciduous forest with a dense shrub understory. The forest is dominated by Dougls fir (*Pseudotsuga menzessi*) and big-leaf maple (*Acer macrophyllum*). The understory consisted of dense tall shrub cover that varied in composition, ranging from dense stands of vine maple (*Acer circinatum*) and salmon raspberry (*Rubus spectabilis*), to areas dominated almost exclusively by Himalayan blackberry (*Rubus ameniacus*). Low cover included stinging nettle (*Urtica dioica*), reed canarygrass (*Phalaris arundinacea*), trailing blackberry (*Rubus ursinus*), sword fern (*Polystichum munitum*), and lady fern (*Athyrium filix-femina*).

Soils were generally consistent with the Alderwood series mapped for the site, with brown to dark brown (10YR 4/3 to 10YR 4/2) subsoil and without redoximorphic features or any indicators of hydric soil conditions. No water table or saturated soil was observed anywhere outside of the delineated wetland on site. Sample plots were located in the vicinity of the wetland (Figure 4, Appendix A).

3.2 WETLAND

Canopy cover in the wetland vicinity is characterized by big-leaf maple (*Acer macrophyllum*) and black cottonwood (*Populus balsamifera*). These trees appear to be approximately 30 to 40 years in age and are homogeneous in terms of stand age composition. The understory is a patchwork with sections dominated by dense stands of vine maple (*Acer circinatum*) and salmon raspberry (*Rubus spectabilis*), while other segments comprise almost exclusively of Himalayan blackberry (*Rubus ameniacus*). Scattered throughout the understory are several grasses and herbs including stinging nettle (*Urtica dioica*), reed canarygrass (*Phalaris arundinacea*), trailing blackberry (*Rubus ursinus*), sword fern (*Polystichum munitum*), and lady fern (*Athyrium filix-femina*).

We observed at least one snag 30 feet tall and greater than 8 inches in diameter in the eastern portion of the site, as well as a number of downed logs of greater than 6 inches diameter. Woodpecker foraging excavations were also noted on at least one of these features.

The forest vegetation community within the site has no distinct edges. The most distinct edges are those between the on-site forest and surrounding properties, particularly on the north, west, and south. The edges are formed by residential housing and associated paved roads (Figure 4). Areas along habitat edges are subject to a number of special environmental factors as compared to larger, more contiguous forest patches, and these factors can positively or negatively affect wildlife. Edge habitat is preferred by many wildlife species, which may increase wildlife species richness and diversity. However, negative factors that are prevalent in edge habitat include increased likelihood for colonization by invasive plant species, increased presence of mid-sized carnivores such as raccoons (potentially leading to increased depredation and decreased reproductive success for resident wildlife), and greater fluctuations in understory temperature, among others.

3.3 WILDLIFE

3.3.1 Wildlife Use and Observations

A wide variety of wildlife species may be expected to inhabit lowland deciduous or mixed forest communities in the Pacific Northwest, such as that found on the project site. Of the more than 300 vertebrate wildlife species expected to occur in west side forests of Oregon and Washington, over 230 species occur within west side lowland mixed coniferous and deciduous forests (Johnson and O'Neil 2001). A more limited number of species are expected to occur within lowland deciduous or mixed forests of western Washington, particularly King County: over 80 species, nearly 60% of which are birds, about 25% are mammals, and the rest are amphibians and reptiles (King County 1987). The number of species expected to inhabit a particular forest stand depends on its size, landscape context, and surrounding uses. Relatively small stands such as that on the Edgewood East property that are surrounded by urban residential uses, would be expected to support a more limited number of wildlife species. Those that do occur there may be further adversely affected by surrounding human activity and predation or other influences from urban-adapted species (such as crows and starlings), or other invasive species.

We observed relatively few wildlife species or their sign during our field reconnaissance visits. Our field visits were conducted during summer (August and September), outside much of the breeding season for birds. As noted above, we also saw sign of past foraging activity by pileated woodpeckers and other small woodpecker species (likely hairy or downy woodpeckers). The number of species that we observed is also likely limited by the relatively small size of the site and the surrounding suburban land uses. Species observed primarily include those adapted to Puget Sound lowland mixed forest, as well as those that can persist in fragmented forest habitat and/or residential areas.

A variety of other bird species are likely to inhabit the site and vicinity at different times of the year. Many of these are spring and summer residents that migrate out of the area for the fall and winter, as well as year-round residents. We observed no raptors (eagles, hawks, falcons, or owls) during our field reconnaissance, and no raptor nests were found on any of the trees within the site. Most of the larger trees had intact tops and lacked appropriate branching structures to support large raptor nests such as bald eagles.

We observed no mammals or their sign during our field visits. Several species of small and medium-sized mammals likely use the site, though many are secretive and/or nocturnal and are therefore unlikely to be observed during a general site reconnaissance. The down woody debris was widely scattered the site, and although limited in extent, along with areas of dense areas of shrub and ground cover, provide potential cover and breeding habitat for small mammals. In addition, on-site trees and snags provide potential cover and breeding locations for medium-sized mammals such as raccoons and squirrels. The presence of domestic dogs and cats in the area may limit the suitability of the forest on site, as they can act as highly effective predators on native wildlife species in urban and suburban areas, particularly those that nest or inhabit the ground (Penland 1984, Maestas et al. 2003, Odell and Knight 2001, Leu et al. 2008).

We did not observe any reptiles, amphibians, or their sign during our field visits, though a small number of species of each group is likely to be present. The minimal amount of down woody debris on the site and the isolation of the wetland may limit the number of Puget Sound lowland terrestrial-breeding amphibians that could occupy the site. Amphibians would most likely be expected to center activities on the wetland. Potential cover and foraging habitat is present on the site for some reptiles, including garter snakes, and some amphibians.

3.3.2 Endangered, Threatened, Sensitive, or Other Priority Species

We observed no species listed as endangered, threatened, or sensitive within the project site or immediate vicinity, nor are any of these species considered to have a primary association with the project site. As noted above, sign of previous foraging by pileated woodpecker, a state candidate species, was observed in one snag on site, but none of this sign appeared to be fresh (i.e., occur since at least this last fall or winter). No snags appeared to be large and tall enough to provide suitable nesting or roosting habitat for pileated woodpeckers. No other priority or other species of concern were observed or likely to occur within the project site.

3.3.3 Wildlife Habitat Movement Corridors and Networks

Wildlife habitat networks or corridors can take different forms, depending on the landscape. Corridors can be in the form of hedgerows or fencerows connecting woodlots in an agricultural landscape. In a fragmented forested landscape, corridors are linear patches of forest or forested riparian zones connecting larger patches of forest. They can also be non-forested linear patches, such as utility easements, or wetland and stream systems, in a landscape that is forested. In an urbanizing environment, open space or native forestland can act as corridors connecting otherwise disjunct habitat for wildlife species.

Corridors can provide (1) habitat for certain species; (2) movement pathways; (3) extensions of foraging ranges for large, wide-ranging species; and (4) escape from predators (Harris 1984, Levenson 1981, Noss 1987, Noss and Harris 1986, Simberloff and Cox 1987). Corridors may also have disadvantages, such as (1) providing conduits for disease, fire, pests, and exotic species; (2) increasing exposure to predation; and, (3) potentially having negative genetic impacts on a population (Noss 1987, Simberloff and Cox 1987).

The BMC Rose Hill, LLC property is situated generally within a larger area of residential development. The forested habitat of the site is contiguous with similar forest stands that extend off site to the north, and east, but are highly fragmented by existing development in the area. Because of the surrounding development, these habitats are relatively isolated from other native habitats within the City of Redmond and therefore do not provide linkages to other such habitats. This also is evident on the City of Redmond Map of Core Preservation Areas, none of which are located near the site. The site scored a total of 14 points on the City of Redmond Habitat Unit Assessment Form (attached in Appendix B).

3.4 STREAM

Within the identified wetland on the site there is a define channel that conveys water from a seep near the western edge of the wetland, downslope to the east before infiltrating near the eastern edge of the wetland. This channel meets the City of Redmond criteria necessary to be classified as a Class IV stream. The stream was not flowing during our August or September site visits and thus would be considered to be an intermittent feature. Because the channel does not connect to other streams it is not fish bearing and based on the Rose Hill properties location within the Sammamish River watershed, the on-site channel is not a headwater stream.

3.5 GEOLOGIC HAZARDS

Geologic hazards on the property are discussed in the AESI (2016) *Preliminary Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report* attached as Appendix C to this document.

4.0 REGULATORY CONSIDERATIONS

4.1 WETLANDS AND STREAMS

Wetlands and streams are protected by Section 404 of the Federal Clean Water Act and other state and local policies and ordinances including the City of Redmond (2014) code.

The City of Redmond (2014) regulates wetlands and streams under Chapter 21.64 of its Zoning Code (RZC). The city classifies wetlands as Category I, II, III, or IV based on the Washington Department of Ecology's (WDOE) Wetland Rating System for Western Washington (publication #04-06-025) (Hruby 2004, as revised 2006, and WDOE 2008). The City of Redmond (2014) determines wetland buffer widths based on their classifications. Standard buffer widths may be modified by averaging or be increased, on a case by case basis by the City of Redmond. Streams are also classified as Class I, II, III, or IV based on definitions in the City of Redmond Code.

The wetland met criteria for Category III rating based on a total score for wetland functions of 35 total points. The wetland also had a score of 15 points for habitat functions. The wetland did not meet criteria for Category I rating because it had a total function score of less than 70 points, and it did not have special characteristics such as the presence of old growth or mature forest greater than 1 acre in area or the presence of a bog vegetation community. The WDOE rating form is found in Appendix B.

Under City of Redmond (2014) regulations, Category III wetlands are provided a buffer of 75, 110 or 150 feet depending upon the intensity of adjoining land use. Because the proposal is to develop the site as a subdivision with density greater than 1 unit per acre the intensity of the adjoining land use is high and a standard 150-foot-wide buffer would be required.

The stream within the wetland met the criteria for Class IV as it does not meet Class I, II, or III criteria, it is not fish bearing, does not have potential to be fish bearing, and is not a headwater stream. City of Redmond (2014) code provides for a 25 foot wide buffer on intermittent Class IV streams.

4.2 WILDLIFE

4.2.1 State of Washington

State law provides protections for wildlife species listed as endangered (WAC 232-12-014), as well as threatened, sensitive, or "other protected" species (WAC 232-232-011). Recently, bald eagles have been down-listed to "sensitive" at the State and de-listed at the federal level. However, in Washington, bald eagles are still protected by the Bald Eagle Protection Act of 1984 (RCW 77.12.655), and the Bald Eagle Protection Rules (WAC 232-12-292). The Bald Eagle Protection rules have been recently amended such that state bald eagle management plans are no longer required unless bald eagles are listed as Threatened or Endangered in Washington State.

The WDFW (2012) PHS and HRTG databases show no known nest or roost sites of eagles or other listed raptor species (such as hawks or owls) in the vicinity of the project site. In addition, we found no raptor nests or potentially suitable nest trees on the project site or in the vicinity.

In addition, the WDFW (2008) has developed management recommendations for "species of concern," which include state listed and other priority species, as well as priority habitats. Occurrences or signs of priority species or habitats in the vicinity of the project site are noted above. These management recommendations are often referenced in local critical area ordinances, such as the City of Redmond in protection of "Fish and Wildlife Habitat Conservation Areas," or FWHCA.

4.2.2 City of Redmond

Redmond (2014) regulates wildlife habitat as "Fish and Wildlife Habitat Conservation Areas" (hereafter, FWHCA's) under Chapter 21.64 of its Zoning Code (RZC). The Redmond Zoning Code generally identifies the following as FWHCA's: (1) federal endangered and threatened species, (2) state endangered, threatened, sensitive, and state candidate species, (3) WDFW priority habitats and species, (4) Habitats and Species of Local Importance, which in Redmond are identified as great blue herons, (5) natural ponds less than 20 acres in size, (6) waters of the state, (7) lakes, ponds, streams, and rivers planted with game fish, and (8) land essential for preserving connections between habitat blocks and open spaces.

As noted above, no federal or state endangered, threatened, or sensitive species were observed on site, nor are they considered to inhabit or have a primary association with the site. The only terrestrial priority species known to occur on site was the pileated woodpecker (a state candidate species), primarily from foraging excavations that appeared to be relatively old. No fresh sign was observed, and none of the snags found on site appeared to be large enough to provide suitable nesting habitat for this species. We found no evidence of use of the site by great blue herons, which are identified as a species of local importance by the City.

5.0 IMPACTS

The following discussion of direct and indirect wetland and stream impacts below is based on our review of revised site plans provided to us by KPFF on January 25, 2016.

5.1 IMPACTS TO VEGETATION

Residential housing and an associated access road would be developed in the southwestern portion of the property. The proposed development would remove less than half of the forest habitat on the site. The wetland and associated buffer would be retained in the northern portion of the property. Thus, no direct impact to the wetland would occur as a result of the proposed development. In addition, the development would retain most of the existing snags on site. The proposed development would thus increase fragmentation of the remaining forest habitat and increase the amount of artificial edges with adjoining single-family residential areas.

5.2 IMPACTS TO WILDLIFE

Direct alteration (reduction) to the distribution, composition, and amount of native vegetation resulting from the proposed residential development would affect the distribution and composition of native wildlife on the property. In addition, indirect impacts to habitat retained on-site would make it less suitable for some species of wildlife currently inhabiting the site.

Upon completion, the proposed residential development would reduce the forest habitat available for native wildlife on the site. This would reduce the local populations of most native species on the property. Grading and construction activities associated with the proposed development, as well as increased levels of human activity on-site, would also result in increased short- and long-term disturbance to wildlife species using the retained habitat areas. This would further reduce the suitability of the on-site habitats to some wildlife species, particularly those vulnerable to predation by domestic cats and dogs (Penland 1984). Some species adapted to urban environments and fringes, including many non-native plant and animal species, would find suitable habitat on-site, and may become established and/or increase in numbers. Some species less adapted for urban environments, however, would be expected to decrease in numbers, and some wildlife species may be eliminated from the site entirely.

Impacts to Endangered, Threatened, Sensitive, or Other Priority Species or Habitats

Because endangered, threatened, and sensitive wildlife species are not known or likely to occur on or in the site or have a primary association with any impacted habitats, no impacts to these species are expected. The proposed subdivision would likely retain most snags on site, including those used by foraging pileated woodpeckers, a state candidate species. The proposed development is not expected to have a substantial adverse impact on pileated woodpeckers, however, as they do not appear to be foraging there currently, and none of the snags on site appear to be suitable for nesting or roosting. In addition, the Rose Hill property is small compared to the large home ranges (more than a square mile) typically occupied by pileated woodpeckers (Lewis and Azerrad 2004), and thus does not likely represent a significant portion of the habitat areas used by pileated woodpeckers in the vicinity. No other terrestrial priority

species, or species of local importance, are known or likely to inhabit the site. Thus, the proposed development would not adversely affect such species.

The proposed site plan would retain the Class III wetland and Class IV stream and their buffers as native open space. The site contains no habitats designated as fish and wildlife conservation areas, so the proposed development would not affect such habitats. Consequently, no habitats or habitat features known or suspected to be used by other priority species or species of local importance would be affected by the proposed site plan.

6.0 MITIGATION

Mitigation has been defined by the State Environmental Policy Act (SEPA) (WAC 197-11-768; cf. Cooper 1987), and more recently in a Memorandum of Agreement between the Environmental Protection Agency and the U.S. Army Corps of Engineers (Anonymous 1989). In order of desirability, mitigation may include:

1. ***Avoidance*** - avoiding impacts by not taking action or parts of an action;

2. ***Minimization*** - minimizing impacts by limiting the degree or magnitude of the action and its implementation;

3. ***Compensation*** - which may involve:

    a) repairing, rehabilitating, or restoring the affected environment;

    b) replacing or creating substitute resources or environments;

    c) mitigation banking.

6.1 AVOIDANCE AND MINIMIZATION

Conversion of a portion of the Rose Hill property to a residential development would incorporate one or more mitigating measures that would avoid or reduce impacts to on-site habitat.

The proposed development plan for the Rose Hill property would establish an open space tract encompassing the Class III wetland and associated buffer (Figure 6). The proposed development plan incorporates a number of other design features that would avoid or minimize impacts to the retained areas and off-site habitats:

- Direct impacts to the on-site Class III wetland would be avoided;
- Direct impacts to the on-site Class IV stream would be avoided;
- The forested buffer would retain a substantial portion of the forested habitat on site; The limits of the buffer tract would be clearly marked with fencing and critical area signage per City of Redmond requirements;
- No residential structures, impervious surfaces, or trails would be located within the designated open space tract;
- The proposed development would route the majority of stormwater runoff to a detention vault to provide water quality treatment and discharge it at controlled rates via pipe down the slope to an energy dissipater to protect downstream resources; and
- Temporary erosion and sediment control (TESC) measures would be installed during construction and would utilize appropriate best management practices (BMPs) designed to prevent sediment deposition to on-site open space tracts and off-site areas.

6.2 COMPENSATORY MITIGATION

As outlined above, the proposed site plan avoids direct impacts to the Class III wetland, Class IV stream, and their buffers. Thus, no compensatory mitigation is required.

7.0 LIMITATIONS

We have prepared this report for the exclusive use of BMC Rose Hill, LLC and its consultants. No other person or agency may rely upon the information, analysis, or conclusions contained herein without permission from BMC Rose Hill, LLC.

The determination of ecological system classifications, functions, values, and boundaries is an inexact science, and different individuals and agencies may reach different conclusions. With regard to wetlands, the final determination of their boundaries for regulatory purposes is the responsibility of the various agencies that regulate development activities in wetlands. We cannot guarantee the outcome of such determinations. Therefore, the conclusions of this report should be reviewed by the appropriate regulatory agencies.

We warrant that the work performed conforms to standards generally accepted in our field, and prepared substantially in accordance with then-current technical guidelines and criteria. The conclusions of this report represent the results of our analysis of the information provided by the project proponent and their consultants, together with information gathered in the course of the study. No other warranty, expressed or implied, is made.

8.0 LITERATURE CITED

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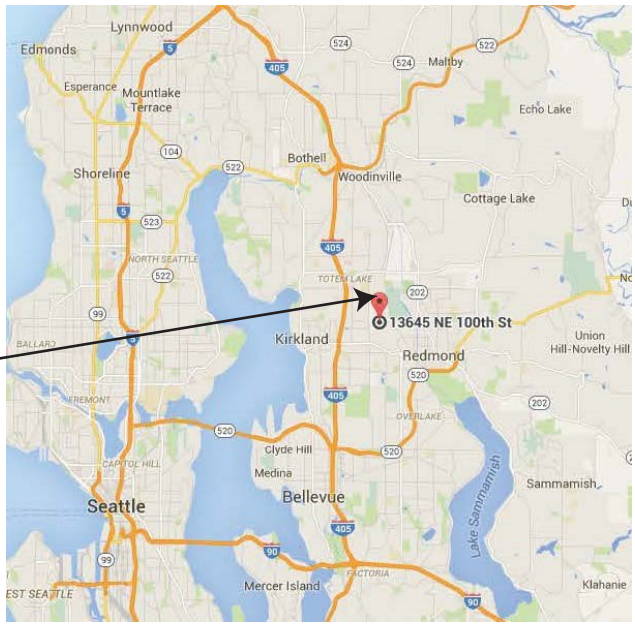
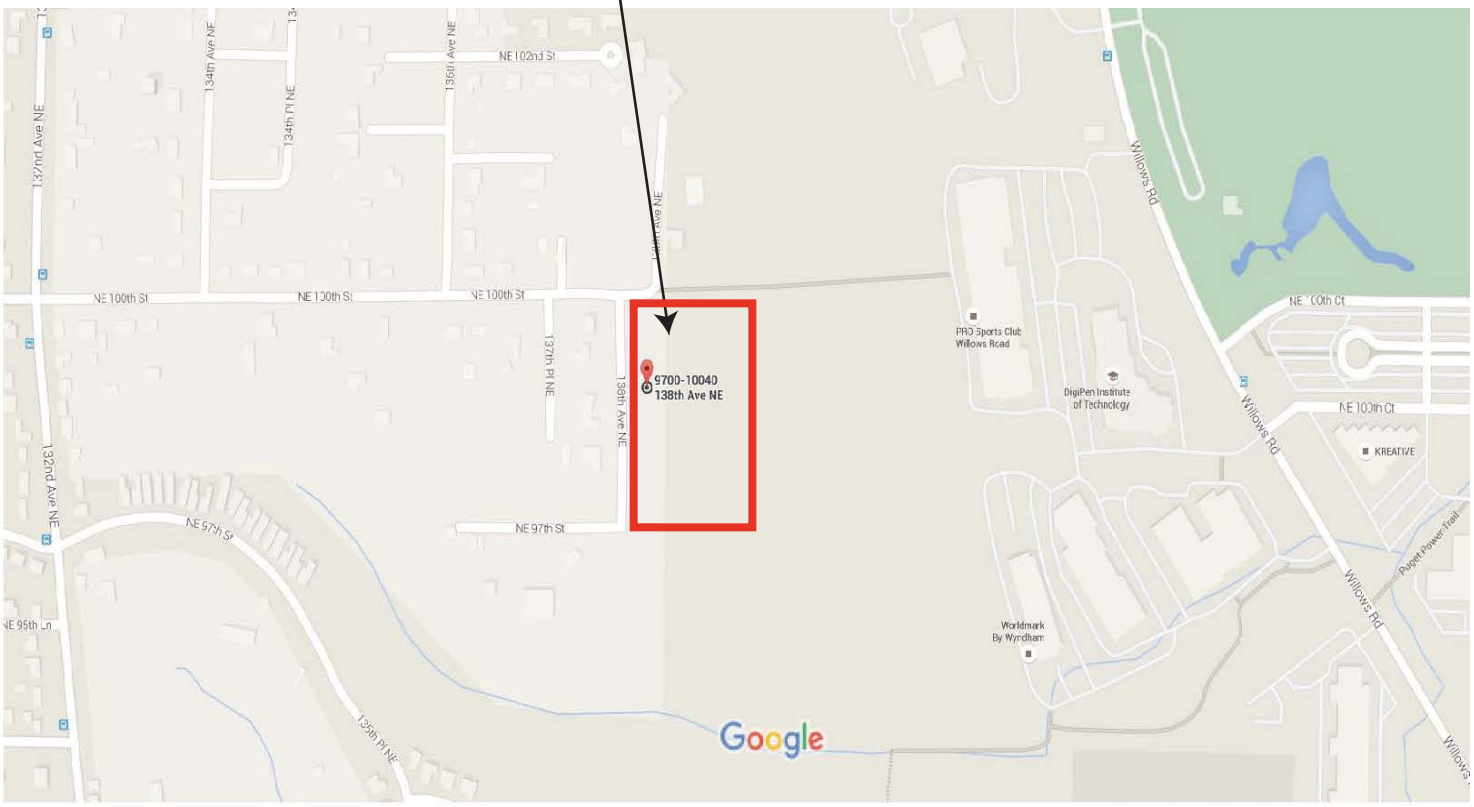
FIGURES

PROJECT LOCATION





N

FIGURE 1

REGIONAL & VICINITY MAP

BMC ROSE HILL LLC

REDMOND, WA

Raedeke Associates, Inc.
2111 N. Northgate Way, Ste. 219
Seattle, WA 98133

RAI # 2015-057-002

PROJECT LOCATION
(APPROX.)

T:\2015\2015-057 Benchmark Rose Hill\Figures 1-4.dwg

Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [2015/9/23].

SOILS KEY:
AgC: Alderwood gravelly sandy loam; 8 to 15% slopes
AgD: Alderwood gravelly sandy loam; 15 to 30% slopes

N

FIGURE 2
SOILS MAP
BMC ROSE HILL LLC
REDMOND, WA

0 100 200 400
SCALE 1"=200'

Raedeke Associates, Inc.
2111 N. Northgate Way, Ste. 219
Seattle, WA 98133

RAI # 2015-057-002

Source: Washington Department of Fish and Wildlife, Priority Habitat and Species Mapping. Available at http://wdfw.wa.gov/mapping/phs/. Accessed on 9/1/2015

September 1, 2015

PHS Report Clip Area	AS MAPPED	TOWNSHIP
PT	SECTION	
LN	QTR-TWP	

N

0 400 800 1600
SCALE 1"=800'

FIGURE 3
PHS MAP
BMC ROSE HILL LLC
REDMOND, WA

Raedeke Associates, Inc.
2111 N. Northgate Way, Ste. 219
Seattle, WA 98133

RAI # 2015-057-004

PROJECT LOCATION

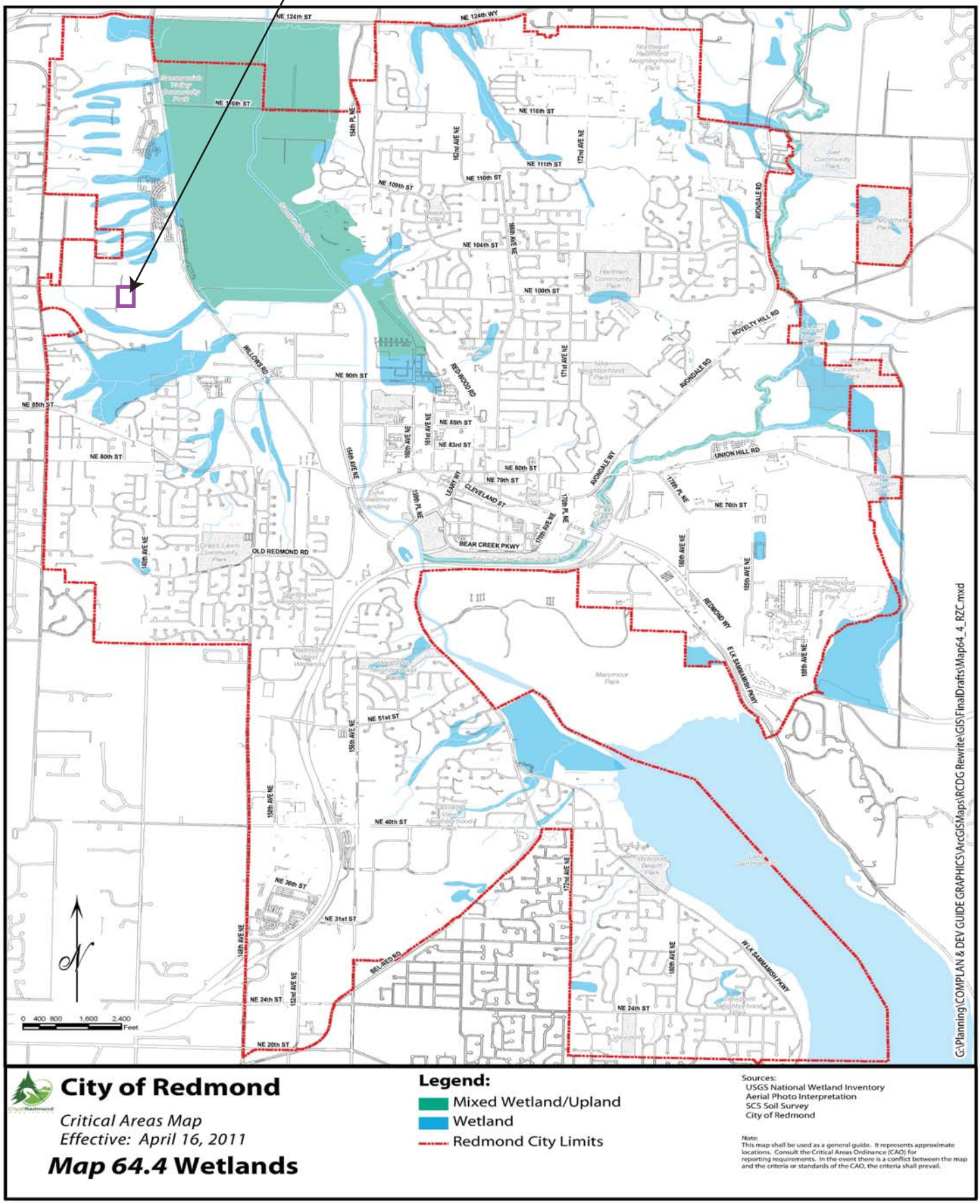


FIGURE 4
CITY OF REDMOND CRITICAL AREAS MAP
BMC ROSE HILL LLC
REDMOND, WA

Raedeke Associates, Inc.
2111 N. Northgate Way, Ste. 219
Seattle, WA 98133

RAI # 2015-057

T:\2015\2015-061 Marymoor Park Apartments\2015-061 Marymoor Park Apts. Figures.dwg

FIGURE 5
EXISTING CONDITIONS

VERTICAL DATUM

NAVD 88

BENCHMARK

CITY OF REDMOND BENCHMARK # COR 9175

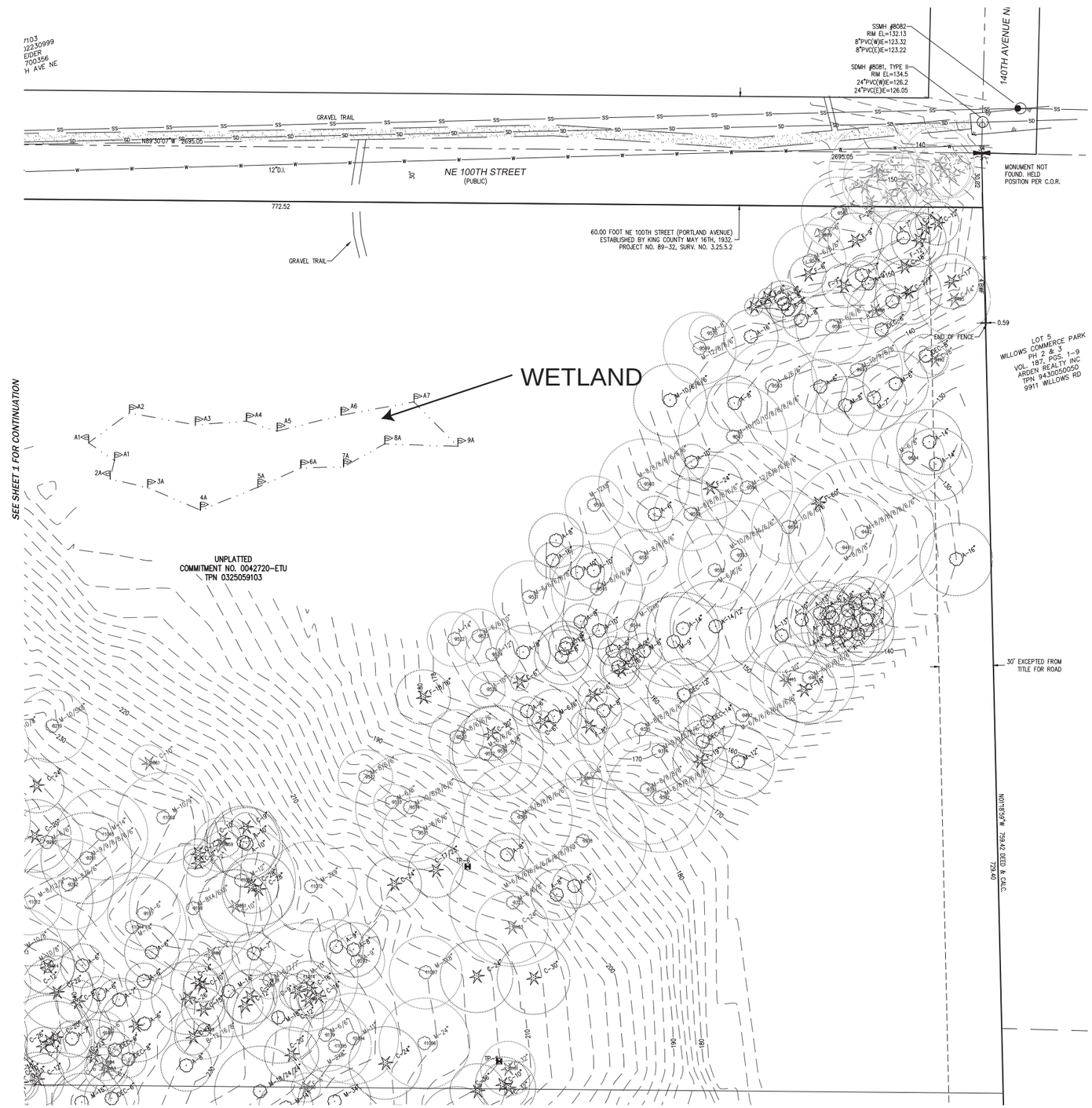
3" BRASS DISK IN CONCRETE MONUMENT LOCATED SOUTHEAST OF THE INTERSECTION OF 132ND AVE N.E. AND N.E. 104TH ST.
ELEVATION: 334.2

CITY OF REDMOND BENCHMARK # COR 9169

RAILROAD SPIKE IN THE WEST FACE OF A POWER POLE ON THE EAST SIDE OF 132ND AVE NE BETWEEN ADDRESSES 9348 AND 9336.
ELEVATION: 328.43

LEGEND

TEST PIT	CLF	CHAIN LINK FENCE	
WATER VALVE	BWF	BARBED WIRE FENCE	
FIRE HYDRANT	SS	SANITARY SEWER LINE	
WATER METER	S	STORM DRAIN LINE	
IRRIGATION VALVE	G	GAS LINE	
GAS VALVE	W	WATER LINE	
SIGN	P	UNDERGROUND POWER	
UTILITY POLE	OHP	OVERHEAD POWER	
BOLLARD	C	CEDAR	
STREET LIGHT	CW	COTTONWOOD	
YARD DRAIN	F	FIR	
MAIL BOX	M	MAPLE	
	A	ALDER	
	B	BIRCH	



SCALE: 1" = 30'

0 15 30 60

Not to Scale @ 11 x 17

NO.	REVISIONS	DATE
1.	WETLAND DELINEATION ADDED	9/8/2015
2.	LOCATE ADDITIONAL TREES	10/9/2015
3.	LOCATE ADDITIONAL TREES	10/23/2015

ROBERT DAVID WEST
STATE OF WASHINGTON
48855
REGISTERED PROFESSIONAL LAND SURVEYOR

14711 NE 29th Place, #101
Bellevue, Washington 98007
425.885.7877 Fax 425.885.7963

CORE DESIGN
ENGINEERING • PLANNING • SURVEYING

BOUNDARY/TOPOGRAPHIC SURVEY
ROSE HILL

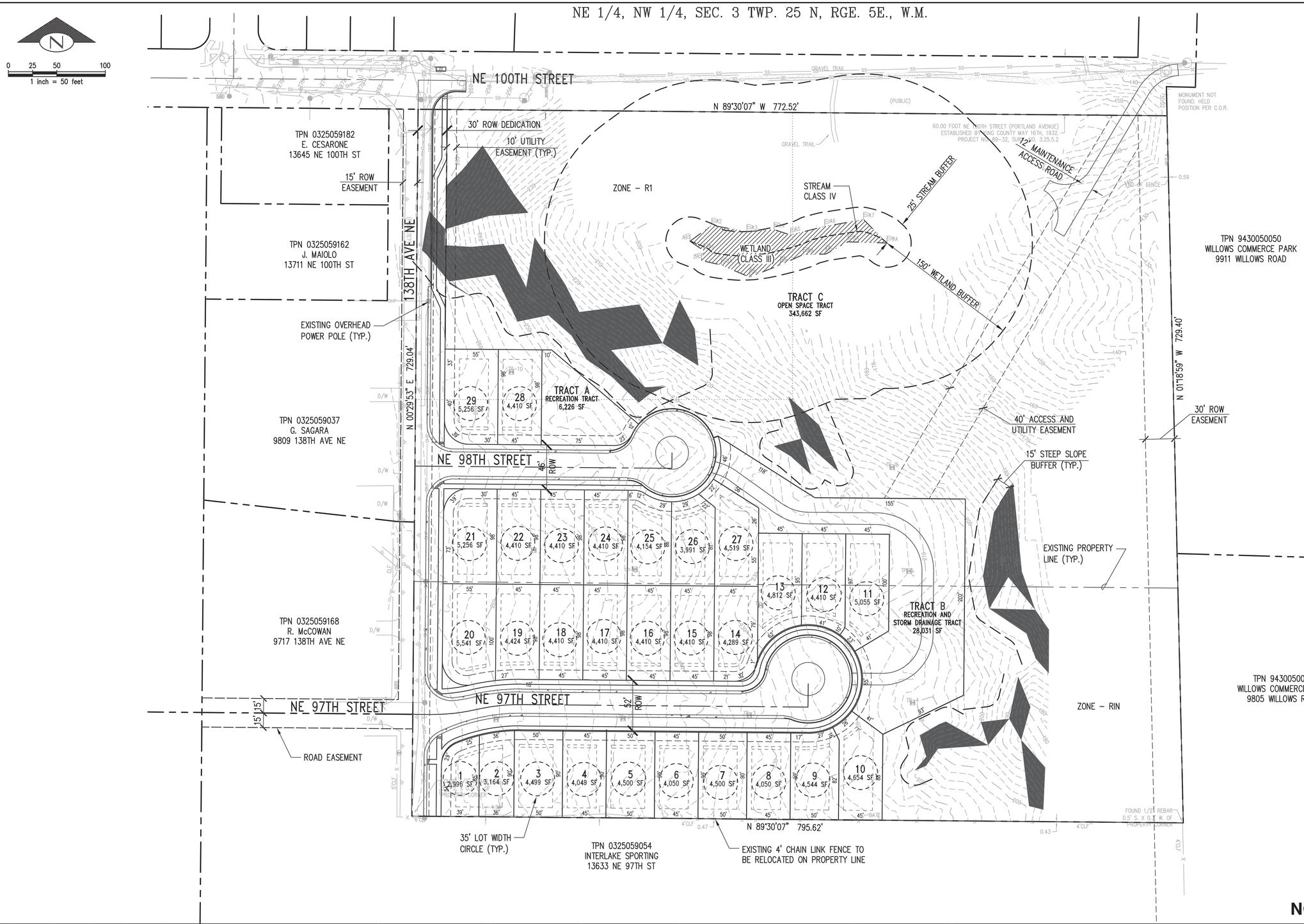
BMC ROSE HILL, LLC
150 120TH AVENUE NE, SUITE 200
BELLEVUE, WA 98005

DATE 8/12/2015
DESIGNED
DRAWN ROW/LJR
APPROVED ROBERT D. WEST
LAFE B. HERMANSEN
PROJECT MANAGER

SHEET	OF
2	4

PROJECT NUMBER
15098

FIGURE 6
PROPOSED SITE PLAN



NOT FOR CONSTRUCTION

NO.	DATE	BY	CHD.	APPR.	REVISION

DRAWN BY WDK&TAD | DESIGNED BY JSF&WDK
CHECKED BY JSF | APPROVED BY MAV
DATE 01/25/2016
J O B No. :115283

CALL TWO BUSINESS DAYS BEFORE YOU DIG 1-800-424-5555

S C A L E: AS NOTED

kpff
1601 5th Avenue, Suite 1600
Seattle, WA 98101
206.622.5822
www.kpff.com

APPLICANT/OWNER'S AGENT
BMC ROSE HILL, LLC
150 120TH AVE NE SUITE 200
BELLEVUE, WA 98005
PHONE: (425) 590-9921
CONTACT: BRENDA FODGE
EMAIL: bfodge@benchmarkcommunities.com

JEREMY S. FEIST STATE OF WASHINGTON 38847 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY

ROSE HILL SUBDIVISION
PARCEL NO. 0325059103 & 0325059071
PARTIAL LEGAL: PORTION OF NE 1/4 OF NW 1/4 OF SEC 3, TWP 25N, RGE 5E, W.M.

SITE PLAN

SHEET C-1.0

Z:\115000-115400\115283 (Rose Hill)\CADD\Design\C0\C-10 RH PLAT.dwg
Mar 09, 2016 - 3:17pm KirkM

APPENDIX A:

Sample Plot Data Sheets

Print Form

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or 1987 Corps Wetland Delineation Manual)

Project/Site: Benchmark Rose Hill Benchmark Communities Applicant/owner: Chris Wright Investigator(s):	Date: 9/2/2015 County: King State: Washington S/T/R: S3, T25N, R5E, W.M
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot 1

VEGETATION
(For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Acer macrophyllum	T	75	FACU				
Rubus spectabilis	S	10	FACU				
Oemleria cerasiformis	S	10	FACU				
Athyrium filix-femina	H	40	FAC				
Polystichum munitum	H	25	FACU				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 20

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation _____
Morphological adaptations _____
Technical Literature _____
Physiological/reproductive adaptations _____
Wetland plant database _____
Personal knowledge of regional plant communities _____
Other (explain) _____

Hydrophytic vegetation present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐

Based on: _____ soil temp (record temp _____)
_____ other (explain)

Dept. of inundation: NA inches

Depth to free water in pit: NA inches
Depth to saturated soil: NA inches

Check all that apply & explain below:
Stream, Lake or gage data: _____
Aerial photographs: _____ Other: ____

Water Marks: yes ☐ no ☒ on _____
Sediment Deposits: yes ☐ no ☒
Drift Lines: yes ☐ no ☒
Drainage Patterns: yes ☐ no ☒
Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒
Local Soil Survey: yes ☐ no ☒
FAC Neutral: yes ☐ no ☐
Water-stained Leaves yes ☐ no ☒
Other (explain):

Wetland hydrology present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

SOILS

Map Unit Name (Series & Phase) Alderwood gravely sandy loams

Drainage Class Somewhat excessively

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☒ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-10	A	10YR 2/2			Sandy Loam	
10-18+	B	10YR 4/3			Gravely Sand Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☐ no ☒
Hydric soils present? yes ☐ no ☒
Wetland hydrology present? yes ☐ no ☒

Is the sampling point within a wetland? yes ☐ no ☒

Rationale/Remarks:

NOTES:

Revised 4/97

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____
Characterized By: _____

Print Form

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or 1987 Corps Wetland Delineation Manual)

Project/Site: Benchmark Rose Hill Benchmark Communities Applicant/owner: Chris Wright Investigator(s):	Date: 9/2/2015 County: King State: Washington S/T/R: S3, T25N, R5E, W.M
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot 2

VEGETATION
(For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Acer macrophyllum	T	75	FACU				
Rubus spectabilis	S	35	FAC				
Acer Circinatum	S	25	FAC				
Oemleria cerasiformis	S	25	FACU				
Athyrium filix-femina	H	30	FAC				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 60

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation _____
Morphological adaptations _____
Technical Literature _____
Physiological/reproductive adaptations _____
Wetland plant database _____
Personal knowledge of regional plant communities _____
Other (explain) _____

Hydrophytic vegetation present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐

Based on: _____ soil temp (record temp _____)
_____ other (explain)

Dept. of inundation: NA inches

Depth to free water in pit: 10 inches
Depth to saturated soil: 0 inches

Check all that apply & explain below:
Stream, Lake or gage data: _____
Aerial photographs: _____ Other: ____

Water Marks: yes ☐ no ☒ on _____
Sediment Deposits: yes ☐ no ☒
Drift Lines: yes ☐ no ☒
Drainage Patterns: yes ☐ no ☒
Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒
Local Soil Survey: yes ☐ no ☒
FAC Neutral: yes ☐ no ☐
Water-stained Leaves yes ☐ no ☒
Other (explain):

Wetland hydrology present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

Soils saturated to surface and a water table at 10 inches.

Print Form

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or 1987 Corps Wetland Delineation Manual)

Project/Site: Benchmark Rose Hill Benchmark Communities Applicant/owner: Chris Wright Investigator(s):	Date: 9/2/2015 County: King State: Washington S/T/R: S3, T25N, R5E, W.M
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot 3

VEGETATION (For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Acer macrophyllum	T	45	FACU				
Rubus spectabilis	S	20	FAC				
Oemleria cerasiformis	S	20	FACU				
Polystichum munitum	H	20	FACU				
Athyrium filix-femina	H	20	FAC				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 40

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation _____
Morphological adaptations _____
Technical Literature _____
Physiological/reproductive adaptations _____
Wetland plant database _____
Personal knowledge of regional plant communities _____
Other (explain) _____

Hydrophytic vegetation present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐

Based on: _____ soil temp (record temp _____)
_____ other (explain)

Dept. of inundation: NA inches

Depth to free water in pit: NA inches
Depth to saturated soil: NA inches

Check all that apply & explain below:
Stream, Lake or gage data: _____
Aerial photographs: _____ Other: ____

Water Marks: yes ☐ no ☒ on _____
Sediment Deposits: yes ☐ no ☒
Drift Lines: yes ☐ no ☒
Drainage Patterns: yes ☐ no ☒
Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒
Local Soil Survey: yes ☐ no ☒
FAC Neutral: yes ☐ no ☐
Water-stained Leaves yes ☐ no ☒
Other (explain):

Wetland hydrology present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

Soils saturated to surface and a water table at 10 inches.

SOILS

Map Unit Name (Series & Phase) Alderwood gravely sandy loams

Drainage Class Somewhat excessively

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☒ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-11	A	10YR 2/2			Sandy Loam	
11-18+	B	10YR 4/2	7.5YR 4/6	3%	Gravely Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

Does not meet NTCHS hydric soil criteria

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☐ no ☒
Hydric soils present? yes ☐ no ☒
Wetland hydrology present? yes ☐ no ☒

Is the sampling point within a wetland? yes ☐ no ☒

Rationale/Remarks:

NOTES:

Revised 4/97

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____
Characterized By: _____

SOILS

Map Unit Name (Series & Phase) Alderwood gravely sandy loams

Drainage Class Somewhat excessively

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☒ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-3	A	10YR 2/2			Sandy Loam	
3-10	B	10YR 4/2			Gravely Sandy Loam	
10-18+	C	10YR 4/2	7.5YR 4/6	10%	Gravely Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
X Other (explain in remarks)

Hydric soils present? **yes** ☒ **no** ☐

Rationale for decision/Remarks:

Soils meet criteria of a depleted matrix (Indicator F3)

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☒ no ☐
Hydric soils present? yes ☒ no ☐
Wetland hydrology present? yes ☒ no ☐

Is the sampling point within a wetland? yes ☒ no ☐

Rationale/Remarks:

NOTES:

Revised 4/97

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____
Characterized By: _____

APPENDIX B:

Wetland Rating Form
Habitat Assessment Form
Wetland Summary Form
Stream Summary Form

Wetland name or number ____

RATING SUMMARY – Western Washington

Name of wetland (or ID #): ROSE HILL Date of site visit: Sep 16

Rated by C. WRIGHT Trained by Ecology? ✓ Yes ___ No Date of training 10/15

HGM Class used for rating SLOPE 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 _____

OVERALL WETLAND CATEGORY III (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	5	6	5	16

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 _____

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	
Hydroperiods	D 1.4, H 1.2	
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
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	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
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	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
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	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
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	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number _____

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.

Wetland name or number _____

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.*

Wetland name or number _____

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	
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	
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 > ½ 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	
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	
Total for D 1 Add the points in the boxes above	

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	
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 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_____ Yes = 1 No = 0	
Total for D 2 Add the points in the boxes above	

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	
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	
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	
Total for D 3 Add the points in the boxes above	

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

Wetland name or number _____

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	
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	
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	
Total for D 4 Add the points in the boxes above	

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	
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	
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	
Total for D 5 Add the points in the boxes above	

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	
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	
Total for D 6 Add the points in the boxes above	

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

Wetland name or number _____

RIVERINE AND FRESHWATER TIDAL FRINGE WETLANDS

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

R 1.0. Does the site have the potential to improve water quality?		
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event:		
Depressions cover > $^3/_4$ area of wetland	points = 8	
Depressions cover > ½ area of wetland	points = 4	
Depressions present but cover < ½ area of wetland	points = 2	
No depressions present	points = 0	
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height, **not** Cowardin classes)		
Trees or shrubs > $^2/_3$ area of the wetland	points = 8	
Trees or shrubs > $^1/_3$ area of the wetland	points = 6	
Herbaceous plants (> 6 in high) > $^2/_3$ area of the wetland	points = 6	
Herbaceous plants (> 6 in high) > $^1/_3$ area of the wetland	points = 3	
Trees, shrubs, and ungrazed herbaceous < $^1/_3$ area of the wetland	points = 0	
Total for R 1	Add the points in the boxes above	

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

R 2.0. Does the landscape have the potential to support the water quality function of the site?		
R 2.1. Is the wetland within an incorporated city or within its UGA?	Yes = 2 No = 0	
R 2.2. Does the contributing basin to the wetland include a UGA or incorporated area?	Yes = 1 No = 0	
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years?	Yes = 1 No = 0	
R 2.4. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4 Other sources _____	Yes = 1 No = 0	
Total for R 2	Add the points in the boxes above	

Rating of Landscape Potential If score is:___**3-6 = H** ___**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?		
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi?	Yes = 1 No = 0	
R 3.2. Is the wetland along a stream or river that has TMDL limits for nutrients, toxics, or pathogens?	Yes = 1 No = 0	
R 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 drainage in which the unit is found*)	Yes = 2 No = 0	
Total for R 3	Add the points in the boxes above	

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

Wetland name or number ____

RIVERINE AND FRESHWATER TIDAL FRINGE WETLANDS

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

R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).*		
If the ratio is more than 20	points = 9	
If the ratio is 10-20	points = 6	
If the ratio is 5-<10	points = 4	
If the ratio is 1-<5	points = 2	
If the ratio is < 1	points = 1	
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have >90% cover at person height. These are NOT Cowardin classes).*		
Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area	points = 7	
Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area	points = 4	
Plants do not meet above criteria	points = 0	
Total for R 4	Add the points in the boxes above	

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

R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 No = 1	
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 No = 0	
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 No = 1	
Total for R 5	Add the points in the boxes above	

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

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.*		
The sub-basin immediately down-gradient of the wetland has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds)	points = 2	
Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
No flooding problems anywhere downstream	points = 0	
R 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	
Total for R 6	Add the points in the boxes above	

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

Wetland name or number _____

LAKE FRINGE WETLANDS Water Quality Functions - Indicators that the site functions to improve water quality		
L 1.0. Does the site have the potential to improve water quality?		
L 1.1. Average width of plants along the lakeshore *(use polygons of Cowardin classes)*:		
Plants are more than 33 ft (10 m) wide	points = 6	
Plants are more than 16 ft (5 m) wide and <33 ft	points = 3	
Plants are more than 6 ft (2 m) wide and <16 ft	points = 1	
Plants are less than 6 ft wide	points = 0	
L 1.2. Characteristics of the plants in the wetland: Choose the appropriate description that results in the highest points, and do not include any open water in your estimate of coverage. The herbaceous plants can be either the dominant form or as an understory in a shrub or forest community. *These are not Cowardin classes. Area of cover is total cover in the unit, but it can be in patches. Herbaceous does not include aquatic bed.*		
Cover of herbaceous plants is >90% of the vegetated area	points = 6	
Cover of herbaceous plants is >$^2/_3$ of the vegetated area	points = 4	
Cover of herbaceous plants is >$^1/_3$ of the vegetated area	points = 3	
Other plants that are not aquatic bed > $^2/_3$ unit	points = 3	
Other plants that are not aquatic bed in > $^1/_3$ vegetated area	points = 1	
Aquatic bed plants and open water cover > $^2/_3$ of the unit	points = 0	
Total for L 1	Add the points in the boxes above	

Rating of Site Potential If score is:___**8-12 = H** ___**4-7 = M** ___**0-3 = L** *Record the rating on the first page*

L 2.0. Does the landscape have the potential to support the water quality function of the site?		
L 2.1. Is the lake used by power boats?	Yes = 1 No = 0	
L 2.2. Is > 10% of the area within 150 ft of wetland unit on the upland side in land uses that generate pollutants?	Yes = 1 No = 0	
L 2.3. Does the lake have problems with algal blooms or excessive plant growth such as milfoil?	Yes = 1 No = 0	
Total for L 2	Add the points in the boxes above	

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

L 3.0. Is the water quality improvement provided by the site valuable to society?		
L 3.1. Is the lake on the 303(d) list of degraded aquatic resources?	Yes = 1 No = 0	
L 3.2. Is the lake in a sub-basin where water quality is an issue (at least one aquatic resource in the basin is on the 303(d) list)?	Yes = 1 No = 0	
L 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 lake or basin in which the unit is found.*	Yes = 2 No = 0	
Total for L 3	Add the points in the boxes above	

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

Wetland name or number _____

LAKE FRINGE WETLANDS Hydrologic Functions - Indicators that the wetland unit functions to reduce shoreline erosion		
L 4.0 Does the site have the potential to reduce shoreline erosion?		
L 4.1. Distance along shore and average width of Cowardin classes along the lakeshore (**do not** include Aquatic bed): *Choose the highest scoring description that matches conditions in the wetland.*		
> ¾ of distance is Scrub-shrub or Forested at least 33 ft (10 m) wide	points = 6	
> ¾ of distance is Scrub-shrub or Forested at least 6 ft (2 m) wide	points = 4	
> ¼ distance is Scrub-shrub or Forested at least 33 ft (10 m) wide	points = 4	
Plants are at least 6 ft (2 m) wide (any type except Aquatic bed)	points = 2	
Plants are less than 6 ft (2 m) wide (any type except Aquatic bed)	points = 0	

Rating of Site Potential: If score is:___**6 = M** ___**0-5 = L** *Record the rating on the first page*

L 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
L 5.1. Is the lake used by power boats with more than 10 hp?	Yes = 1 No = 0	
L 5.2. Is the fetch on the lake side of the unit at least 1 mile in distance?	Yes = 1 No = 0	
Total for L 5	Add the points in the boxes above	

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

L 6.0 Are the hydrologic functions provided by the site valuable to society?		
L 6.1. Are there resources along the shore that can be impacted by erosion? If more than one resource is present, choose the one with the highest score.		
There are human structures or old growth/mature forests within 25 ft of OHWM of the shore in the unit	points = 2	
There are nature trails or other paths and recreational activities within 25 ft of OHWM	points = 1	
Other resources that could be impacted by erosion	points = 1	
There are no resources that can be impacted by erosion along the shores of the unit	points = 0	

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

NOTES and FIELD OBSERVATIONS:

Wetland name or number _____

SLOPE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	
S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of the average slope of the wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance)* Slope is 1% or less — points = 3 Slope is > 1%-2% — points = 2 Slope is > 2%-5% — points = 1 Slope is greater than 5% — points = 0 ✓	0
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*: Yes = 3 No = 0 ✓	0
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* Dense, uncut, herbaceous plants > 90% of the wetland area — points = 6 Dense, uncut, herbaceous plants > ½ of area — points = 3 Dense, woody, plants > ½ of area — points = 2 ✓ Dense, uncut, herbaceous plants > ¼ of area — points = 1 Does not meet any of the criteria above for plants — points = 0	2
Total for S 1 — Add the points in the boxes above	2

Rating of Site Potential If score is: ___12 = H ___6-11 = M ✓ 0-5 = L *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? Yes = 1 No = 0	0
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ Yes = 1 No = 0	0
Total for S 2 — Add the points in the boxes above	0

Rating of Landscape Potential If score is: ___1-2 = M ✓ 0 = L *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 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	
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list.* Yes = 1 No = 0	
S 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 unit is found.* Yes = 2 No = 0	?
Total for S 3 — Add the points in the boxes above	

Rating of Value If score is: ✓ 2-4 = H ___1 = M ___0 = L *Record the rating on the first page*

?

Wetland name or number _____

SLOPE WETLANDS Hydrologic Functions - Indicators that the site functions to reduce flooding and stream erosion	
S 4.0. Does the site have the potential to reduce flooding and stream erosion?	
S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > $^{1}/_{8}$ in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 ✓ All other conditions points = 0	1

Rating of Site Potential If score is: ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 (No = 0)	0

Rating of Landscape Potential If score is: ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

S 6.0. Are the hydrologic functions provided by the site valuable to society?	
S 6.1. Distance to the nearest areas downstream that have flooding problems: The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) (points = 2) Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	2
S 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 S 6 Add the points in the boxes above	

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

NOTES and FIELD OBSERVATIONS:

Wetland name or number ____

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 — 4 structures or more: points = 4
____Emergent — 3 structures: points = 2
✓ Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1
____Forested (areas where trees have > 30% cover) — 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

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 — 4 or more types present: points = 3
____Seasonally flooded or inundated — ✓ 3 types present: points = 2
✓ Occasionally flooded or inundated — 2 types present: points = 1
✓ Saturated only — 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**

2

H 1.3. Richness of plant species

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

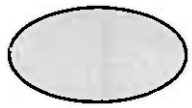
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

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

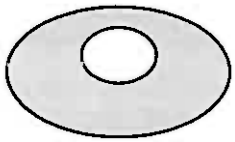
1

H 1.4. Interspersion of habitats

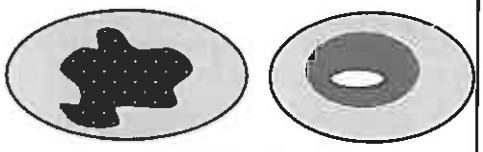
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always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



None = 0 points ✓

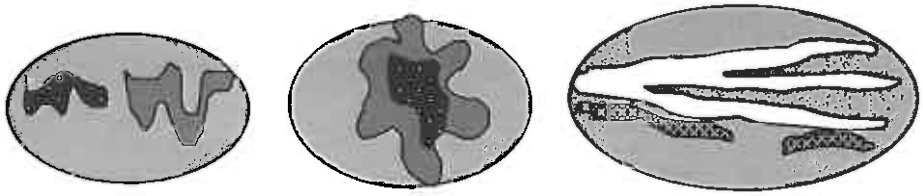


Low = 1 point



Moderate = 2 points

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



0

Wetland name or number ____

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	5

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 30 + [(% moderate and low intensity land uses)/2] 5 = 35 % 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	3
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat 30 + [(% moderate and low intensity land uses)/2] 5 = 35 % 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	2
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	3

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*

Wetland name or number _____

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.

Wetland name or number _____

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? 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://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.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 bog**	**Cat. I**

Wetland name or number _____

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**	**Cat. I**
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. 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**	**Cat I**
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**	**Cat. II**
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**	**Cat. III**
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. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

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WETLAND SUMMARY SHEET

Wetland Summary			Buffer Summary				Wetland Impacts		Mitigation Summary		
Label[1]	Category[2]	Size[3]	Required[4]	Proposed[5]	Increase[6] Reduce[7]	Averaging[8]	Fill[9]	Paper Fill[10]	Ratio[11]	Area[12]	Location[13]
A	III	8000sq ft	150	150			0	0			

[1] Wetland A, B, C, etc.
[2] Wetland category per City wetland classification system.
[3] Area of wetland.
[4] Required buffer width in feet per RCDG.
[5] Proposed buffer width in feet.
[6] Does the uniqueness of the wetland require an increased buffer? If so, what is the width in feet.
[7] Is there a request to reduce the buffer width? If so, what is the width in feet.
[8] Is buffer averaging being used? If so, what is the average buffer width in feet.
[9] Amount of wetland fill.
[10] Amount of paper fill.
[11] Required ratio for wetland mitigation per RCDG.
[12] Size of mitigation area.
[13] Note location of mitigation area (keyed to the mitigation map).

CITY OF REDMOND
HABITAT UNIT ASSESSMENT FORM

HABITAT UNIT: Benchmark Rose Hill
LOCATION:
TOTAL SCORE: 14

Habitat Parameter	Scoring Criteria	Habitat Unit Score
Size	• >50 acres = 3 points • 10-50 acres = 2 points • 0-10 acres = 1 point	2
Vegetation Community Types	≥ 4 types = 3 points • 2-3 types = 2 points • 1 type = 1 point • None = 0 points	2
Community Interspersion	• High = 3 points • Medium = 2 points • Low = 1 point • None = 0 points	1
Priority Species Presence	• Threatened & Endangered Species = 3 points • Candidate Species = 2 points • Monitor Species = 1 point • None = 0 points	0
Priority Species Habitat Use	• Breeding = 3 points • Roosting = 2 points • Foraging = 1 point • None = 0 points	0
Habitat Continuity	• Links protected habitats = 3 points • Links unprotected habitats = 2 points • Extends habitat corridor = 1 point • None = 0 points	1
Forest Vegetation Layers	• 3 layers = 3 points • 2 layers = 2 points • 1 layers = 1 point • None = 0 points	3
Forest Age	• Mature = 3 points • Pole = 2 points • Seedling/Shrub = 1 point • None = 0 points	3
Invasive Species Presence	• 0-25% = 3 points • 26-50% = 2 points • 51-75% = 1 point • 75-100% = 0 points	2

CITY OF REDMOND
HABITAT UNIT ASSESSMENT FORM

VEGETATION COMMUNITY TYPES:

Forested

INVASIVE PLANTS:

reed canarygrass, English ivy, morning glory

HABITAT FEATURES (snags, perches, downed logs, etc):

few snags on slopes

WILDLIFE OBSERVATIONS (direct or indirect):

pileated woodpecker forage sign on snags

THREATS TO HABITAT INTEGRITY:

OTHER NOTES:

STREAM SUMMARY SHEET

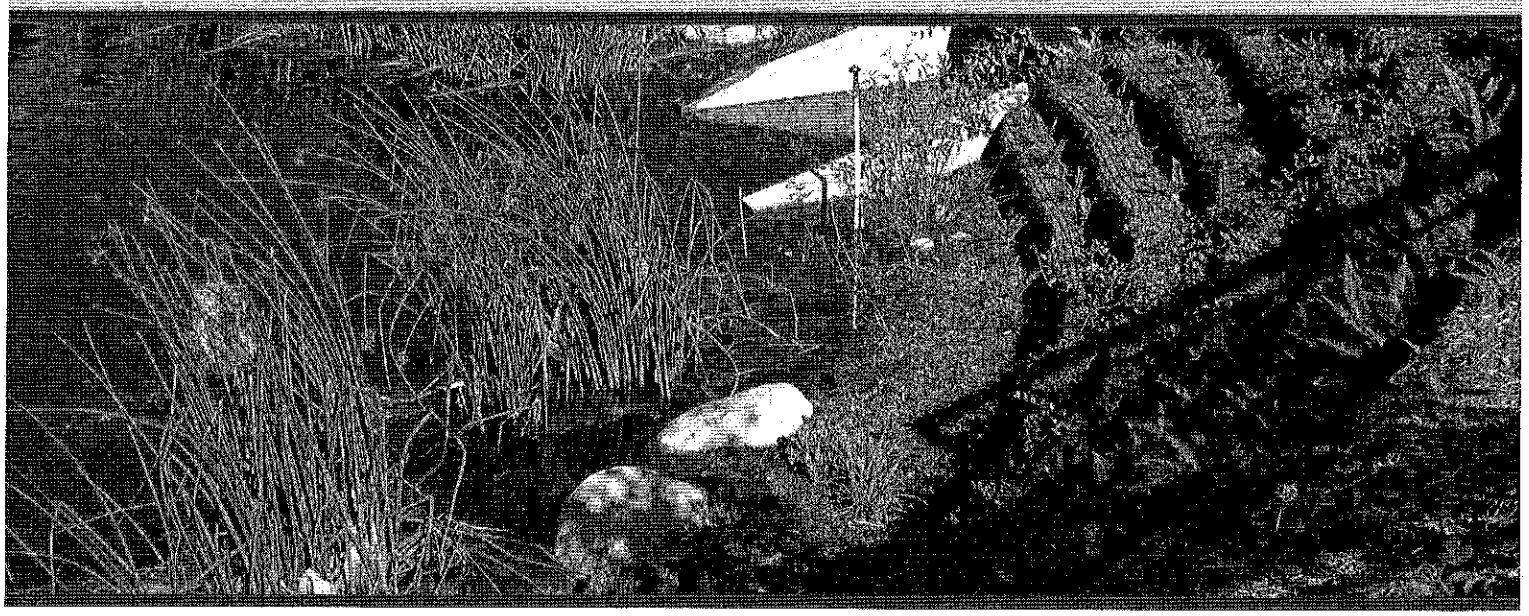
Stream Summary			Buffer Summary			Riparian Corridor Summary		
Label[1]	Type[2]	Linear Feet[3]	Required[4]	Proposed[5]	Averaging[6]	Disturbed Area[7]	Filled Area[8]	Mitigation Area[9]
1	IV	155	25	25	0	0	0	0

[1] Stream A, B, C, etc.
[2] Stream type per City stream classification system.
[3] Length of stream on the property.
[4] Required buffer width in feet per RCDG.
[5] Proposed buffer width in feet.
[6] Note if buffer averaging is used. If so, identify minimum and maximum buffer widths in feet as well as area in square feet contained within the buffer prior to and after averaging.
[7] Area of buffer that is disturbed in square feet.
[8] Area of buffer to be filled in square feet, such as for a road crossing.
[9] Location and size in square feet of riparian corridor mitigation.

APPENDIX C

Preliminary Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report

associated
earth sciences
incorporated



Preliminary Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report

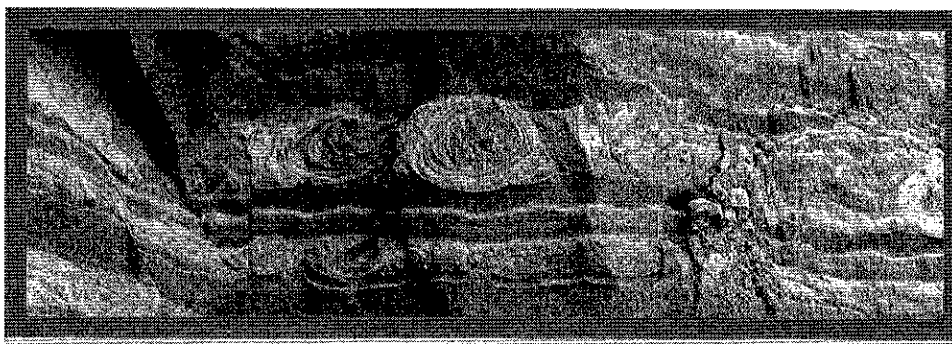
ROSE HILL PROPERTY

Redmond, Washington

Prepared For:

BMC ROSE HILL, LLC

Project No. EE150375A
January 29, 2016



Associated Earth Sciences, Inc.
911 5th Avenue
Kirkland, WA 98033
P (425) 827 7701
F (425) 827 5424

associated
earth sciences
incorporated

April 18, 2016
Project No. KE140213A

Benchmark Communities
150 – 120th Avenue NE, Ste. 200
Bellevue, WA 98005

Attn: Brenda Fodge

Subject: Grading Plan Review
Rose Hill Subdivision
Redmond, Washington

Dear Ms. Fodge:

As requested, Associated Earth Sciences, Inc. (AESI) has completed a plan review of the grading plan for the Rose Hill Subdivision. The plans sheets are dated April 28, 2016 and numbered as follows:

- Plans sheets C 6.0 to C 6.3
- Sheets C7.0 to C7.7

Upon completion of our review it is our opinion that the plans are in general accordance with the recommendations of the geotechnical report.

We hope this information meets you present requirements. Please contact the undersigned at (425) 827-7701 should you have any questions.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

MATTHEW A. MILLER
STATE OF WASHINGTON
30284
REGISTERED
PROFESSIONAL ENGINEER
4-18-16

Matthew A. Miller, PE
Principal Engineer

associated
earth sciences
incorporated

January 29, 2016
Project No. EE150375A

BMC Rose Hill, LLC
Ridgewood Corporate Center, Building F
150 120th Avenue NE, Suite 200
Bellevue, Washington 98005

Attention: Ms. Brenda Fodge

Subject: Preliminary Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report
Rose Hill Property
Redmond, Washington

Dear Ms. Fodge:

We are pleased to present your copy of the referenced report. This report summarizes the results of our subsurface exploration, geologic hazard, and geotechnical engineering studies and offers preliminary recommendations for the design and development of the proposed project. Recommendations presented in this report are considered preliminary in that plans have not yet been finalized.

We have enjoyed working with you on this study and are confident that the recommendations presented in this report will aid in the successful completion of your project. If you should have any questions or if we can be of additional help to you, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Everett, Washington

Matthew Miller, P.E
Principal Engineering

MM/pc - EE150375A5 - Projects\20150375\EE\WP

PRELIMINARY
SUBSURFACE EXPLORATION, GEOLOGIC HAZARDS, AND GEOTECHNICAL ENGINEERING REPORT

ROSE HILL PROPERTY

Redmond, Washington

Prepared for:
BMC Rose Hill, LLC
Ridgewood Corporate Center, Building F
150 120th Avenue NE, Suite 200
Bellevue, Washington 98005

Prepared by:
Associated Earth Sciences, Inc.
2911 ½ Hewitt Avenue, Suite 2
Everett, Washington 98201
425-259-0522
Fax: 425-827-5424

January 29, 2016
Project No. EE150375A

I. PROJECT AND SITE CONDITIONS

1.0 INTRODUCTION

This report presents the results of our subsurface exploration, geologic hazards, and geotechnical engineering study for the proposed new residential development at the above-referenced property located on the east side of 138th Avenue NE near the intersection with NE 97th Street in Redmond, Washington (Figure 1). The proposed development is located within the southwestern portion of King County Parcel No. 0352059103 (northern parcel) and the western two-thirds of Parcel No. 0352059071 (southern parcel). The existing site topography, provided by KPFF Consulting Engineers (KPFF), and approximate locations of the explorations accomplished for this study, are presented on the "Site and Exploration Plan," Figure 2. This plan also includes proposed road and lot layout, and the location of the planned recreation and storm water tracts. In the event that any changes in the nature, design, or locations of the proposed improvements are planned, the conclusions and recommendations contained in this report should be reviewed and modified, or verified, as necessary.

1.1 Purpose and Scope

The purpose of this study was to provide subsurface data and preliminary geotechnical engineering recommendations to be utilized in the design of the project. As noted above, our recommendations are considered preliminary in that plans for the proposed development have not yet been finalized. Our current study included a review of the "Rose Hill Subdivision Site Plan" (Sheet C-1.0) by KPFF dated January 25, 2016, available geologic literature, excavating 10 exploration pits, and performing geologic studies to assess the type, thickness, distribution, and physical properties of the subsurface sediments and shallow ground water. Geotechnical engineering studies were completed to formulate our preliminary recommendations for site preparation, excavation, and structural fill placement, shallow foundation support, floor support, drainage considerations, and storm drainage facility (concrete vault) considerations. This report summarizes our current fieldwork and offers preliminary development recommendations based on our present understanding of the project. We recommend that we be allowed to review the final project plans prior to construction to verify that our geotechnical recommendations have been correctly interpreted and incorporated into the design.

1.2 Authorization

This report has been prepared for the exclusive use of BMC Rose Hill, LLC and their agents for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering

and engineering geology practices in effect in this area at the time our report was prepared. No other warranty, express or implied, is made.

2.0 PROJECT AND SITE DESCRIPTION

This report was completed with an understanding of the project based on the above-referenced site development plan provided to us by KPFF on January 27, 2016. The preliminary plan for development depicts 28 new home sites with one recreation tract (Tract A) along the north side of the proposed development and one recreation and storm water tract (Tract B) located along the eastern side of the property. Grade separation between the individual lots will be provided by segmental block retaining walls anticipated to range up to approximately 4 feet. A segmental block retaining wall is also planned along the eastern (down slope) side of Tract B. Tract B will contain a concrete storm water detention vault that will outlet via a 40-foot-wide access and utility easement extending northeast from the northeastern corner of the development to an existing storm drainage in the NE 100th Street easement. Access to the new residential development will be via two new roads extending east from 138th Avenue NE.

The total area of the two parcels is approximately 12 acres. The parcels are currently undeveloped and forested. The area of the proposed development will encompass approximately 5 acres.

The overall topography across the two parcels generally slopes down toward the east. A large drainage is present within the majority of the northern parcel generally north of the proposed development. The existing site topography consists of a topographic high of approximately 265 feet along the east side of 138th Avenue SE and a topographic low of generally 140 feet along the eastern property line downslope directly to the east of the area of the proposed development. The east-facing slope continues east off the properties to an existing development located along the west side of Willows Road NE. The topographically lowest portion of the limits of the proposed development ranges from approximately 195 to 205 feet along the eastern side of Tract B. Slope gradients in the area of the proposed development ranges from approximately 10 to 15 percent. Slope gradients immediately adjacent to the proposed development to the east and north range from approximately 27 percent to 37 percent. There are scattered areas with slope gradients exceeding 40 percent that are greater than 10 feet in height north and east of the limits of the proposed development shown as shaded areas on the site plan developed by KPFF.

3.0 SUBSURFACE EXPLORATION

Our field study included completing 10 exploration pits with a tracked excavator to gain shallow subsurface information about the site.

The various types of sediments, as well as the depths where characteristics of the sediments changed, are indicated on the exploration logs presented in the Appendix. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types. If changes occurred between sample intervals in our explorations, they were interpreted. The exploration locations are noted on the "Site and Exploration Plan," Figure 2, attached with this report.

The conclusions and recommendations presented in this report are based on the explorations completed for this study. The number, locations, and depths of the explorations were completed within site and budget constraints. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this report and make appropriate changes.

3.1 Exploration Pits

Ten exploration pits were excavated using a track-mounted excavator at the site on July 17, 2015. The approximate locations of the pits are shown on the "Site and Exploration Plan," Figure 2. The pits permitted direct, visual observation of subsurface conditions. Materials encountered in the exploration pits were studied and classified in the field by an engineering geologist from our firm. All exploration pits were backfilled immediately after examination and logging. Exploration pit backfill was tamped with the excavator bucket, but was otherwise uncompacted. Where exploration pits are present under areas that will be prepared for future structures, the backfill should be removed and replaced as structural fill prior to construction. Selected samples were then transported to our laboratory for further visual classification and laboratory testing.

4.0 SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from the field explorations, visual reconnaissance of the site, and review of published geologic literature for the vicinity of the property. As shown on the field logs, the exploration pits encountered two main native soil types. The majority of the explorations encountered dense, grading to very dense sand with

variable amounts of silt and gravel interpreted as lodgement till. These sediments were weathered at shallow depths and became progressively less weathered and more dense with increasing depth below the ground surface. These sediments are overlain across the site by topsoil. These sediment types are discussed in greater detail below from shallowest (youngest) to deepest (oldest).

4.1 Topsoil

A very loose, organic-rich layer of silt, sand, and gravel mimicking the underlying soils was encountered in each of our exploration pits. The thickness of the topsoil layer ranged from approximately 6 to 12 inches. Topsoil is not suitable to support structural loads or for use as structural fill and should be completely removed during construction.

4.2 Vashon Lodgement Till

Vashon lodgement till sediments were observed in all the exploration pits underlying the topsoil described above. Vashon lodgement till typically consists of a dense, poorly sorted mixture of clay, silt, sand, and gravel. The lodgement till encountered in our exploration pits at depth commonly consists of dense to very dense, moist, olive to gray, silty fine- to medium-grained sand with variable gravel content and occasional cobbles and boulders. Typically, the lodgement till has a very low permeability, and water tends to perch atop the till and flow laterally as interflow, although some water very slowly infiltrates down into the underlying sediments. The moisture content of the lodgement till throughout much of the year is a few percent over the optimum moisture content for maximum compaction. The medium dense to very dense lodgement till is suitable for support of building foundations, walls, and other settlement-sensitive structures; however, they will deteriorate rapidly if disturbed while in a wet condition. The upper 2 to 5 feet of the till was observed to be in a medium dense weathered condition. Some areas of the weathered portion of the till may be in a loose condition requiring additional over-excavation to achieve a subgrade suitable for placement of structural fill and/or for support of structural loads. The lodgement till sediments can be used in structural fills, and the ability to achieve suitable compaction and performance of the fill will depend mostly on the moisture content at the time of placement. Some moisture-conditioning may be required. It should be noted, as mentioned above, that boulders can occur within this unit at the site. Though boulders may not be abundant, it is likely that more will be encountered.

4.3 Published Geologic Map

Review of the regional geologic maps titled *Geologic Map of the Kirkland Quadrangle, Washington*, by James P. Minard (1983), and the *Geologic Map of King County*, compiled by Derek B. Booth, Kathy A. Troost, and Aaron P. Wisher (2006), indicate that the area of the subject site is underlain by Vashon-age advance outwash. Vashon-age lodgement till is

mapped in the vicinity directly west of the property. Our interpretation of the lodgement till sediments encountered in our explorations is in general agreement with the regional geologic mapping. Advance outwash sediments consist generally of a dense, variable mixture of sand and gravel with low silt contents that were deposited in rivers and streams ahead of the advancing glacier and subsequently overridden by the glacial ice. The presence and lateral distribution of geologic units contained in regional geologic maps such as those referenced above can differ from that observed during site-specific subsurface investigations based on the sometimes limited amount of surface soil exposures during regional geologic mapping. It is likely that the Vashon advance outwash is present underlying the Vashon lodgement till at depths greater than that explored at the site during this investigation. However further exploration would be needed to determine the extent and the potential presence of ground water at depth.

4.4 Hydrology

Ground water seepage was not observed in any of our exploration pits at the time of our subsurface exploration in July 2015. Shallow ground water is commonly absent in sloping upland areas underlain by lodgement till during seasonally drier periods of the year (generally June through September). However, shallow ground water is typically present during seasonally wetter periods of the year as a condition known as interflow. Interflow occurs atop lodgement till or other relatively impermeable sediments. Interflow generally occurs during the months of October through June when surface water infiltrates down through the topsoil and relatively permeable weathered parent sediments and becomes trapped atop a very low-permeability parent sediment. Potential interflow would follow the topography and flow in primarily an easterly direction across the site. Perched, interflow ground water should be expected during and after extended periods of increased precipitation. Ground water may occur during other times of the year due to variations in the amount of rainfall, and/or changes in site usage.

II. GEOLOGIC HAZARDS AND MITIGATIONS

The following discussion of potential geologic hazards is based on the geologic, slope, and ground water conditions as observed and discussed herein.

5.0 SLOPE HAZARDS AND MITIGATIONS

Slope gradients at the site within the area of the proposed development are moderate (generally less than approximately 20 percent). The sediments underlying the slope generally consist of glacially consolidated glacial sediments as described above with relatively thin, surficial deposits of loose to medium dense, topsoil, and weathered glacial sediments. Ground water was not encountered within the shallow subsurface at the site.

We understand that the project is regulated under the City of *Redmond Zoning Code* (RZC). Section 21.064.060 of the RZC defines landslide hazard areas as any area with a slope 40 percent or steeper with a vertical relief of 10 feet or more. The RZC prohibits most development within a landslide hazard area buffer, which is defined as 50 feet from the top or toe of the slope. However, the buffer may be reduced to a minimum of 15 feet upon approval of a geotechnical engineer.

The sediments underlying the slope generally consist of glacially consolidated glacial sediments as described previously. Adverse ground water conditions were not observed in the explorations accomplished for our study. Based on the subsurface conditions encountered, it is our opinion that a minimum buffer of 15 feet from areas in excess of 40 percent grade that exceeds 10 feet in vertical height is sufficient to adequately protect the proposed and surrounding developments from the critical landslide hazard. Associated Earth Sciences, Inc. (AESI) should be provided a copy of the grading plan for review when it becomes available.

We recommend that structures constructed bordering the 15-feet buffer be founded upon the underlying, undisturbed, dense glacial sediments. Specific recommendations for building support are provided in the "Foundations" section of this report.

6.0 SEISMIC HAZARDS AND MITIGATIONS

Earthquakes occur in the Puget Lowland with great regularity. The vast majority of these events are small and are usually not felt by people. However, large earthquakes do occur, as evidenced by the 1949, 7.2-magnitude event; the 1965, 6.5-magnitude event; and the 2001, 6.8-magnitude event. The 1949 earthquake appears to have been the largest in this area

during recorded history. Evaluation of return rates indicates that an earthquake of a magnitude between 6.0 and 7.0 is likely within a given 25- to 40-year period.

Generally, there are four types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture, 2) seismically induced landslides, 3) liquefaction, and 4) ground motion. The potential for each of these hazards to adversely impact the proposed project is discussed below.

6.1 Surficial Ground Rupture

The project site is located approximately 8 miles north of the Seattle Fault Zone and 4 miles southwest of the Southern Whidbey Island-Lake Alice Fault Zone (SWIFZ).

Recent studies of the Seattle Fault Zone by the United States Geological Survey (USGS; e.g., Johnson et al., 1994, *Origin and Evolution of the Seattle Fault and Seattle Basin, Washington*, Geology, v. 22, p.71-74; and Johnson et al., 1999, *Active Tectonics of the Seattle Fault and Central Puget Sound Washington - Implications for Earthquake Hazards,* Geological Society of America Bulletin, July 1999, v. 111, n. 7, p. 1042-1053) have provided evidence of surficial ground rupture along a northern splay of the Seattle Fault. The recognition of this fault is relatively new, and data pertaining to it are limited, with the studies still ongoing. According to the USGS studies, the latest movement of this fault was about 1,100 years ago when about 20 feet of surficial displacement took place.

A recent study of the SWIFZ by the USGS (Sherrod et al., 2005, *Holocene Fault Scarps and Shallow Magnetic Anomalies Along the Southern Whidbey Island Fault Zone near Woodinville, Washington*, Open-File Report 2005-1136, March 2005) indicates that "strong" evidence of prehistoric earthquake activity has been observed along two fault strands thought to be part of the southeastward extension of the SWIFZ located about 8 miles southeast of the site. The study suggests as many as nine earthquake events along the SWIFZ may have occurred within the last 16,400 years. The recognition of this fault splay is relatively new, and data pertaining to it are limited with the studies still ongoing. The recurrence interval of movement along this fault system is still unknown, although it is hypothesized to be in excess of one thousand years.

The recurrence interval for movement along these fault systems is still unknown, although it is hypothesized to be in excess of several thousand years. Due to the suspected long recurrence interval and distance from the fault zone, the potential for surficial ground rupture at the site is considered to be low during the expected life of the structures and no mitigation efforts beyond complying with the 2012 *International Building Code* (IBC) are recommended.

6.2 Seismically Induced Landslides

The on-site, natural sediments found during the explorations are glacially consolidated lodgement till sediments and are not sensitive to landsliding given the topographic conditions

at the site. No current evidence of landslide activity was observed. Given the subsurface and topographic conditions within and adjacent to the proposed development area, it is our opinion that the risk of damage to the proposed project by landsliding is low. This opinion is dependent upon site grading and construction practices being completed in accordance with the geotechnical recommendations presented in this report.

6.3 Liquefaction

Liquefaction is a condition where loose, saturated, typically fine-grained soils lose shear strength when subjected to high-intensity cyclic loads, such as occur during earthquakes. The resulting reduction in strength can cause differential foundation settlements and slope failures. Loose, saturated, fine-grained soils that cannot dissipate the buildup of pore water pressure are the predominant type of sediments subject to liquefaction.

The observed site soils were dense and no ground water was observed. These soils are not expected to be prone to liquefaction. A detailed liquefaction hazard analysis was not performed as part of this study, and none is warranted, in our opinion.

6.4 Seismic Site Class (2012 IBC)

In our opinion, the subsurface conditions at the site are consistent with seismic Site Class "D" in accordance with the 2012 IBC, and the publication ASCE 7 referenced therein, the most recent version of which is ASCE 7-10.

7.0 EROSION HAZARDS AND MITIGATION

As of October 1, 2008, the Washington State Department of Ecology (Ecology) Construction Storm Water General Permit (also known as the National Pollutant Discharge Elimination System [NPDES] permit) requires weekly Temporary Erosion and Sedimentation Control (TESC) inspections and turbidity monitoring for all sites 1 or more acres in size that discharge storm water to surface waters of the state. Because we anticipate that the proposed project will require disturbance of more than 1 acre, we anticipate that these inspection and reporting requirements will be triggered. The following recommendations are related to general erosion potential and mitigation.

The erosion potential of the site soils is moderate, but may be high if steep slopes remain unvegetated during construction. The most effective erosion control measure is the maintenance of adequate ground cover. Maintaining cover measures atop disturbed ground provides the greatest reduction to the potential generation of turbid runoff and sediment transport. During the local wet season (October 1 through March 31), exposed soil should not remain uncovered for more than 2 days unless it is actively being worked. Ground-cover

measures can include erosion control matting, plastic sheeting, straw mulch, crushed rock or recycled concrete, or mature hydroseed.

7.1 Erosion Hazard Mitigation

To mitigate the erosion hazards and potential for off-site sediment transport, we recommend the following:

1. The winter performance of a site is dependent on a well-conceived plan for control of site erosion and storm water runoff. It is easier to keep the soil on the ground than to remove it from storm water. The owner and the design team should include adequate ground-cover measures, access roads, and staging areas in the project bid to give the selected contractor a workable site. The selected contractor needs to be prepared to implement and maintain the required measures to reduce the amount of exposed ground. A site maintenance plan should be in place in the event storm water turbidity measurements are greater than the Ecology standards.

2. All TESC measures for a given area to be graded or otherwise worked should be installed prior to any activity within that area. The recommended sequence of construction within a given area would be to install sediment traps and/or ponds and establish perimeter flow control prior to starting mass grading.

3. During the wetter months of the year, or when large storm events are predicted during the summer months, each work area should be stabilized so that if showers occur, the work area can receive the rainfall without excessive erosion or sediment transport. The required measures for an area to be "buttoned-up" will depend on the time of year and the duration the area will be left un-worked. During the winter months, areas that are to be left un-worked for more than 2 days should be mulched or covered with plastic. During the summer months, stabilization will usually consist of seal-rolling the subgrade. Such measures will aid in the contractor's ability to get back into a work area after a storm event. The stabilization process also includes establishing temporary storm water conveyance channels through work areas to route runoff to the approved treatment facilities.

4. All disturbed areas should be revegetated as soon as possible. If it is outside of the growing season, the disturbed areas should be covered with mulch, as recommended in the erosion control plan. Straw mulch provides the most cost-effective cover measure and can be made wind-resistant with the application of a tackifier after it is placed.

5. Surface runoff and discharge should be controlled during and following development. Uncontrolled discharge may promote erosion and sediment transport. Under no

circumstances should concentrated discharges be allowed to flow over significant slopes.

6. Soils that are to be reused around the site should be stored in such a manner as to reduce erosion from the stockpile. Protective measures may include, but are not limited to, covering with plastic sheeting, the use of low stockpiles in flat areas, or the use of straw bales/silt fences around pile perimeters. During the period between October 1 and March 31, these measures are required.

7. On-site erosion control inspections and turbidity monitoring should be performed in accordance with Ecology requirements. Weekly and monthly reporting to Ecology should be performed on a regularly scheduled basis. TESC monitoring should be part of the weekly construction team meetings. Temporary and permanent erosion control and drainage measures should be adjusted and maintained, as necessary, at the time of construction.

8. It is our opinion that with the proper implementation of the TESC plans and by field-adjusting appropriate mitigation elements (best management practices) during construction, as recommended by the erosion control inspector, the potential adverse impacts from erosion hazards on the project may be mitigated.

8.0 CRITIAL AQUIFER RECHARGE AREA (CARA)

The site is located within wellhead protection Zone 4 of the City of Redmond's CARA program. As per the City of Redmond a detailed ground water study is not required for sites within Zone 4. No mitigation measures outside of erosion control BMP's (best management practices) will be incorporated into the construction of final design of the project.

III. PRELIMINARY DESIGN RECOMMENDATIONS

9.0 INTRODUCTION

Our exploration indicates that, from a geotechnical standpoint, the proposed project is feasible provided the recommendations contained herein are properly followed. The bearing stratum is relatively shallow, and conventional shallow foundations should perform well with proper subgrade preparation. Important geotechnical considerations for the project will include adequate keying and benching of structural fills that will be placed on slopes, and management of moisture-sensitive subgrade soils and excavated soils that will be used in structural fill applications. The following report sections provide specific geotechnical site development recommendations.

10.0 SITE PREPARATION

Existing vegetation and topsoil should be removed from areas where new buildings, paving, or other structures are planned. The observed in-place depth of topsoil at the exploration locations is presented on the exploration logs in the Appendix, and typically ranged from 6 to 18 inches. After the upper 6 to 18 inches is stripped, the surface should be evaluated in the specific area by proof-rolling to verify a firm and unyielding condition. Topsoil should be expected to increase in volume by a factor of approximately 1.3 from in-place volume to loose stockpile volume. After topsoil stripping, remaining roots and stumps should be removed from structural areas. All soils below finished grade disturbed by stripping and grubbing operations should be recompacted as described below for structural fill.

Based on our explorations completed for this study, any deep excavations that are planned for the project should be expected to encounter dense to very dense soil conditions. The lodgement till sediments are very dense at depth, and excavation progress was slow during our subsurface exploration program. The lodgement till will be used as structural fill for the planned grading on the site. Due to the density of these materials in place, a swell factor of 1.0 to 1.1 may be used for compacted, in-place material throughout the site. Due to the variability of the fines content and the density across the site, this is a best estimate of the potential conditions.

Once excavation to subgrade elevation is complete, the resulting surface should be proof-rolled with a loaded dump truck or other suitable equipment. Soft, loose, or yielding areas should be excavated to expose suitable bearing soils. The subgrades should then be compacted to a firm and unyielding condition as determined by the geotechnical engineer or their representative. Structural fill can then be placed to achieve desired grades, if needed.

In our opinion, stable, temporary construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, we anticipate that temporary, unsupported cut slopes in the unsaturated lodgement till less than 12 feet in height can be excavated at angles of ¾H:1V (Horizontal: Vertical) or flatter. Temporary excavations in medium dense weathered soils should be planned at angles of 1H:1V. If steeper slopes are needed, shoring and/or trench boxes should be used. All permanent cut or fill slopes should be sloped back at no steeper than 2H:1V unless protected with the use of rockeries or other stabilization methods. These slope angles assume that ground water seepage is not encountered and that surface water is not allowed to flow across the temporary slope faces. If ground or surface water is present when the temporary excavation slopes are exposed, flatter slope angles will be required. As is typical with earthwork operations, some sloughing and raveling may occur, and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

The on-site soils contain high amounts of fine-grained material. The high percentage of fine-grained material makes them moisture-sensitive and subject to disturbance when wet. Overall, the soils found on-site are suitable for structural fill, but should be closely monitored to allow for placement at the optimum moisture content. The contractor must use care during site preparation and excavation operations so that moisture-sensitive subgrade soils are not softened. If disturbance occurs, the softened soils should be removed and the area brought to grade with structural fill. .

11.0 STRUCTURAL FILL

Structural fill will be necessary to establish desired grades in some areas. All references to structural fill in this report refer to subgrade preparation, fill type, placement, and compaction of materials, as discussed in this section. If a percentage of compaction is specified under another section of this report, the value given in that section should be used.

After stripping, planned excavation, and any required overexcavation have been performed to the satisfaction of the geotechnical engineer/engineering geologist, the surface should be proof-rolled to verify a firm and unyielding condition. After the exposed ground is tested and approved, structural fill may be placed to attain desired grades. Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in maximum 12-inch loose lifts, with each lift being compacted to at least 95 percent of the maximum dry density (MDD) as the standard. In non-structural areas outside of building pads, roadways, and utilities, this standard may be reduced to at least 90 percent of MDD. In the case of roadway and utility trench filling, the backfill should be placed and compacted in accordance with current local codes and standards. The top of the compacted fill should extend horizontally outward a minimum distance of 3 feet beyond the locations of the perimeter footings or roadway edge before sloping down at an angle of 2H:1V.

Where new structural fill will be placed on slopes steeper than 5H:1V, the fill should be keyed and benched into suitable underlying native soils. The key trench should be at least 8 feet wide and 3 feet deep, and hillside benches should be cut horizontally as the fill progresses. Hillside benches should be at least 2 feet wide and typically are less than 8 feet wide.

The contractor should note that any proposed fill soils must be evaluated by AESI prior to their use in fills. This would require that we have a sample of the material 72 hours in advance to perform a Proctor test and determine its field compaction standard. Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. The native soils present on-site consisted primarily of silt and are considered highly moisture-sensitive. Use of excavated native silts in structural fills is not recommended due to their very high content of fine-grained material. In addition, construction equipment traversing the site when the soils are wet can cause considerable disturbance. We recommend that a select import material consisting of a clean, free-draining gravel and/or sand be used in structural fill applications. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction with at least 25 percent retained on the No. 4 sieve.

A representative from our firm should observe the stripped subgrade and be present during placement of structural fill to document the work and perform a representative number of in-place density tests. In this way, the adequacy of the earthwork may be evaluated as filling progresses, and any problem areas may be corrected at that time. It is important to understand that taking random compaction tests on a part-time basis will not assure uniformity or acceptable performance of a fill. As such, we are available to aid the owner in developing a suitable monitoring and testing program.

12.0 FOUNDATIONS

Spread footings may be used for building support when they are constructed above new structural fill placed as described above, or by medium dense to very dense native soils. The foundation bearing stratum, consisting of either medium dense to very dense Vashon sediments or structural fill placed over these sediments, is relatively shallow and spread footings may be used for foundation support. The depth to foundation bearing soils ranged from 1½ to 2½ feet in all exploration pits. For residential structures, footings may be designed for an allowable foundation soil bearing pressure of 2,500 pounds per square foot (psf), including both dead and live loads. With the site soils, higher foundation soil bearing pressures are possible, but are not expected to be needed for the project. An increase of one-third may be used for short-term wind or seismic loading. All foundations must penetrate to the prescribed bearing stratum, and no foundations should be constructed in or above loose, organic, or existing fill soils.

Anticipated settlement of footings founded as recommended should be on the order of ¾ inch or less, with differential settlement of ½ inch or less. However, disturbed material not removed from footing trenches prior to footing placement could result in increased settlements. All footing areas should be observed by AESI prior to placing concrete to verify that the foundation subgrades are undisturbed and construction conforms to the recommendations contained in this report. Perimeter footing drains should be provided, as discussed under the "Drainage Considerations" section of this report.

It should be noted that the area bounded by lines extending downward at 1H:1V from any footing must not intersect another footing or intersect a filled area that has not been compacted to at least 95 percent of *American Society for Testing and Materials* (ASTM):D 1557. In addition, a 1½H:1V line extending down and away from any footing must not daylight onto a slope or cut because sloughing or raveling may eventually undermine the footing. Thus, footings should not be placed near the edge of steps or cuts in the bearing soils.

13.0 LATERAL WALL PRESSURES

All backfill behind walls or around foundations should be placed as per our recommendations for structural fill and as described in this section of the report. Horizontally backfilled walls that are free to yield laterally at least 0.1 percent of their height may be designed using an equivalent fluid equal to 35 pounds per cubic foot (pcf). Fully restrained, horizontally backfilled, rigid walls that cannot yield should be designed for an equivalent fluid of 50 pcf. Walls that retain sloping backfill at a maximum angle of 2H:1V should be designed using an equivalent fluid pressure of 45 pcf for yielding conditions.

The lateral pressures presented above are based on the conditions of a uniform backfill consisting of the on-site, natural glacial sediments or imported sand and gravel compacted to 90 percent of ASTM:D 1557. A higher degree of compaction is not recommended, as this will increase the pressure acting on the walls.

Footing drains must be provided for all retaining and foundation walls, as discussed under the "Drainage Considerations" section of this report. It is imperative that proper drainage be provided so that hydrostatic pressures do not develop against the walls. This would involve installation of a minimum 1-foot-wide blanket drain to within 2 feet of the ground surface using imported, washed gravel against the walls placed to be continuous with the footing drain.

13.1 Passive Resistance and Friction Factors

Footings cast directly against undisturbed, dense soils in a trench may be designed for passive resistance against lateral translation using an equivalent fluid equal to 350 pcf. The passive equivalent fluid pressure diagram begins at the top of the footing; however, total lateral resistance should be summed only over the depth of the actual key. This value applies only to footings/keyways where concrete is placed directly against the trench sidewalls without the use of forms. If footings are placed on grade and then backfilled, the top of the compacted backfill must be horizontal and extend outward from the footing for a minimum lateral distance equal to three times the height of the backfill before tapering down to grade. With backfill placed as discussed, footings may be designed for passive resistance against lateral translation using an equivalent fluid equal to 250 pcf and the truncated pressure diagram discussed above.

The allowable friction coefficient for footings cast directly on undisturbed, dense soils may be taken as 0.36. Since it will be difficult to excavate these soils without disturbance, the soil under the footings must be recompacted to at least 95 percent of the above-mentioned standard for this value to apply.

14.0 FLOOR SUPPORT

Crawl space floors could be used if supported on spread foundations. If crawl space floors are used, an impervious moisture barrier should be provided above the soil surface within the crawl space. Slab-on-grade floors may be used over medium dense to very dense native soils or structural fill, as recommended in the "Site Preparation" section of this report. The floor should be cast atop a minimum of 4 inches of washed pea gravel or washed crushed rock to act as a capillary break. It should also be protected from dampness by an impervious moisture barrier or otherwise sealed. Floor slabs that are supported by medium dense to very dense soils and structural fill should experience ½ inch or less of settlement.

15.0 DRAINAGE CONSIDERATIONS

Ground water was not observed in any of our exploration pits. However, ground water could occur seasonally where loose, weathered soils are underlain by dense, unweathered soils. Ground water could also be present in granular layers within a less-weathered soil unit. Due to the potential variability of the site soils in terms of composition and density across short distances, it is difficult to predict where these conditions will occur. Therefore, prior to site work and construction, the contractor should be prepared to provide subgrade protection and drainage, as necessary.

All footing walls should be provided with a drain at the footing elevation. Drains should consist of rigid, perforated, polyvinyl chloride (PVC) pipe surrounded by washed pea gravel. The level of the perforations in the pipe should be set at the bottom of the footing at all locations, and the drain collectors should be constructed with sufficient gradient to allow gravity discharge away from the buildings. In addition, all foundation walls taller than 3 feet should be lined with a minimum 12-inch-thick washed gravel blanket provided over the full height of the wall to within 12 inches of final grade, and which ties into the footing drain. Roof and surface runoff should not discharge into the footing drain system, but should be handled by a separate, rigid, tightline drain. In planning, exterior grades adjacent to foundations should be sloped downward away from the structures to achieve surface drainage. No surface water discharges should be planned on or above steep slopes.

16.0 PROJECT DESIGN AND CONSTRUCTION MONITORING

We are available to provide additional geotechnical consultation as the project design develops and possibly changes from that upon which this report is based. We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, our earthwork and foundation recommendations may be properly interpreted and implemented in the design.

We are also available to provide geotechnical engineering and monitoring services during construction. The integrity of the foundations for buildings and of new pavement depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of the current scope of work. If these services are desired, please let us know, and we will prepare a cost proposal.

We have enjoyed working with you on this study and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Everett, Washington

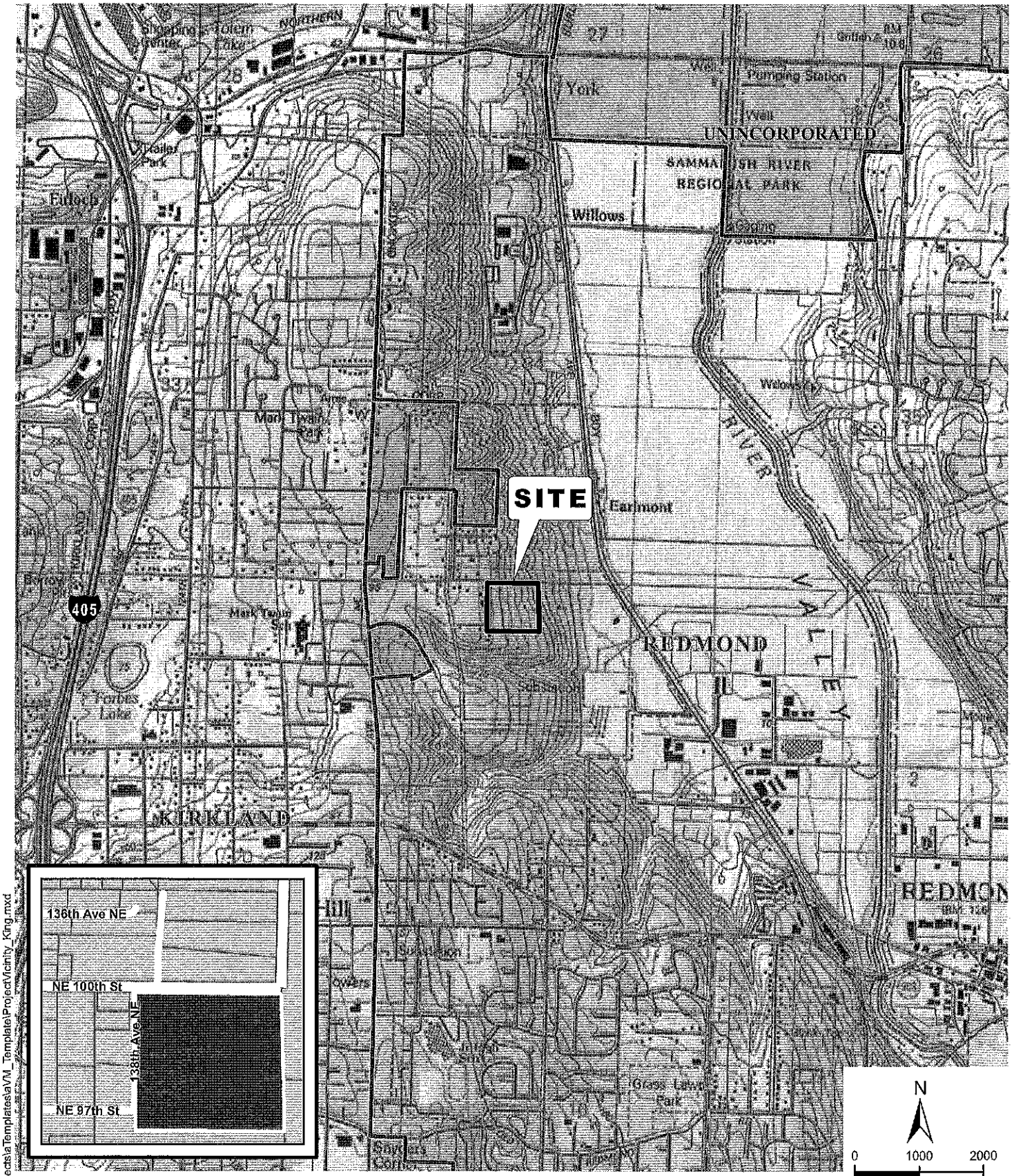
State of Washington
Engineering Geologist
1387
Licensed Geologist
1/29/16
Frank S. Mocker

MATTHEW A. MILLER
STATE OF WASHINGTON
30284
REGISTERED
PROFESSIONAL ENGINEER
1-29-16

Frank S. Mocker, L.G., L.E.G.
Project Geologist

Matthew A. Miller, P.E.
Principal Engineer

Attachments: Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Appendix: Exploration Logs



REFERENCE: USGS, KING CO

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

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VICINITY MAP

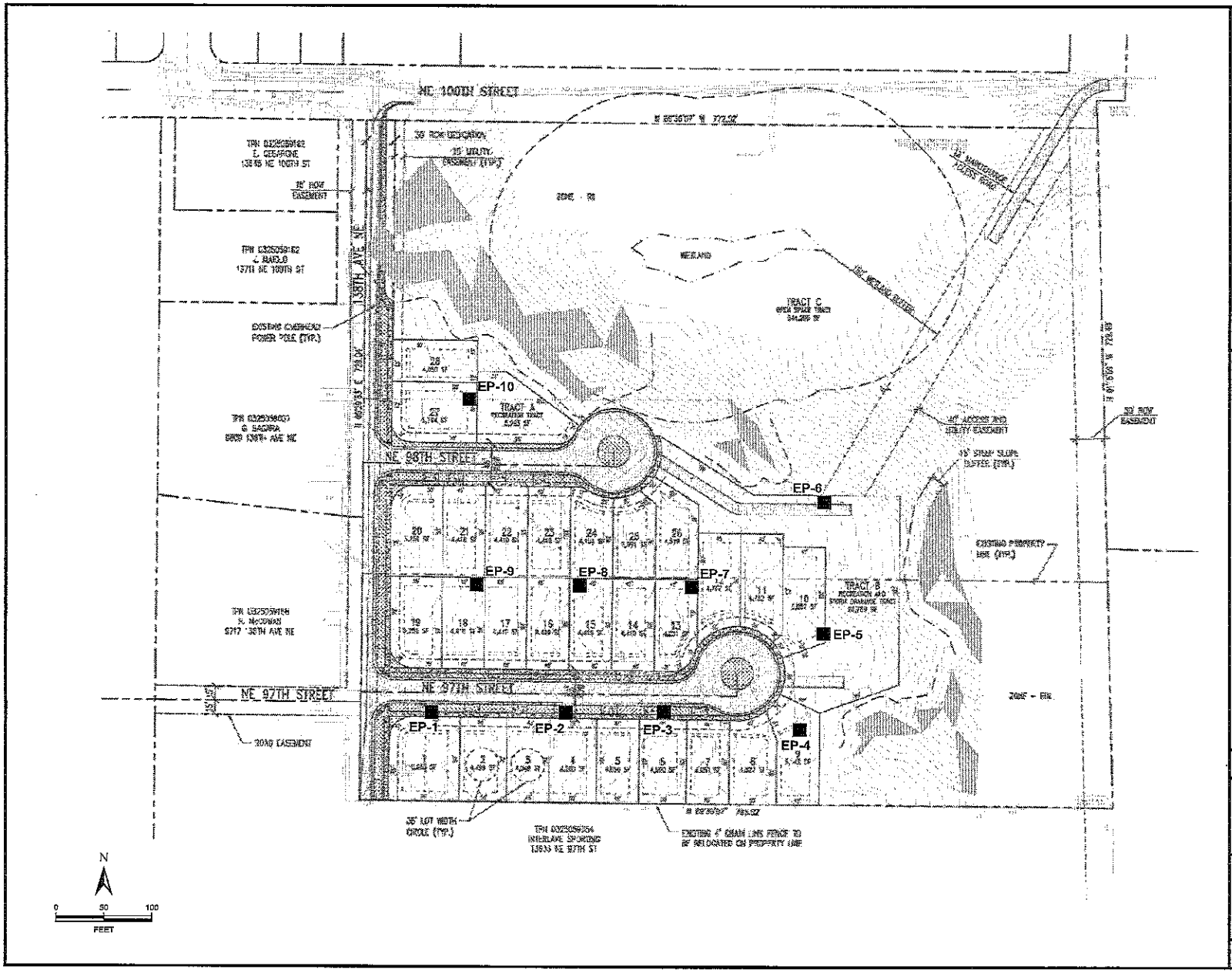
ROSE HILL PROPERTY
REDMOND, WASHINGTON

FIGURE 1

DATE 7/15

PROJ. NO. EE150375A

Document Path: H:\GIS_Projects\aTemplates\aVM_Template\Project\Vicinity_King.mxd



LEGEND:

- **EP** EXPLORATION PIT
- EXISTING LOT LINE
- PROPOSED LOT LINE
- EASEMENT LINE
- BUILDING SETBACK LINE
- CRITICAL AREA BUFFER
- STEEP SLOPE

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: KPFF, ROSE HILL SUBDIVISION SITE PLAN, SHEET C-1.0 REVISED DATED 1-25-2016

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SITE AND EXPLORATION PLAN

ROSE HILL PROPERTY
REDMOND, WASHINGTON

PROJ NO.	DATE:	FIGURE:
EE150375A	1/16	2

150375 Rose Hill | 150375 F2 Site and Exploration Plan 1-29-2016.cdr

APPENDIX

Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines[5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines[5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines[5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines[5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils

Density	SPT[2] blows/foot
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	>50

Fine-Grained Soils

Consistency	SPT[2] blows/foot
Very Soft	0 to 2
Soft	2 to 4
Medium Stiff	4 to 8
Stiff	8 to 15
Very Stiff	15 to 30
Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

[3] Estimated Percentage

Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols

Sampler Type
2.0" OD Split-Spoon Sampler (SPT)
Bulk sample
Grab Sample
Blows/6" or portion of 6"

Sampler Type Description

3.0" OD Split-Spoon Sampler
3.25" OD Split-Spoon Ring Sampler
3.0" OD Thin-Wall Tube Sampler (including Shelby tube)
Portion not recovered

Cement grout surface seal
Bentonite seal
Filter pack with blank casing section
Screened casing or Hydrotip with filter pack
End cap

(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
ATD = At time of drilling
Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

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EXPLORATION LOG KEY

FIGURE A1

blocks\1.dwg\1 log_key.dwg LAYOUT: Layout 4 -2014 Qty Chng

LOG OF EXPLORATION PIT NO. EP-1

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~257
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, moist, light brown, silty SAND, some fine to coarse rounded gravel, trace organics (roots); nonstratified (SM).
3	
	Vashon Lodgement Till
4	Dense, moist, light olive, silty fine to coarse SAND, trace to some fine to coarse rounded gravel, trace rounded cobbles; slightly less silty with depth; less gravel with depth; sand grades to fine to medium grained; nonstratified to faintly bedded (SM).
5	
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
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20	

Rose Hill Property
Redmond, WA

Logged by: FSM
Approved by: JHS

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Project No. EE150375A
7/17/15

LOG OF EXPLORATION PIT NO. EP-2

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~247
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, moist, light brown, fine to medium SAND, some silt to silty, trace to some gravel, trace organics (rootlets) (SP/SM).
3	
4	**Vashon Lodgement Till**
5	Dense, moist, light olive, silty fine to medium SAND, some fine to coarse gravel, trace cobbles; nonstratified; varies to very silty (SM).
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
16	
17	
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20	

KCTP3 150375.GPJ January 28, 2016

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7/17/15

LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~232
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Loose to medium dense, moist, light brown, very silty fine to coarse SAND, trace fine to coarse gravel, trace organics (roots) (SM). Becomes medium dense at ~2.5 feet.
3	
4	
5	
6	
	Vashon Lodgement Till
7	Dense, moist, light olive, silty fine to medium SAND, trace coarse sand, trace fine to coarse rounded gravel, trace rounded cobbles; (SM).
8	Varies to some fine to coarse rounded gravel at 7.5 feet.
9	
10	
11	
12	Dense, moist light olive, fine to coarse SAND, some silt, trace to some fine to coarse gravel, trace cobbles from 12 to 13 feet (SW/SM).
13	Becomes silty at 13 feet.
14	
15	Bottom of exploration pit at depth 14 feet No seepage. No caving.
16	
17	
18	
19	
20	

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Project No. EE150375A

7/17/15

LOG OF EXPLORATION PIT NO. EP-4

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~208
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist, light brown, very silty fine to coarse SAND, trace gravel, trace cobbles, trace organics (rootlets); nonstratified (SM).
3	
4	At 4.5 feet, strongly iron oxide staining in fine to medium SAND, trace to some silt seams, trace organics (rootlets); stratified (SP).
5	**Vashon Lodgement Till**
6	Very dense, moist, olive gray, fine to coarse SAND, some silt to silty, trace to some fine to coarse rounded gravel; nonstratified (SM).
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. No caving.
17	
18	
19	
20	

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Project No. EE150375A
7/17/15

LOG OF EXPLORATION PIT NO. EP-5

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~203
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist, light brown, silty SAND, trace gravel, trace cobbles, trace organics (rootlets); sand is fine to medium grained, trace coarse sand (SM).
3	**Vashon Lodgement Till**
4	Dense to very dense, moist, light olive, silty fine to coarse SAND, trace to some gravel, trace cobbles; nonstratified (SM).
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. No caving.
17	
18	
19	
20	

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Project No. EE150375A

7/17/15

LOG OF EXPLORATION PIT NO. EP-6

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~203
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist, light brown, silty fine to coarse SAND, trace to some gravel, trace cobbles, trace organics (roots) (SM).
3	
	Vashon Lodgement Till
4	Dense to very dense, moist, light olive, fine to coarse SAND, some silt to silty, trace to some fine to coarse rounded gravel, trace cobbles; nonstratified; ranges to some silt with depth (SW/SM).
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	Bottom of exploration pit at depth 14.5 feet No seepage. No caving.
16	
17	
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Project No. EE150375A

7/17/15

KCTP3 150375.GPJ January 28, 2016

LOG OF EXPLORATION PIT NO. EP-7

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~226
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist, light brown, silty fine to coarse SAND, trace gravel, trace cobbles, trace organics (roots) (SM).
3	
4	
5	
6	More pronounced iron oxide staining at 6 feet. Becomes dense below 6 feet.
7	**Vashon Lodgement Till**
8	Dense to very dense, moist, light olive, silty fine to coarse SAND, trace to some gravel, trace cobbles (SM).
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

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Project No. EE150375A
7/17/15

LOG OF EXPLORATION PIT NO. EP-8

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~242
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist to moist, light brown, silty fine to coarse SAND, trace to some fine to coarse rounded gravel, trace cobbles, trace organics (SM).
3	
4	
	Vashon Lodgement Till
5	Dense to very dense, moist, olive gray, silty fine to coarse SAND, trace to some fine to coarse rounded gravel, trace cobbles (SM).
6	
7	
8	
9	Color varies to greenish olive.
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No caving.
12	
13	
14	
15	
16	
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19	
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Rose Hill Property
Redmond, WA

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Project No. EE150375A
7/17/15

LOG OF EXPLORATION PIT NO. EP-9

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** Elev: ~254
	Topsoil
1	Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).
	Weathered Vashon Lodgement Till
2	Medium dense, slightly moist to moist, light brown, silty fine to coarse SAND, trace to some fine to coarse rounded gravel, trace cobbles, trace organics (SM).
3	
4	
5	
6	
	Vashon Lodgement Till
7	Dense to very dense, moist, light olive, fine to coarse SAND, some silt to silty, some fine to coarse gravel, trace cobbles; nonstratified; faintly cross stratified? (defined by faint parting planes) (SW/SM).
8	
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. No caving.
17	
18	
19	
20	

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Redmond, WA

Logged by: FSM

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Project No. EE150375A

7/17/15

LOG OF EXPLORATION PIT NO. EP-10

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

DESCRIPTION

Elev: ~251

Topsoil

1 Very loose, dry, brown, silty SAND, trace gravel; abundant organics (SM).

Weathered Vashon Lodgement Till

2 Medium dense, slightly moist to moist, light brown, silty fine to coarse SAND, trace to some fine to coarse rounded gravel, trace cobbles, trace organics (SM).

3

4

Vashon Lodgement Till

5 Dense to very dense, moist, olive, silty SAND, trace to some gravel, trace cobbles; occasional seam of fine to coarse SAND, some gravel, some silt (SM).

6

7

8

9

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11 Bottom of exploration pit at depth 10 feet
No seepage. No caving.

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KCTP3 150375.GPJ January 28, 2016

Rose Hill Property
Redmond, WA

Logged by: FSM

Approved by: JHS

associated earth sciences incorporated

Project No. EE150375A

7/17/15