Evans Creek Relocation Preliminary Design Report

City of Redmond

July 31, 2014

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Acronyms and Abbreviations

cfs	cubic feet per second
HDR	HDR, Inc.
LWD	Large Woody Debris
APE	Area of Potential Effects
HRA	Historical Research Associates, Inc.
OPCC	Opinion of Probable Construction Cost
RM	River Mile
sf	Square feet
TESC	Temporary Erosion and Sediment Control
USACE	U.S. Army Corps of Engineers
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
NAVD	National Vertical Datum of 1988

Introduction

HDR, Inc. (HDR) has been retained by the City of Redmond (City) to provide a design for the relocation of a portion of Evans Creek in Redmond, Washington. The proposed project is anticipated to begin at the existing upstream limit of the Washington State Department of Transportation (WSDOT) SR 520 Eastside Wetlands Mitigation project. The proposed project will extend upstream to approximately river mile (RM) 0.75 just downstream of the NE Union Hill Road Bridge crossing. Currently, this reach of Evans Creek has a narrow riparian buffer, is channelized, is encroached by multiple industrial land uses, and is affected by limited water quality treatment or flow control of stormwater runoff. The proposed relocation will direct the Creek through existing wetlands, resulting in a higher-functioning ecological system. It is anticipated that the proposed channel relocation will provide improvements to riparian buffer and floodplain connectivity, enhance rearing habitat for Chinook Salmon and other Salmonids, augment fish passage to the upper watershed, maintain or improve beneficial community access, and help facilitate potential redevelopment of adjacent industrial properties and associated stormwater upgrades. A map of the general project location and vicinity is shown in Figure 1.

Multiple design and construction approaches were considered during the initial phases of project development. An “Integrated” approach was selected for establishing a channel path through the existing forested wetland. This approach incorporates elements of both the “Soft Touch” and “Conventional” where initial physical modification to the wetland floor could be minimized. This document presents the basis for decisions for design elements in the context of the recommended restoration concept. The design and construction approaches described above are provided within the previously submitted Concept Refinement Technical Memorandum (HDR, Inc. 2014b).

Purpose and Objective

The purpose of this report is to discuss the selection approach, concept development, and implementation of the project design components. A previous analysis presented in the Concept Refinement Technical Memorandum (HDR, Inc. 2014b) describes the evaluation of design alternatives and the basis for selecting a preferred concept to guide the restoration design. The selected restoration concept will establish a defined stream channel while applying a “soft touch” approach as defined in HDR (2014a) to minimize impacts to the existing forested wetland that makes up the downstream reach of the proposed channel alignment.

Objectives of this report include the following:

- Present the technical basis for decisions regarding specific design elements including channel alignment, cross section size and shape, construction approach, planting, and habitat elements
- Provide a summary of existing conditions that inform and constrain the design approach.

- Summarize the results of analyses that inform the design (e.g., hydrologic and hydraulic analysis, sediment mobility analysis).

Overall Project Goals

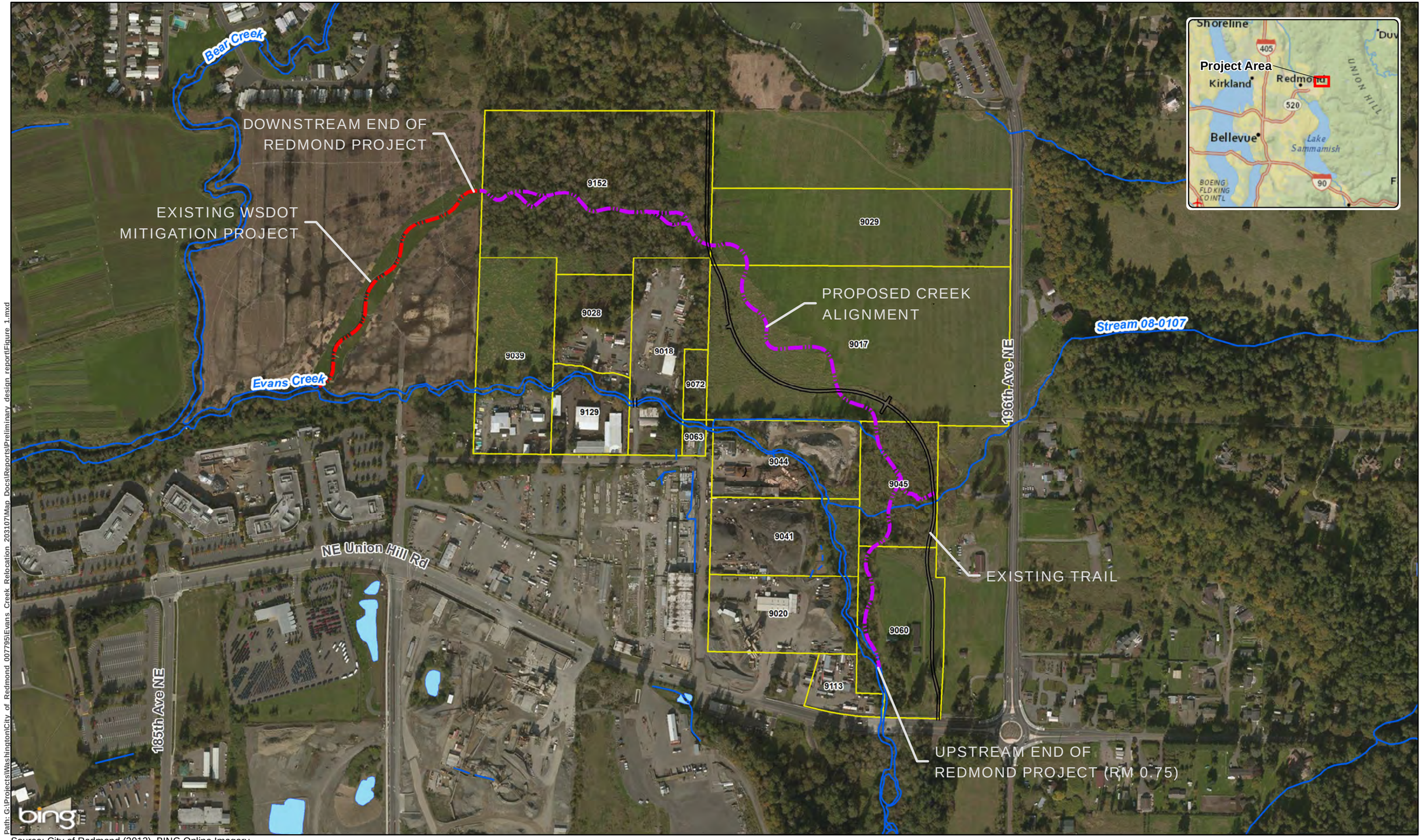
This project is listed in the Water Resources Inventory Area (WRIA) 8 Chinook Conservation Plan and will fulfill both local and federal habitat improvement goals documented in that plan. The overall project goal is to design an urban stream relocation project that will improve environmental functions, and benefit Chinook Salmon in an area of existing and proposed urban land uses. This goal will be met by implementing the following actions:

- Relocate the stream channel away from existing industrial land use and into open space with forested riparian habitat
- Enhance in-stream habitat conditions
- Manage invasive plant species and establish communities of native vegetation
- Provide ample riparian buffer and floodplain
- Improve fish passage to the upper watershed
- Provide habitat of the type needed to support for significantly enhanced juvenile rearing, as well as increased spawning habitat
- Increase the passive recreation opportunities, fostering environmental stewardship
- Enhance natural flood conveyance and material transport properties
- Heighten the potential for redevelopment of adjacent industrial properties to foster installation of water quality and flow control facility upgrades

Measureable Performance Criteria

Measurable performance criteria will be developed for the project in the future. The set of criterion provided below illustrate attributes of the restoration project that will be measured based on required maintenance efforts. Specific quantities will be added as the design progresses:

- Establish new wetted channel habitat compared to existing conditions
- Establish large woody debris (LWD) loading rates typical of this type of stream restoration project.
- Manage invasive species to no more than 20 percent per year survival within the project boundaries
- Establish forested riparian buffers that average at least 100 feet in width on each side of the restored channel within the project area
- Establish and maintain a new channel throughout the project area that is fish passable at all life stages



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Source: City of Redmond (2013), BING Online Imagery.

Stream
WaterBody
Parcel
Existing Trail
Study Area
Proposed HDR Alignment
Existng WSDOT Alignment

HDR

N

0 125 250 500 Feet

Prelimniary Design Report

Figure 1 - Vicinty Map

Evans Creek Relocation - Redmond, WA

- Satisfy Federal Emergency Management Agency (FEMA) floodplain and floodway requirements within the project area
- Achieve no net loss of wetland acreage and increased wetland function compared to existing conditions
- Establish and maintain the public trail within the project area to encourage stewardship

Guiding Design Principles

The following design principles were used as informal templates for development of the overall design strategy for the project:

Low Impact – To restore the fluvial processes, hydrologic regime, and ecological diversity of the creek and floodplain area (as discussed in the following sections of this document), design elements must be developed to provide minimal impacts to the beneficial elements of the surrounding environment. The goal will be to achieve this through taking considerations such as incorporation of existing habitat elements, planform design in line with the natural tendencies of the system, and minimization of construction impacts within critical areas during generation of the design concepts.

Process Design – The design intent is to reestablish geomorphic processes over time by improving habitat and providing a more functional river and floodplain environment. Initial construction will act as the catalyst for the ongoing processes to evolve the system in a manner that is consistent of natural functionality. The goal will be to provide an effective starting point for the initiation of these processes and successfully continue over time.

Opportunities and Constraints (General)

Each of the design elements discussed in this document have unique opportunities and constraints associated with them. The project includes wetland areas situated in the floodplain, located adjacent to the existing degraded and channelized portion of reach proposed for relocation. The wide expansive area provides an opportunity for the restoration of floodplain hydrology and processes on the site. Additionally, the trees in forested wetland areas can be salvaged and utilized as in-stream habitat features within the proposed channel stream, reducing habitat material and transportation costs and minimizing the introduction of sediments from outside the project area.

The project is located within the lower portion of the Evans/Bear Creek Watershed. Expected habitat benefits to multiple salmonid species will help remediate the habitat deficiencies described within the WRIA 8 Chinook Conservation Plan (Kerwin, 2001). The proposed project is also anticipated to improve overall habitat for terrestrial species that utilize Evans Creek and its riparian corridors. By re-aligning the stream channel through the large wetland complex and creating a contiguous forested and scrub-shrub riparian corridor, the project will create a relatively undisturbed travel corridor through the Evans Creek system, increase the diversity of habitat types in the large wetland area, and provide additional opportunities for food sources, shelter.

The general constraints associated with the project include the relationship between cost and ecological benefits, potential impacts to existing habitat, technical feasibility, and regulatory limitations. The primary project costs will be attributed to grading quantities and planting. Potential impacts to existing habitat include temporal loss of a portion of mature forested wetland in the downstream portion of the proposed channel alignment, and potential fish stranding in abandoned or existing isolated channels during flood events. In addition, the documented presence of beaver activity in the upstream portion of the proposed channel alignment area will likely pose ongoing challenges to re-establishment of woody vegetation and maintaining suitable site hydrology in the upstream portion of the re-aligned channel and adjoining wetlands. The constraints associated with the technical feasibility of the project are discussed in detail later in this document. Compliance with regulatory requirements was considered throughout the development of all methods of construction activity; however, they are not specifically addressed in this report.

The majority of the project area lies within critical areas, where trail systems are not preferred by resource agencies. Relocation of the Creek would provide a connection between the surrounding resources, while maintaining the City's vision of providing a public trail, to establish a connection between the public areas adjacent to the project area. The connection of the trail system and involvement of adjacent property owners provide for great opportunity for stewardship of the project area. Maintaining trail connection and involving adjacent property owners within the project, will benefit passive recreation opportunities and foster environmental stewardship of the project area.

Summary of Existing Conditions

Review of Existing Documentation and Studies

Documentation reviewed or produced by the HDR team for this project consisted of materials specific to the project area and those applicable to areas adjacent to the project. In particular, each document is listed within associated category discussed above:

<u>Project Area Specific:</u>

- Wetland and Stream Delineation Report (HDR, Inc. 2014a)
- Geotechnical Investigation Report (GeoEngineers, 2013)
- Archeological Investigation Report (HRA, 2013)
- Concept Refinement Technical Memorandum (HDR, Inc. 2014b)

<u>Areas Adjacent to Project:</u>

- WSDOT Mitigation Site Design Documentation (WSDOT, 2012)

Site Location and Vicinity

The proposed project is located northwest of the intersection of 196th Avenue NE and NE Union Hill Road (Section 6, Township 25 North, Range 6 East) within the City of Redmond,

Washington (See Figure 1). The project site is centered at latitude 47.680946 North and longitude -122.085857 West.

The proposed project is anticipated to tie Evans Creek into the new channel constructed at the WSDOT SR 520 Eastside Wetlands Mitigation Project to approximately RM 0.75, approximately 200 feet downstream of the NE Union Hill Road Bridge Crossing.

The project area consists of fourteen parcels owned by either City of Redmond (062506-9045, 062506-9060, 062506-9152, 062506-9063) or private land owners (062506-9017, 062506-9029, 062506-9113, 062506-9020, 062506-9041, 062506-9044, 062506-9072, 062506-9018, 062506-9028, 062506-9129, and 062506-9039). Figure 1 displays the parcel boundaries within the project area.

Site Description

General

The project will begin on a City-owned parcel approximately 200 feet north of Union Hill Road. The actual relocation of the creek is proposed to begin at approximately RM 0.75. At this location the new alignment will head downstream for approximately 500 feet in a similar orientation to that of the existing creek at an approximate offset of 80 feet from the existing system. From this point the proposed alignment will travel downstream in a northwesterly orientation for approximately 470 feet through a portion of existing forested wetland. The alignment will then be constructed in a northwesterly orientation for approximately 1,280 feet through an existing wetland, then routed in a westerly direction for approximately 1,290 feet through another area of forested wetland, eventually connecting to the upstream end of the existing channel constructed as part of the WSDOT SR 520 Evans Creek Eastside Wetland Mitigation project (see Figure 1).

The area of the proposed alignment is located on relatively undeveloped properties. The vegetation consists mainly of reed canarygrass, mixed deciduous tress, and a sparse collection of conifers. A total of 12 wetlands and two streams were identified within the Wetland and Stream Delineation Report conducted as part of the project. Out of 12 wetlands, one wetland encompasses a large complex wetland system within the project area. The remainder of the wetlands are located along the existing channelized portion of Evans Creek. All wetland features discussed above are displayed within Figure 2 within the Evans Creek Wetland and Stream Delineation Report provided in Appendix C. Descriptions of each of these features are also provided within this document.

Topography of the site generally slopes down from the east to the west, with surface elevations ranging from approximately 62 feet (NAVD 88) at the upstream end to about 57 feet (NAVD 88) at the downstream end of the project.

Soil composition is described as mainly recessional outwash and alluvial deposits. Recessional outwash deposits consist primarily of sand gravel, and cobbles with varying amounts of silts. The alluvial deposits within the project area consist mainly of peat, organic silt, silt, sand, and gravel. Groundwater levels experienced at the site were found to be relatively shallow (0.5 to

1.5 feet below the ground surface), exhibiting seasonal fluctuation in response to both rain events and water levels changes in the Sammamish River and in Bear Creek and Evans Creek (GeoEngineers, 2013). Further discussion of the geotechnical properties of the site is provided within the Geotechnical Report provided in Appendix D.

Cultural Resources

To satisfy the United States Army Corps of Engineers permit requirements of 36 CFR 800.13, a Phase I Cultural Resources Inventory of the area of potential effects (APE) was conducted. As a result of the analysis, it has been recommended that continued monitoring of geotechnical investigation and construction activities within the APE are conducted (HRA, 2013). A full archeological investigation report has been prepared. This report is confidential per State requirements.

Evaluation of Stream Alignment Alternatives

An assessment of the alternatives for the relocation of the creek was conducted to provide an understanding of the tendencies of the system, analyze the potential affects of each alternative, and provide a recommended alignment for the relocation.

This analysis can also be utilized for the development of the formal USACE 404(b)1 analysis that is required to be submitted as part of the permitting process.

Alternative Development

HDR coordinated with City staff to develop the list of potential alignments for the analysis. In particular, considerations were made to analyze the following potential alternatives: “Restore-In-Place”, “No Impact”, and “Owner Participation.” Additionally, an analysis of historical aerial imagery was conducted to identify changes in plan form that would warrant an evaluation of a “historical alignment” as part of the analysis. Aerial imagery from 1942 was obtained from the Department of Ecology Washington State Coastal Atlas. The image was geo-referenced into ArcGIS software to assess change in plan form within the system. After review of the imagery it was concluded that the system is fixed in nature; therefore, additional historical analysis was not conducted. A summary of each of the alternatives is provided in the following section.

Summary of Potential Alternatives

Historical Channel

This alternative evaluates the potential for relocating the reach to the historic channel alignment. Homestead maps from the 1800’s were acquired and georeferenced in the ArcGIS software for delineation of an alignment representative of the historical channel alignment. The potential alignment would begin at the upstream transition point (RM 0.75) and continue downstream for approximately 1,500 at an offset of about 100 feet to the east of the existing creek alignment. At this point, the channel would then shift to a northerly orientation for approximately 1,200 feet. At this pint the alignment would then continue downstream in a southwesterly orientation for approximately 2,000 feet before connecting to the Bear Creek system. The alternative described above is displayed within Figure 2.

Restore-In-Place

This alternative considers the potential for improvement of the reach within the current location through bank plantings and additional Large Woody Debris (LWD) within the stream corridor. The approximate reach of potential restoration activities is displayed in Figure 3.

Owner Participation

This alternative evaluates a stream alignment that is located on both private and City-owned property. The alignment would provide a shift to a northerly orientation out of the existing alignment at approximately RM 0.75. This alternative would involve a strategic plan to provide adjacent landowners giving up property to the project are compensated with an equivalent fill area within the existing channel to be abandoned that can be used and is not considered sensitive. The proposed alignment for this alternative is provided in Figure 4.

No Impact

The “No Impact” alternative examines an alignment that is fully contained within City-owned property. The alignment would provide a shift to a northwesterly orientation at the defined upstream end of the project (RM 0.75). Since the proposed alignment would be located entirely on City-owned property, acquisition of land from adjacent property owners would not be required. The proposed alignment for this alternative is provided in Figure 5.

Alternative Evaluation

Each alternative was qualitatively evaluated based on its ability to meet the project goals. Alternatives were ranked as Low, Moderate, or High during the evaluation process. Evaluation of the alternatives included the following activities:

- Identification of evaluation factors to be used as a uniform basis of comparison
- Development of screening matrix and rating of alternatives based upon how well they are perceived to meet the constraints of the established evaluation factors
- Ranking of alternatives based upon their apparent ability to meet project goals
- Preparation of order of magnitude project construction, operation and maintenance, and implementation costs.

Discussion and conclusions resulting from these activities are summarized below.

Evaluation Factors

Six evaluation factors were chosen that adequately reflect the objectives of the proposed project. The evaluation factors used in the final evaluation process are provided below in their relative order of priority for this project:

1. Habitat Improvement – The intent of this evaluation factor is to measure the relative the potential for each alternative to satisfy the objectives of the project related to habitat improvement. An alternative that supports ongoing initiatives to a higher level received a higher rating.
2. Flood Conveyance – This factor compares the relative ability of each potential alternative to meet the to regulatory flood conveyance objectives such as no rise in water surface

elevations within the floodplain during the 100-year storm event. An option that is believed to have a higher likelihood of meeting the project objective is given a higher rating than one that may not.

3. Constructability – This factor compares the relative level of complexity to construct a potential option. Construction elements considered include scheduling within in-stream construction windows, interaction with the existing facility, and basic construction methods, as well as the number and complexity of construction elements.
4. Capital Cost – This factor is a qualitative comparison of the relative order of magnitude construction costs. Construction costs are assumed to include the general conditions, mobilization, earthwork, purchase of materials, installation of project components, start-up, demonstration, and commissioning of the proposed facility. An option with a higher anticipated construction cost would rate lower than an option with a lower anticipated construction cost.
5. Impacts to Adjacent Property Owners – This factor compare the potential impacts to an adjacent property owner anticipated for each alternative. An option which requires a significant amount of effort towards land acquisition and/or easement development would rate lower than an option which required little or no land management planning
6. Stormwater System – This factor measures the relative level of resultant stormwater system improvements potentially generated by the alternative. An option which provides the potential for flow control and water quality upgrades as a result of the redevelopment of industrial properties would rate higher than an approach where the opportunity for these types of upgrades to the stormwater system.

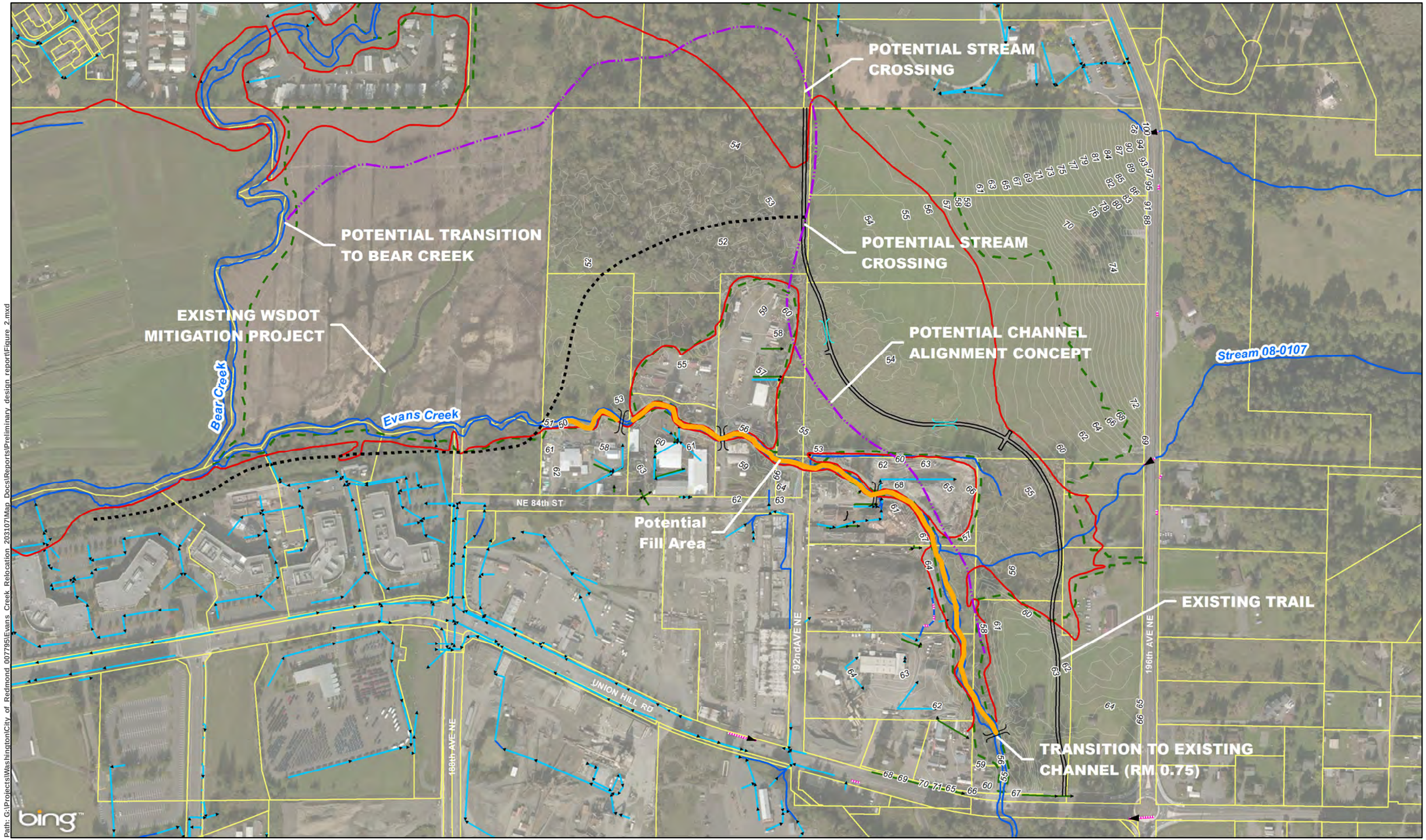
Rating Scale and Results

Alternatives were rated High, Moderate, or Low for each evaluation factor. An option that is given a rating of High is considered to meet the intent of the evaluation factor better than an option that is given a rating of Low. In the case of Habitat Improvement and Capital Cost, ratings of High are equivalent to significantly improved fish passage and rearing and lower relative capital costs, respectively. The screening matrix is provided in Table 1.

Preferred Alternative Selected for Design Development

In review of the results from the alternatives analysis, it was observed that both the “No Impact” and “Owner Participation” alternatives received the highest ratings, but were found to be overall equal.

To make a final determination, coordination with City staff was conducted to determine the final weighting factors to be implemented for the final selection of the preferred alternative. The primary factor in selection of the final alignment alternative was proximity to the identified historical findings within the archeological investigation. In particular, the “No Impact” alternative was found to bisect the identified area, and was therefore not considered for further evaluation. Thus, the determination was made to select the “Owner Participation” option as the preferred alternative.



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Source: City of Redmond (2013), BING Online Imagery.

- Existing Channel Alignment
- Existing Trail
- Existing culvert
- Existing stormdrain (City)
- Existing stormdrain (Survey)
- Existing FEMA 100-Year Floodplain Delineation
- Existing Bridge
- Approximate Wetland Boundary
- Parcel
- Potential Channel Alignment
- Potential Stream Crossing
- Potential Channel Decomission
- Potential Trail Connection

HDR

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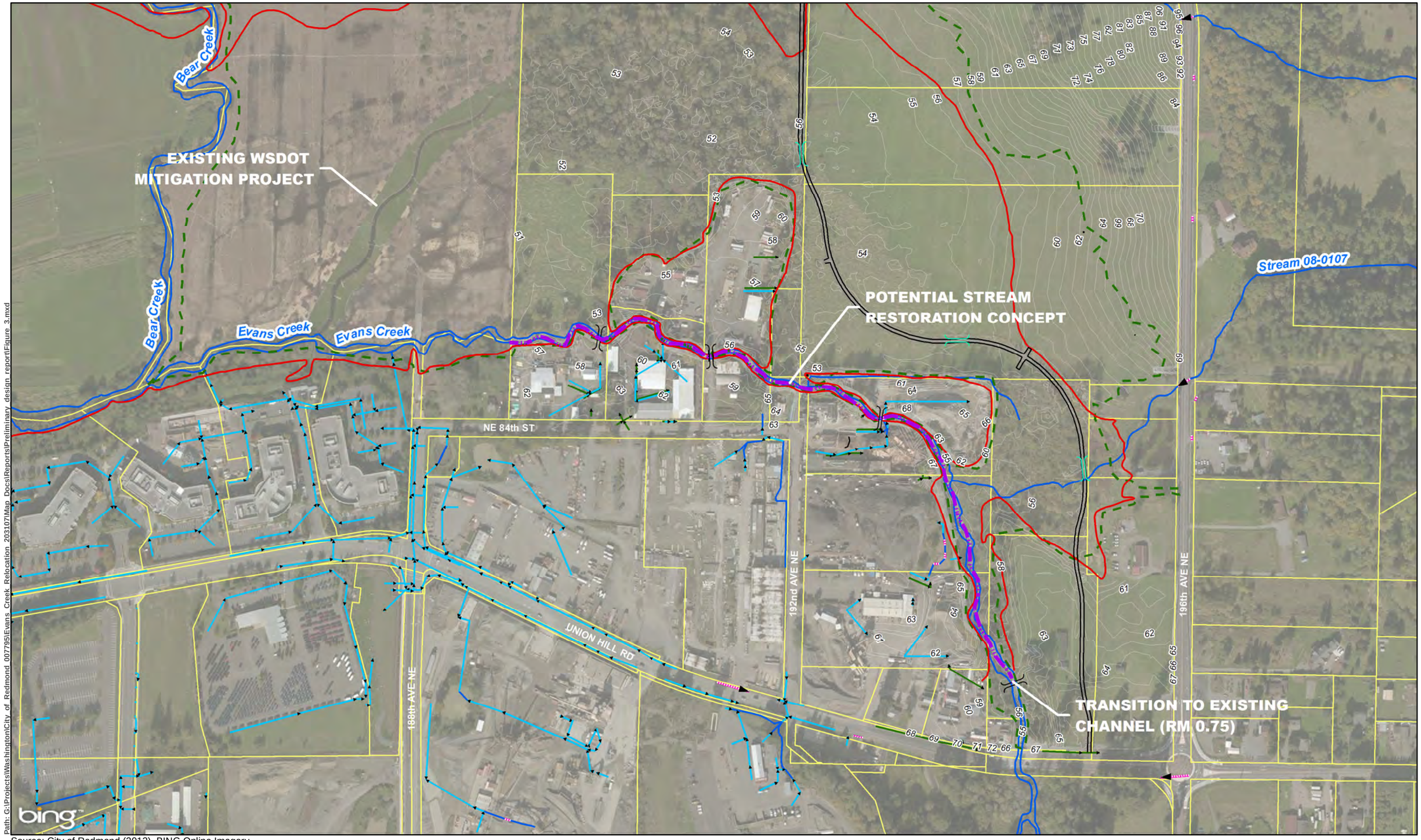
0 125 250 500 Feet

Preliminary Design Report

Figure 2 - Historical Channel Alternative

Evans Creek Relocation - Redmond, WA



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Source: City of Redmond (2013), BING Online Imagery.

- Existing Channel Alignment
- Existing Trail
- Existing culvert
- Existing stormdrain (City)
- Existing stormdrain (Survey)
- Existing FEMA 100-Year Floodplain Delineation
- Existing Bridge
- Approximate Wetland Boundary
- Parcel
- Approximate Reach of Resotration
- Potential Stream Crossing

HDR

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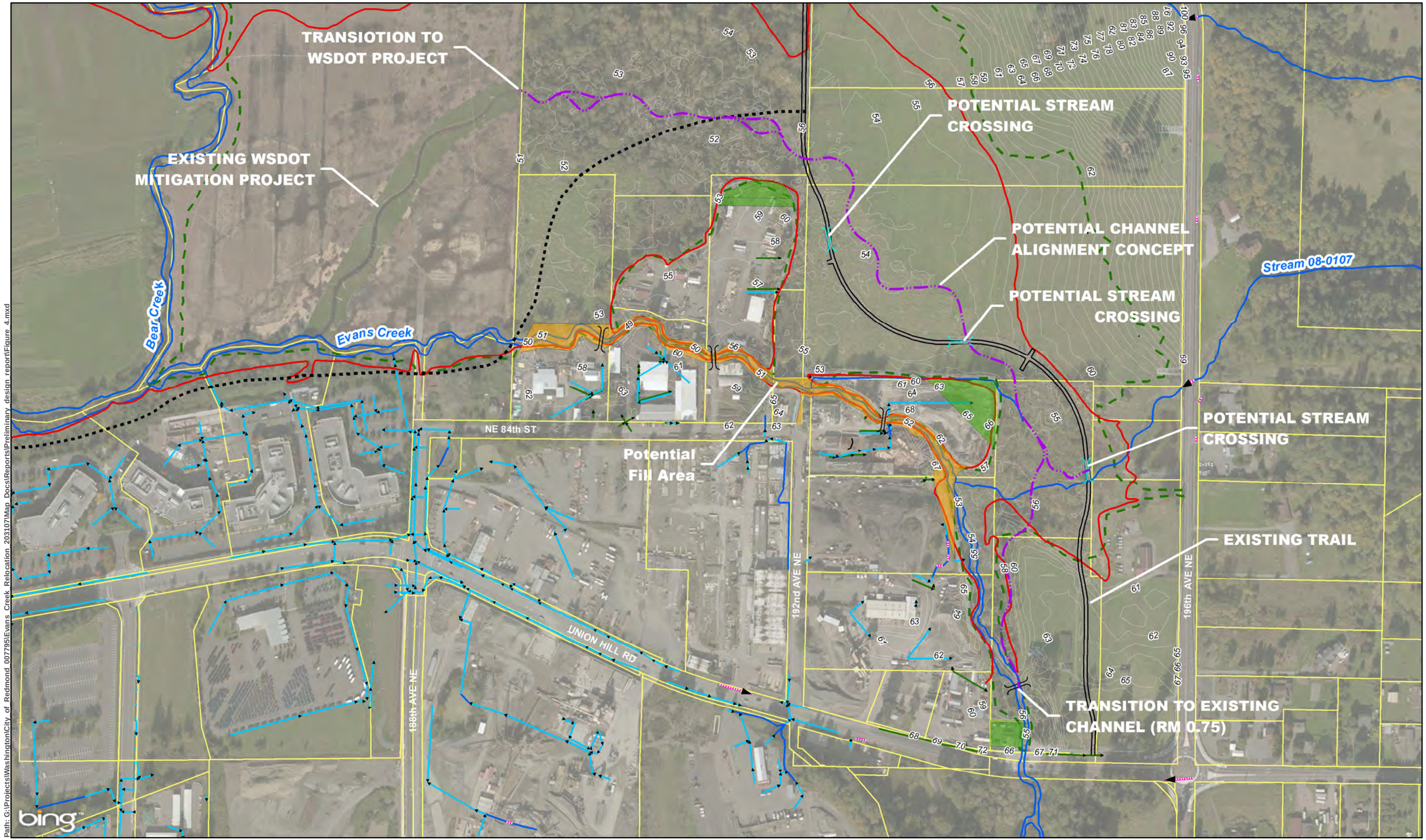
0 125 250 500 Feet

Preliminary Design Report

Figure 3 - Restore-In-Place Alternative

Evans Creek Relocation - Redmond, WA



Path: G:\Projects\Washington\City of Redmond 0077951\Evans Creek Relocation 203107\Map_Docs\Reports\Preliminary design report\Figure 4.mxd

Source: City of Redmond (2013), BING Online Imagery.

- Existing Channel Alignment
- Existing Trail
- Existing culvert
- Existing stormdrain (City)
- Existing stormdrain (Survey)
- Existing FEMA 100-Year Floodplain Delineation
- Existing Bridge
- Approximate Wetland Boundary
- Parcel
- Potential Channel Alignment
- Potential Stream Crossing
- Potential Fill Area
- Potential Corresponding Offset
- Potential Trail Connection

HDR

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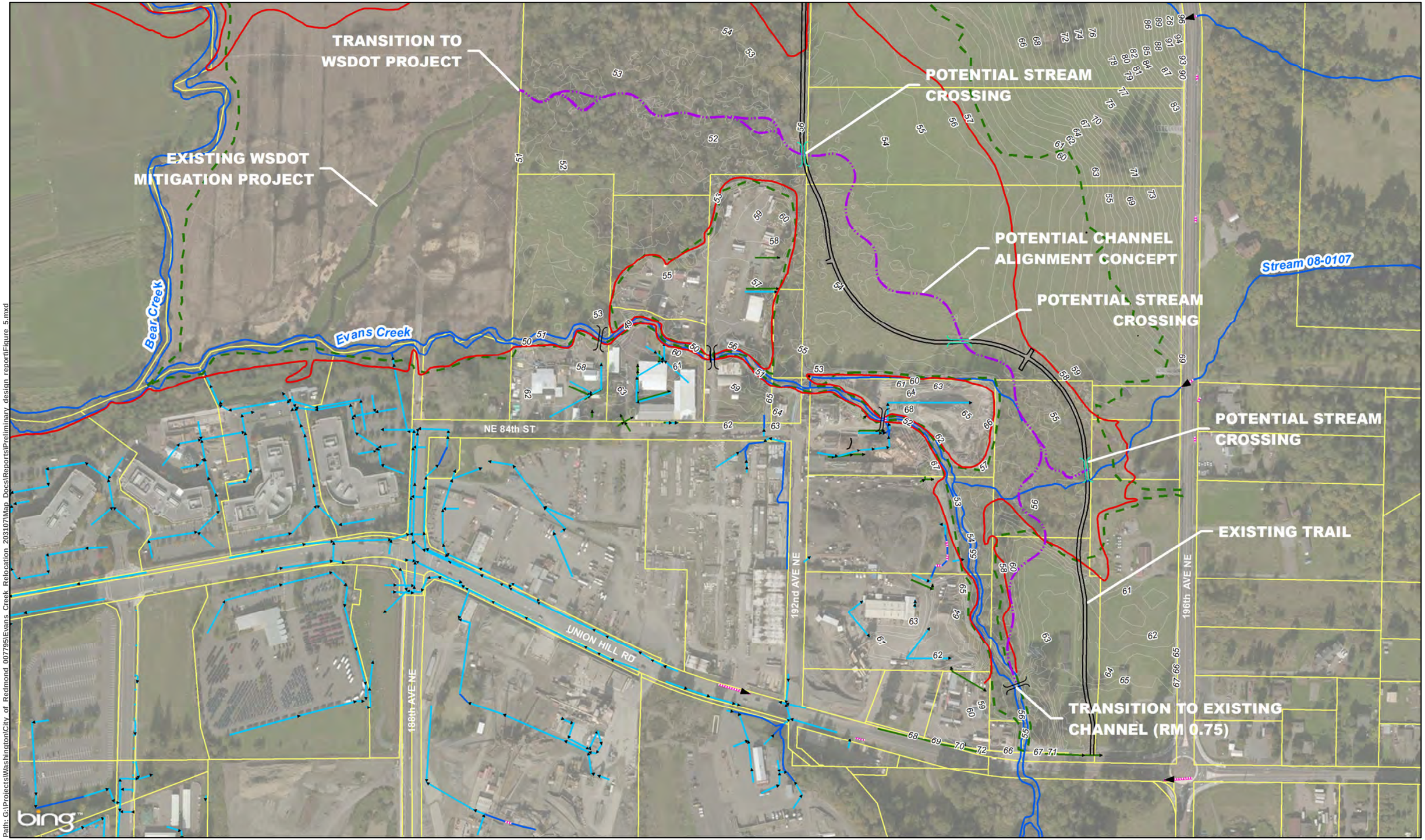
Preliminary Design Report

Figure 4 - Owner Participation Alternative

Evans Creek Relocation - Redmond, WA



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Source: City of Redmond (2013), BING Online Imagery.

Existing Channel Alignment
Existing Trail
Existing culvert
Existing stormdrain (City)
Existing stormdrain (Survey)
Existing FEMA 100-Year Floodplain Delineation
Existing Bridge
Approximate Wetland Boundary
Parcel
Potential Channel Alignment
Potential Stream Crossing

HDR

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0 125 250 500 Feet

Preliminary Design Report

Figure 5 - No Impact Alternative

Evans Creek Relocation - Redmond, WA

Table 1. Summary of results from qualitative screening of alignment alternative evaluation

Alternative	Evaluation Factors					
	Habitat Improvement	**Flood Conveyance**	**Constructability**	**Capital Costs**	**Impacts to Adjacent Land Owners**	**Stormwater System**
Historical Channel	High – This alternative is anticipated to enhance in-stream habitat conditions, provide ample riparian buffer and floodplain, ultimately improving fish passage to the upper watershed and rearing within the project area.	High – This alternative is expected to provide additional flood conveyance capacity over the existing channel. In addition, it is anticipated that water surface elevations within the 100-year floodplain would decrease under this alternative.	Low – Construction efforts anticipated with this alternative are expected to be complex. Construction of the stream channel through areas of forested wetland and a high groundwater table will produce a variety of constructability challenges such as providing minimal damage to the existing habitat and groundwater intrusion during channel excavation.	Low – This alternative would require a significant amount of land acquisition of adjacent properties. Although the resultant Capital Costs incurred would not likely be as great as restoring the channel in the current location, the required funds to achieve this alternative would be substantial.	Low – This alternative would involve several of the adjacent landowners. Due to the expansive portion of the alignment located on private land, potential both complete and partial buyout of private properties would be required. Where full buyout is unnecessary, the option would likely provide that land owner with a fill area within the existing channel equivalent to the portion of their land acquired for the project.	Moderate – This alternative would relocate portions of the existing stream out of the confined channel, currently subject to contaminated surface water runoff from adjacent industrial site industrial sites and route it through sections of the wetland complex. The wetland vegetation is anticipated to provide natural filtration of surface waters, potentially enhancing the overall water quality of the system. Also, opportunities for other stormwater system upgrades in portions of industrial properties being redeveloped are provided.
Restore-In-Place	Low - This alternative is perceived to have low potential for habitat rehabilitation as the stream alignment would still be confined within the adjacent industrial properties.	Moderate – Due to the development adjacent to both sides of the creek, flood conveyance opportunities for this alternative would likely be limited to the minimal flood conveyance provided under existing conditions.	Low – Construction of this alternative is anticipated to have a high level of complexity. It is assumed that constructing a new channel and adjacent floodplain within a confined area would present a variety of challenges with construction.	Low – This alternative is anticipated to have the highest capital costs of all alternatives. Higher costs are associated with purchasing of private lands, demolition of impervious surfaces, and complex construction.	Low – Adjacent land owners would be significantly impacted by this alternative. The City would have to buy out many of these land owners potentially forcing many to abandon their location of business.	Low – This alternative would not relocate the stream to an area that is protected from potentially contaminated surface waters. Although restoration would occur within the stream corridor, the opportunity for potentially contaminated runoff from adjacent properties would still be introduced into the system.
Owner Participation	High – This alternative is anticipated to enhance in-stream habitat conditions, provide ample riparian buffer and floodplain, ultimately improving fish passage to the upper watershed and rearing within the project area.	High – This alternative is expected to provide additional flood conveyance capacity over the existing channel. In addition, it is anticipated that water surface elevations within the 100-year floodplain would decrease under this alternative.	Moderate – Construction efforts anticipated with this alternative are expected to be complex. Construction of the stream channel through areas of forested wetland and a high groundwater table will produce a variety of constructability challenges such as providing minimal damage to the existing habitat and groundwater intrusion during channel excavation.	Moderate –This alternative would involve a strategic plan to provide an equivalent compensation of usable area to adjacent property owners giving up land to the project	Moderate – This alternative would involve all adjacent landowners. The option would provide landowners with a fill area within the existing channel equivalent to the portion of their land acquired for the project.	High – This alternative would relocate the existing stream out of the confined channel, currently subject to contaminated surface water runoff from adjacent industrial site industrial sites and route it through the wetland complex. The wetland vegetation is anticipated to provide natural filtration of surface waters, potentially enhancing the overall water quality of the system. Also, opportunities for other stormwater system upgrades in portions of industrial properties being redeveloped are provided.
No Impact	High – This alternative is anticipated to enhance in-stream habitat conditions, provide ample riparian buffer and floodplain, ultimately improving fish passage to the upper watershed and rearing within the project area.	High – This alternative is expected to provide additional flood conveyance capacity over that of the existing channel. In addition, it is anticipated that water surface elevations within the 100-year floodplain would decrease under this alternative.	Low – Construction efforts anticipated with this alternative are expected to be complex. Construction of the stream channel through areas of forested wetland and a high groundwater table will produce a variety of constructability challenges such as providing minimal damage to the existing habitat and groundwater intrusion during channel excavation.	Moderate – Because the new channel would not require the acquisition of adjacent properties, capital costs for this alternative would be less compared to the other alternatives considered.	High – The proposed alignment would be located on solely City-owned property. Thus, temporary impacts to adjacent land owners would be minimized.	High – This alternative would relocate the existing stream out of the confined channel, currently subject to contaminated surface water runoff from adjacent industrial site industrial sites and route it through the wetland complex. The wetland vegetation is anticipated to provide natural filtration of surface waters, potentially enhancing the overall water quality of the system. Also, opportunities for other stormwater system upgrades in portions of industrial properties being redeveloped are provided.

Notes – 1. High ratings correspond to the alternative's ability to provide a potentially high level of satisfaction for a specific evaluation factor. For example, an alternative would be rated "high" within the "Impacts to Adjacent land Owners" category if the alignment were contained within City owned land.

Design and Construction Approach

To provide an understanding of the opportunities and constraints associated with a given design and construction approach, an analysis of the considered alternatives was conducted at the conceptual design stage for the project. This analysis consisted of a screening level evaluation of four design and construction approaches. The analysis documents the advantages and disadvantages of each approach and evaluates them for applicability in accordance with the existing site conditions. The analysis discussed above is described in detail within the Concept Refinement Technical Memorandum (HDR 2014a) submitted on April 23, 2014. The full document is provided within Appendix F.

Preliminary Design Criteria

The objectives, assumptions, and design rationale for the specific design components discussed below are provided based on selection of the "Owner Participation" alternative as the proffered alignment alternative.

Stream Channel Design

Stream channel design includes the design of the physical channel configuration including plan form, profile, and channel cross section.

Objectives

The design of the stream channel must simultaneously meet the following objectives:

- Provide adequate conveyance for the range of anticipated flows including flood scenarios
- Enhance rearing conditions for Chinook Salmon and other Salmonids
- Accommodate sediment delivered to the project area from upstream
- Establish and maintain fish passable conditions throughout the new channel alignment
- Support ongoing in-stream habitat conditions appropriate to the landscape context.

Assumptions

OBSERVATIONS OF EXISTING CONDITIONS

Primary factors that determine channel configuration include hydrology (i.e., range of stream flows), topography, sediment (i.e., grain size distribution and load), and land cover.

The proposed relocation should have no effect on the flow quantities associated with peak flow events. Aligning the channel through existing wetland areas will establish a direct connection between stream hydrology and wetland hydrology adjacent to the stream. This connection may enhance the quality and quantity of in-stream flow during low flow periods. Overbank flows during periods of moderate flow should enhance rearing conditions.

The flat topography within the project area limits the overall stream gradient allowing for only four feet of vertical drop in the channel elevation over the entire proposed channel length of

approximately 3,540 linear feet. The proposed channel will have a low gradient on a nearly flat landscape that slopes gently to the southwest.

No monitoring data for sediment load exist. Initial observations of in-stream sediment indicate that some sediment is delivered from upstream to the project area. The flat gradient promotes deposition of any sediment coarser than fine sand within the first 200 feet of the upstream project boundary. Sediment load from upstream is not expected to have a noticeable effect on project performance. Opportunities for sediment contribution within the project area are limited by the flat gradient of both the landscape and the proposed channel. The anticipated substrate for a natural channel in this landscape setting is sand. The stream lacks the capacity to transport material larger than sand into the project area beyond the first 200 feet at the upstream end of the project. Geotechnical borings indicate the predominant soil material along the proposed channel alignment is sand. It is anticipated that native material will be suitable substrate for the restored channel. Ultimately, the channel substrate will be comprised of the native material discussed above and an engineered streambed gravel to limit erosion potential.

The proposed channel alignment will route the new channel through two zones of existing riparian forest and one intermediate zone of existing meadow. Within the forested portions of the proposed alignment, the proposed approach will minimize impacts to the existing forested wetland.

DESIGN RATIONALE

Given the proposed alignment, an irregular meandering plan form pattern is appropriate for the low gradient forested floodplain condition. Meander dimensions are based on comparison to the existing channel pattern and on correlation between bankfull channel width and meander wavelength. Observations of meandering channels over a wide range of scales shows that meander wavelength ranges between approximately seven and 10 times the bankfull channel width (Leopold et.al. 1964). Stream channels flowing through forests show more irregularity in plan form compared to meandering channels flowing through more uniform pasture lands. The proposed plan form takes into consideration the general guidelines provided above.

Channel cross section shape and size are dictated by flow and gradient. The bankfull channel capacity (i.e., flow at which floodplain flow is initiated) correlates to flow event frequency ranging from a 1-year flood to 5-year flood for a range of natural channels (Leopold and Wolman 1960). Common design flows for stream channels in the Pacific Northwest include the 1.1-year, 1.5-year, and 2-year flows. The proposed design considers the entire range of anticipated flows in determining appropriate morphology for the channel and floodplain. For low gradient meandering streams through a forested landscape, the anticipated channel morphology is an irregular multi-thread meandering channel with a relatively high overall width to depth ratio. The channel is expected to evolve over time under the influence of bank vegetation so that individual threads have a narrower, deeper shape as stream power and vegetation encroachment strike a balance over time.

The stream profile is dictated by the overall flat gradient that limits the vertical drop and produces a nearly flat stream gradient. The gradient is not sufficient to support the formation of riffles and pools. Deeper pools may form in locations where the channel is constricted by LWD

habitat structures, tree roots, or other encroaching overhanging vegetation. Overall, the profile will be fairly uniform with riffles and pools.

Habitat Design

Objectives

Habitat design includes the design of both in-stream and riparian features. LWD will be installed to improve stream channel complexity. Proposed habitat structures along the stream channel are incorporated to provide habitat for wildlife and to increase the structural complexity and species diversity functions in the project area.

Assumptions

The primary factors considered in the selection and design of habitat features is a combination of the surrounding ecosystem and process design functionality. In-stream habitat features will be introduced into the channel to facilitate processes such a scour pool formation and recruitment of LWD, critical to the formation of fish habitat. Generally, desirable fish habitat consists of off-channel areas containing deep, cool pools with adequate cover. Although the formation of pools within this system is not likely, off channel habitat can be achieved through introduction of LWD and increased canopy within the stream corridor..

Proposed habitat structures are intended to provide immediate habitat for wildlife until the project area matures to be self-sustaining. Brush piles will be placed vertically along the stream channel to mimic dense thickets that are caused by fallen or toppled trees. LWD will be installed in drier parts of wetlands to provide decadent vertical wood elements typical of a mature forest, and habitat logs will be located in wetlands (outside of bankfull width) to mimic toppled trees which create structure, and organic soil inputs as well as the habitat complexity usually present in forested sites. These structures are expected to provide habitat for small mammals, amphibians, reptiles, predatory species, passerine-sized birds, wood peckers, and bats.

OBSERVATIONS OF EXISTING CONDITIONS

The upstream portion of the existing creek(directly downstream of the Union Hill Road Bridge) provided evidence of a healthy system. Specifically, this determination was made through observations of side channels with pools, and significant vegetative cover. This portion of the stream is considered to be a good model for design and development of a downstream system, exhibiting process design functionality. LWD was observed in the existing stream channel, and snags, habitat logs, and brush piles are present in the forested wetland area. Upstream of the forested wetland area is a fallow pasture area that is currently dominated by reed canarygrass and lacks habitat features. South of the pasture area, it is currently inundated due to one active beaver dam located just upstream of the confluence with “Stream 08-0107.” Increased inundation behind the dam has caused mortality of deciduous trees that are not adapted to the prolonged flooded conditions. On September 10, 2013, the beaver dam was breached by the City to lower the water level to conduct field investigations.

DESIGN RATIONALE

The basis for the design of the in-stream habitat features is provided in previous sections. Although the stream has been identified to have low overall stream power, anchoring of LWD structures will be completed to provide resistance during flood flows. LWD structures will be located within the proposed alignment to provide the potential for the desired hydraulic diversity and cover.

Other habitat features are mainly located upstream of the forested wetland area. The forested wetland area already contains numerous habitat features; therefore, no habitat features are proposed in this area. Brush piles and snags are mainly located on the right bank of the proposed channel to avoid prolonged inundating areas.

Planting Plan

Objectives

The planting plan design is based on the following objectives:

- Create a fast-growing, woody vegetation community along the margins of the new stream channel so that shading and allochthonous input become quickly established
- Enhance existing degraded pasture wetlands by managing invasive species and establishing a forested and scrub-shrub riparian corridor with a diverse palette of native plant species to increase habitat diversity
- Replace wetland vegetation temporarily removed for construction of the proposed project and provide improved wetland functions by increasing wetland plant species diversity. This goal would be achieved by replanting disturbed areas with native woody vegetation that would provide cover and add forage value for wildlife.

Assumptions

- Excavation of the new stream channel will not result in substantial elevation changes in adjoining wetlands landward of the new alignment.
- The new channel alignment will not substantially alter hydrology in adjoining wetlands; therefore the wetland areas will continue to have sufficient hydrologic conditions to meet wetland criteria and support hydrophytic plants.
- Beaver activity in the southeast portion of the project site will likely result in ongoing permanent or semi-permanent ponding in this area.
- Species listed in the plant schedule (Appendix A) will establish and grow within the specified planting zones.

OBSERVATIONS OF EXISTING CONDITIONS

The planting plan design has been developed based on existing hydrologic, vegetation, and soil conditions observed during wetland delineations conducted by HDR in June 2013 (HDR 2014b) and initial geotechnical investigations conducted by GeoEngineers in September 2013 after the beaver dam had been breached (GeoEngineers 2013). Hydrologic conditions in the large wetland where the new channel will be located are variable. The downstream portion of the

proposed alignment in the mature forested wetland had pockets of shallow inundation in June 2013, and only shallow groundwater in September 2013. Most of the degraded wetland in the middle portion of the proposed alignment had areas of ponding up to 0.5 feet deep during the summer months, indicating permanent to semi-permanent inundation. As the pasture wetland extends upslope to the northeast, hydrology is typified by shallow groundwater and no inundation. The wetland upstream of the beaver pond had over 12 inches of inundation in September 2013, indicating this area likely is permanently ponded with or without the presence of beaver dams. Of note, precipitation during spring and summer 2013 was at least an inch below normal (NOAA 2014), thus hydrologic conditions observed in the wetland areas are likely less than would be observed during years with normal or above-normal precipitation. Native wetland vegetation communities are described in detail in HDR (2014b).

RATIONALE

The planting plan design has been developed based on observations of successful native wetland plant communities in the stream relocation area, varying hydrologic regimes and natural changes in elevations observed along the alignment, and anticipated hydrologic conditions after the project is completed. The suite of plant species represents best professional judgment of appropriate plant assemblages for the varying hydrologic, soil, and sun exposure conditions in the channel relocation area.

Proposed Design Elements

Stream Channel Design

Stream channel design includes the design of the physical channel configuration including plan form, profile, and channel cross section.

Plan Form

The plan form channel alignment is shown in Appendix A. The stream will take on an irregular multi-thread meandering pattern suitable for a low gradient stream through forested landscape.

Cross Section

The proposed typical cross sections are shown in Appendix A. The cross section dimensions provide sufficient capacity at the proposed stream gradient to convey up to 90 cubic feet per second (cfs). That flow falls between the 1-year and 2-year flow event in keeping with the observed correlation between channel capacity and flow frequency. This capacity also accounts for the expected loss of conveyance due to evolution of the channel through vegetation encroachment over time. Anticipated flow velocity during elevated flow events ranges from 1.6 feet per second (ft/s) at the 1-year flow of 51 cfs up to 8.8 ft/s for the 100-year flow of 280 cfs. To counteract the buoyancy of each log element and provided resistance under flood flows, LWD features will be anchored to the creek bed.

Profile

The proposed stream channel profile is shown in Appendix A. The design profile is shown as a continuous grade line between the known elevations at the upstream and downstream tie-in points that connect the proposed channel to the existing channel.

Substrate

The anticipated substrate for a natural channel in this landscape setting would be sand. The stream lacks the capacity to transport material larger than sand into the project area beyond the first 200 feet at the upstream end of the project. Geotechnical borings indicate the predominant soil material along the proposed channel alignment is sand. It is anticipated that native material will be suitable substrate for the restored channel.

Habitat Design Features

In-stream

Within the proposed low-gradient stream system, the functional role of habitat elements and LWD structures will be to create hydraulic diversity and cover. Overall LWD loading rate achieved by the proposed design will be typical of a stream restoration project of this type. Root wads and stumps obtained through project related clearing of the forested wetland areas will also serve as the LWD features.

Riparian

Riparian habitat features consist of brush piles, vertical snags, and habitat logs. Approximate locations for these features are shown on the design drawings provided in Appendix A. Similar to the in-stream habitat features, exact location and orientation will be field determined.

Planting

Removal of Invasive Plant Species

The degraded pasture wetland area shown on the site preparation and utility plan sheets in Appendix A will receive targeted treatment for reed canarygrass after earthwork is complete and prior to installation of new plant material. The proposed method for reed canarygrass control will be the mow-and-spray method, which will involve mowing reed canarygrass during the growing season and applying herbicide application after the grass has grown to approximately 6 inches. This method of reed canarygrass control has been selected because the area of infestation is too large for manual or mechanical removal, and the mow-and-spray method has been shown to be effective for long-term canarygrass control in wetlands (King County 2011, Antieau 1998).

Native Planting and Revegetation

The native planting plan will use one of the six restoration types shown in Appendix A. These planting plan types are used throughout the project drawings to describe planned planting along the new channel alignment and riparian corridor. Live stakes of willows and other shrub species will be densely planted along top-of-bank of the new stream channel, while the riparian corridor landward of the stream channel will be planted with a mix of containerized plant material and live stakes at varying densities consistent with the City of Redmond (2014) stream and wetland mitigation guidelines.

Grading and Earthwork

The proposed grading and earthwork for the project will consist primarily of the proposed stream channel and the adjacent floodplain area. In addition to the excavation of material from these

areas, fill within adjacent industrial areas is also proposed. Private land owners contributing area to the project will be provided with an equivalent area of fill within the portion of the existing reach to be decommissioned. This fill area will be of structural composition to offer an area that can be utilized for current operations.

Material will be filled throughout the existing channel to an approximate top of bank elevation. Specifically, the existing channel will be filled from approximately RM 0.29 to RM 0.64. All fill areas adjacent to wetland areas will be graded at a 3 to 1 slope no depressions are created that could result in the stranding of migratory fish. Further investigations of the composition of material excavated from the site will be conducted to determine whether the soil could be amended to meet the required structural requirements. If the soil is found to be inadequate upon completion of this analysis, non native structural material will be introduced to provided the required structural integrity. Additionally, an impoundment structure consisting of the fill material will be provided at the upstream end of the proposed channel fill. This structure will serve as a routing mechanism to redirect flow into the proposed channel alignment. This embankment will also be constructed with 3 to 1 side slopes to prevent fish stranding.

Stream Crossings

The proposed alignment bisects the Evans Creek Trail at two locations. The downstream and upstream crossings are located at approximately STA 14+25 and 21+05, respectively. In addition to the crossings on the main creek, an additional crossing is located on “Stream 08-0107”, approximately 250 feet upstream of the proposed confluence.

A raised boardwalk transitioning to a parallel chord truss bridge is proposed at the three locations described above. The structures will be designed to span the effective channel with a minimal number of support piers within the floodplain area. Additionally, these features will provide a handrail across the entire structure and maintain the minimum distance to ground as specified per City standards. The structures will be ADA compliant consistent with Park Department standards. Figure 6 provides an example of the bridge concept. Additionally, a standard detail drawing showcasing the proposed bridge in section is provided within the design drawings included within Appendix A.

Figure 6. Proposed Stream Crossing Bridge Concept

Construction

Construction Sequencing and Phasing

Proposed construction activities are planned to be accomplished during two phases, between the months of July and September of the construction year. The construction extents are provided on the design drawings within Appendix A.

Construction Schedule

The specifics of the construction schedule for the channel work will be dictated by the means and methods chosen for implementation by the contractor. The overall limitations on the project schedule are provided within this section. The design was established on the assumption that the groundwater will rise during the months following construction, providing saturated soils for newly vegetated areas and groundwater-fed refuge pools within the proposed stream network during low flows. Thus, it is advantageous for construction of the new channel to occur during the months discussed above in order to both keep with the in-water construction window specified by the Washington Department of Fish and Wildlife. Specifically, construction is anticipated to be limited to the time between July 1st and September 15th, to minimize impacts to resident and migrating fish, as well as minimize excavation impacts within wetland areas when the groundwater table is at a seasonal low.

Access and Material Staging

Pending property agreements, construction access and material staging for the project will be provided at two locations. The two designated areas are referred to as “Construction Access and Staging Area A” and “Construction Access and Staging Area B” within the design drawings provided within Appendix A, providing access to the eastern and southern portions of the site, respectively.

“Construction Access and Staging Area A” is located on the west side of 196th Avenue NE, approximately 1,300 feet north of the intersection of NE Union Hill Road and 196th Avenue NE. Alternatively, the access and staging area provided at the southern portion of the project site (“Construction Access and Staging Area B”) will utilize the existing access for the Evans Creek Trail at Martin Park. Specifically, this access is located approximately 300 feet west of the intersection of NE Union Hill Road and 196th Avenue NE. The two access areas described above will provide access and staging for construction equipment and materials.

Site Preparation

General site preparation consists of construction of access roads, fencing off the project limits and identified areas of invasive species removal, and installing silt fencing as shown on the Temporary Erosion and Sediment Control (TESC) Plan and supplemental detail sheets provided in Appendix A. High visibility fence will be installed in the field for delineation of the project limits. This will provide essential regulation of access to the project and protection for existing habitat from construction activities. Areas designated for equipment staging, stockpiling, and parking and fueling/maintenance will also be delineated using the stake fencing described above. Silt fence installation will be conducted in areas of proposed excavation and fill as well

as areas downgradient of stockpiles. Construction easements will be required for development of construction access routes on properties adjacent to the site. A quarry spall/gravel apron and wheel wash will be constructed at each construction access location per the TESC Plan.

Clearing of the site will consist of tree and brush removal from within areas of excavation only, enabling the maximum amount of natural growth as possible adjacent to proposed excavations. Cleared brush will be processed to mulch or used for habitat brush piles. Larger trees and root wads will be salvaged to function as habitat structures (LWD).

Upon delineation of all boundaries and clearing of vegetation, the existing ground surface will be surveyed to install construction control measures such as benchmarks, cut stakes, and offsets.

Earthwork

Earthwork at the site will consist of temporary stormwater detention and filter berms; stripping and salvaging the existing topsoil; excavating sand and gravels down to the design grades, and grading the stream channel to design grades.

The existing locally elevated topography at the proposed WSDOT channel tie-in location will be left in place during construction to act as a settlement area for sediment, limiting sediment discharge from the site. Upon satisfactory compliance with the turbidity requirements for the system, the temporary stormwater control features will be removed.

Historically, the land has been utilized for agricultural purposes, creating an organic soil composition throughout the majority of the soils on-site. Excavated soils found to be of an acceptable composition per specifications will be directly utilized as plant bedding material. Materials found to be out of compliance with the desired specifications with either be amended for use as plant bedding or stockpiled for later removal from the site.

Upon implementation of all sediment and stormwater controls and removal of topsoil has been completed, removal of underlying sands and gravel will commence. These materials will be excavated and direct-hauled off-site or placed within the designated on-site stockpile location.

For the proposed channel areas, detention plugs will be left in place at both the upstream and downstream ends of the proposed channel. The plugs will function as temporary sediment control for the system. These features will remain in place until the channel geometry has been constructed and plantings have been placed.

The proposed site grading for the site is provided within the design drawings provided within Appendix A. The specified design representative will be on-site to accept the final excavated surface. Grading of the subgrade will be left with some irregularity throughout, to provide a more natural design.

Upon acceptance of the subgrade elevation, stockpiled topsoil will be placed in one loose lift over the subgrade in the overbank areas upgradient of the proposed floodplain. Equipment traffic on topsoil layers will consist solely of low-ground pressure tracked equipment (less than 8 pounds per square inch ground pressure) to avoid excessive compaction of the topsoil layer. The creek bed will then be “track-walked” to minimize erosion potential until plantings can be established.

Planting

After earthwork and invasive species control is completed, plant material will be installed. Plant material will be provided from commercial nurseries. The planting plans are provided within Appendix A.

Inspection of all woody plants will be conducted to ensure compliance with the planting plan design specifications regarding size requirements, root ball mass, and the overall health of the plant. Delineation of planting zones will be completed per the planting plan, with planting being conducted under the supervision of the City's wetland scientist/horticulture specialist. Planting is to occur from October through March; however, planting in permanently or semi-permanently ponded areas may need to occur during the dry season when plants can be installed in little or no standing water. Herbivory deterrents such as plant collars, deer repellent spray, or deer fencing will be installed on new plant material, as needed.

Construction Monitoring Requirements

Inspection of all woody plants will be conducted to ensure compliance with the planting plan design specification s regarding size requirements, root ball mass, and the overall health of the plant. Delineation of planting zones will be completed per the planting plan, with planting being conducted under the supervision of the City's wetland scientist/horticulture specialist. A discussion of the anticipated ongoing maintenance for the project is provided in following sections of this document.

Opinion of Probable Construction Costs

An opinion of probable construction costs (OPCC) was developed based on the 30 Percent Design Drawings. Cost data generated as part this OPCC is based upon bids received from other similar projects, available vendor cost data, details from cost estimates prepared for other projects of similar scope, input from City construction management staff, WSDOT bid tabs, RS Means Cost data, and professional judgment. The OPCC is based upon the 30 Percent Design Drawings provided in Appendix A. A more detailed summary of each OPCC is provided in Appendix B. The resulting OPCC values, rounded to the nearest $100,000, are displayed within Table 2, which is provided within the following section.

The cost estimate includes all major construction items including grading, planting, habitat structures, utilities including relocation, and storm drainage system.

Opinions of probable construction cost are developed on current information available and experience and qualifications. It should be noted that the cost of labor, materials, equipment or services furnished by others, or over the contractor(s') methods of determining prices, or over competitive bidding or market conditions, are subject to change. Therefore, all variances of the bids or actual project or construction cost could vary from the OPCC.

Monitoring and Maintenance Costs/Lifecycle Costs

Monitoring of the construction site should occur for at least five years after construction to ensure adequate performance of the project. Typically, the monitoring and maintenance costs for stream rehabilitation projects include baseline monitoring, first-year monitoring, and second-

year through fifth-year monitoring. In total, the costs described above are usually estimated to be approximately 10 percent of the project cost (Templeton, F., & Sessions, 2008).

Maintenance refers to activities that occur once monitoring of the project has begun. Comprehensively, this effort consists of both minor and major types of repairs. Minor repairs are considered betterment of deterioration or small damages, potentially occurring during the monitoring process. Major damages consider the costs associated with re-design and subsequent construction efforts to remediate a site upon significant damage from storm events or alternative uncontrollable natural hazards experienced during the monitoring process. Typically, maintenance procedures were found to account for 4.7 percent of all expenses (Templeton, F., & Sessions, 2008). Estimated annual project monitoring and maintenance costs are provided in Table 2.

Table 2. Summary of the OPCC, costs associated with monitoring and maintenance, and anticipated project implementation costs.

Cost Type	**Cost ($)**
Base OPCC with Contingency	$4,459,817
Base Annual Monitoring & Maintenance Costs as a percentage of the OPCC	$89,196
Anticipated Project Implementation Costs as a percentage of the OPCC	$209,611

Monitoring and Maintenance

Monitoring and maintenance activities for restoration projects typically focus on performance monitoring and maintenance related to plant survival and sediment dynamics. The landscape position and nearly flat gradient for the proposed project indicate that sediment loading and sediment-related maintenance should be negligible. Therefore, monitoring will focus on documenting that the restoration project was established per the design and meets the measurable performance objectives listed previously in this document. Maintenance activities associated with the restoration project will be limited to short-term actions related to plant establishment.

Permit applications for habitat restoration projects typically include a detailed performance monitoring plan. Period of monitoring typically ranges from five to 10 years with duration depending on time required for plant establishment. A separate monitoring plan will be developed as part of the permit application package based on the following measureable performance objectives:

- Establish new wetted channel habitat compared to existing conditions
- Establish large woody debris (LWD) loading rates typical of this type of stream restoration project.
- Manage invasive species to no more than 20 percent areal coverage within the project boundaries

- Establish forested riparian buffers that average at least 100 feet in width on each side of the restored channel within the project area
- Establish and maintain a new channel that is fish passable throughout the project area
- Achieve no net loss of wetland acreage and functions compared to existing conditions.

Suppression/control of reed canarygrass will require active site management. While complete elimination of reed canarygrass from the site may not be possible, it should be managed sufficiently to ensure survival of the native planted species until they can effectively compete. Other contingency actions may be needed to correct unforeseen problems such as plant mortality. Contingency revisions typically require coordination with the permitting agencies. As necessary, contingency measures (site management or revisions to performance criteria with permitting agency agreement) will be implemented to meet performance measures and standards.

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Appendix A - 30% Design Drawings
(Under Separate Cover)

Appendix B - Opinion of Probable Construction Costs

CITY OF REDMOND
EVANS CREEK RELOCATION PROJECT
CLASS 4 OPINION OF PROBABLE CONSTRUCTION COSTS
CONCURRENT WITH 30 PERCENT LEVEL OF DESIGN
COST ITEM SUMMARY

ITEM			TOTAL
MOBILIZATION AND DEMOBILIZATION (7%)			**$211,893**
GENERAL CONDITIONS (10%)			**$302,705**
DEMOLITION AND DECOMISSIONING			**$37,000**
CREEK FILL AND MITIGATION AREAS			**$225,898**
STREAM CROSSINGS			**$449,250**
MISCELANEOUS HABITAT STRUCTURES			**$50,900**
SITEWORK			**$197,439**
CHANNEL RECONFIGURATION & CONNECTIVITY			**$440,425**
STREAMBED GRAVEL			**$266,500**
CHANNEL STRUCTURE PLACEMENT			**$129,000**
INVASIVE PLANT REMOVAL AND CONTROL			**$273,299**
PLANTING			**$957,336**
SUBTOTAL CONSTRUCTION COSTS			**$3,541,645**
UNDEFINED DESIGN AND CONSTRUCTION ITEMS (15%)			**$531,247**
INFLATION (2% PER YEAR)	2	YR	**$141,666**
SUBTOTAL W/ CONTINGENCY			**$4,072,892**
SALES TAX (9.5%)			**$386,925**
TOTAL OPCC			**$4,459,817**

CITY OF REDMOND
EVANS CREEK RELOCATION PROJECT
CLASS 4 OPINION OF PROBABLE CONSTRUCTION COSTS
CONCURRENT WITH 30 PERCENT LEVEL OF DESIGN
COST ITEM DETAIL

ITEM	QUANTITY	UNIT	UNIT COST	AMOUNT	TOTAL
MOBILIZATION AND DEMOBILIZATION (7%)	1	LS	211,893	$211,893	**$211,893**
GENERAL CONDITIONS (10%)	1	LS	302,705	$302,705	**$302,705**
DEMOLITION AND DECOMISSIONING					**$37,000**
EXISTING PED BRIDGE AT 35+20	1	LS	25,000	$25,000	
EXISTING BOARD WALK	480	SQFT	25	$12,000	
CREEK FILL AND MITIGATION AREAS					**$225,898**
CLEAR AND GRUB (by others)	3.2	AC	0	$0	
EXCAVATION & HAUL	7,388	CY	25	$184,698	
COMMON BACKFILL ON-SITE (by others)	3,694	CY	0	$0	
COMMON BACKFILL IMPORT (by others)	10,809	CY	0	$0	
GRAVITY WALL - ECOLOGY BLOCKS	2,060	SQFT	20	$41,200	
STREAM CROSSINGS					**$449,250**
EXCAVATE AND REMOVE EXISTING BERM AND TRAIL	50	CY	25	$1,250	
ELEVATED BOARDWALK	400	SQFT	100	$40,000	
(2) 50 FT PED BRIDGE SPAN WITH HANDRAIL	1,200	SQFT	300	$360,000	
FOUNDATION, 18-INCH PILES, IMPACT DRIVEN	240	LF	200	$48,000	
MISCELANEOUS HABITAT STRUCTURES					**$50,900**
LIVE DEBRIS FENCE	390	LF	60	$23,400	
LOG HABITAT STRUCTURE	40	EA	500	$20,000	
BRUSH PILE	10	EA	450	$4,500	
VERTICAL SNAG	10	EA	300	$3,000	
SITEWORK					**$197,439**
TEMPORARY EROSION AND SEDIMENT CONTROL	1	LS	58,000	$58,000	
CREEK DEWATERING	1	LS	25,000	$25,000	
WORK AREA ISOLATION AND DEWATERING	1	LS	25,000	$25,000	
GENERAL EXPORT UNDESIREABLE MATERIALS	1	LS	20,000	$20,000	
CONSTRUCTION ACCESS DEVELOPMENT	1	LS	8,000	$8,000	
STAGING AND MATERIAL LAYDOWN AREAS	2.6	AC	12,000	$31,439	
SITE CLEAN-UP	1	LS	30,000	$30,000	
CHANNEL RECONFIGURATION & CONNECTIVITY					**$440,425**
SELECTIVE HAND CLEARING AND GRUBBING	2	AC	5,500	$11,000	
EXCAVATION	20,000	CY	20	$400,000	
COIR LOG LIFT	535	LF	55	$29,425	
STREAMBED GRAVEL					**$266,500**
ENGINEERED STREAMBED MATERIAL (3-INCH MINUS WASHED)	4,100	CY	65	$266,500	
CHANNEL STRUCTURE PLACEMENT					**$129,000**
INCORPORATE EXISTING HABITAT ELEMENTS	1	LS	15,000	$15,000	
ROOT WAD WITH LOG	40	EA	700	$28,000	
DOUBLE ROOT WAD WITH LOG	35	EA	1,200	$42,000	
CHANNEL LOG STRUCTURE	24	EA	1,600	$38,400	
ANGLGED BANK LOG STRUCTURE	14	EA	400	$5,600	

CITY OF REDMOND
EVANS CREEK RELOCATION PROJECT
CLASS 4 OPINION OF PROBABLE CONSTRUCTION COSTS
CONCURRENT WITH 30 PERCENT LEVEL OF DESIGN
COST ITEM DETAIL

ITEM	QUANTITY	UNIT	UNIT COST	AMOUNT	TOTAL
INVASIVE PLANT REMOVAL AND CONTROL					**$273,299**
CLEARING AND GRUBBING	22	AC	4,000	$89,135	
HERBICIDE TREATMENT	22	AC	5,500	$121,000	
FINISH GRADING	25.3	AC	2,500	$63,164	
PLANTING					**$957,336**
WOOD MULCH, 3-INCH DEPTH OVER 1/2 OF 22 AC	4,719	CY	45	$212,336	
SOIL AMMENDMENT, COMPOST, 3-INCH DEPTH OVER 10 AC	4,033	CY	30	$121,000	
FORESTED WETLAND MIX A	12	AC	12,000	$144,000	
FORESTED WETLAND MIX B	3	AC	10,000	$30,000	
SCRUB SHRUB WETLAND MIX	2	AC	11,000	$22,000	
STREAM BANK PLANTING MIX	2	AC	203,000	$406,000	
UPLAND FOREST MIX	1	AC	14,000	$14,000	
LOW GROW SEED MIX	2	AC	4,000	$8,000	
SUBTOTAL CONSTRUCTION COSTS					**$3,541,645**
UNDEFINED DESIGN AND CONSTRUCTION ITEMS (15%)					**$531,247**
INFLATION (2% PER YEAR)	2	YR			**$141,666**
PSAR SUBTOTAL W/ CONTINGENCY					**$4,072,892**
SALES TAX (9.5%)					**$386,925**
TOTAL OPCC					**$4,459,817**

Appendix C - Wetland and Stream Delineation Report

Evans Creek Relocation Project

Wetland and Stream Delineation Report

February 2014

DRAFT

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Suite 1200
Bellevue, WA 98004-5549
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D Ecology Rating Forms

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Acronyms and Abbreviations

Ecology	Washington State Department of Ecology
GPS	Global Positioning System
HDR	HDR Engineering, Inc.
HGM	Hydrogeomorphic
LWD	Large Woody Debris
OHWM	Ordinary High Water Mark
RZC	City of Redmond Zoning Code
USACE	U.S. Army Corps of Engineers
USDA NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington State Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

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Chapter 1: Introduction

This report describes the methods and findings of wetland and stream delineations for the Evans Creek Relocation Project. The report was prepared by HDR Engineering, Inc., (HDR) biologists, and is intended to provide documentation for local, state, and federal permitting activities required for the project.

1.1 Background

HDR has been retained by the City of Redmond to provide a design for the relocation of a portion of Evans Creek in Redmond, Washington. The proposed project is anticipated to tie Evans Creek in to the new channel being constructed at the Washington State Department of Transportation (WSDOT) SR520 Eastside Wetlands Mitigation Project to approximately RM 0.74, which is downstream of the NE Union Hill Road Bridge Crossing. Currently, this reach of Evans Creek has a narrow riparian buffer, is channelized, is encroached by multiple industrial land uses, and is negatively impacted by stormwater quantity and quality. The proposed relocation will direct the creek through existing wetlands, resulting in a higher-functioning ecological system. It is anticipated that the proposed relocation will provide improvements to riparian buffer and floodplain connectivity, fish passage to the upper watershed, beneficial community access, and potential redevelopment of adjacent industrial properties.

This project is listed in the Water Resource Inventory Area (WRIA) 8 Chinook Conservation Plan (WRIA 8 Steering Committee and Forum, 2005) and will fulfill both local and federal habitat improvement goals documented in the plan. The overall project goal is to provide a functioning urban stream relocation project that will improve environmental function within the context of existing and proposed urban land uses in the project area. Specifically, this goal will be met by:

- Providing an ample riparian buffer and floodplain,
- Improving fish passage to the upper watershed,
- Enhancing passive recreation by connecting proposed trails to an existing trail system, and
- Heightening the potential for redevelopment of adjacent industrial properties.

1.2 Project Setting

The proposed project is located northwest of the intersection of 196th Avenue NE and NE Union Hill Road (Section 6, Township 25 North, Range 6 East) within the City of Redmond, Washington (Figure 1).

The project site is centered at latitude 47.680946 North and longitude -122.085857 West. Topography of the site generally slopes down from the east to the west. Surface elevation in the study area ranges from 50 feet to 65 feet above mean sea level.

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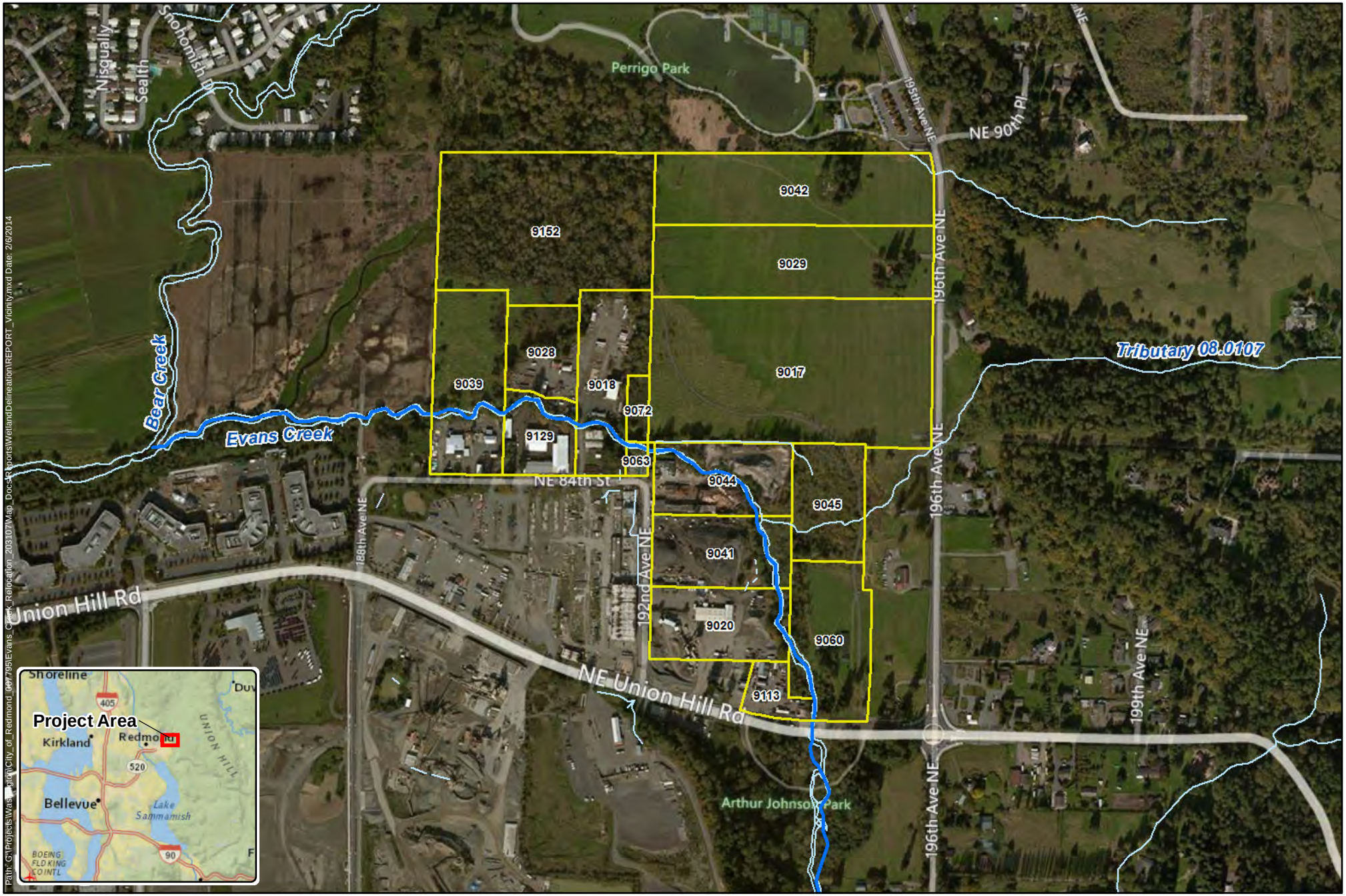

Path: G:\Projects\Was_prop\City_of_Redmond_007795\Evans_Creek_Relocation_203107\Map_Docs\Reports\WetlandDelineation\REPORT_Vicinity.mxd Date: 2/6/2014

Data Source: Parcels - King County GIS; Streams - NHD; Aerial - ESRI ArcGIS Online. Map information was compiled from the best available public sources. HDR does not warrant that the information is accurate or complete.

Study Area

City of Redmond Stream Inventory

0 250 500 1,000 Feet

Figure 1 - Evans Creek Relocation Vicinity Map

Wetland and Stream Delineation Report
Evans Creek Relocation - Redmond, WA

Chapter 2: Methods

2.1 Study Area

The study area consists primarily of fifteen parcels owned by King County, City of Redmond and other private land owners (parcels 062506-9060, 062506-9045, 062506-9020, 062506-9041, 062506-9044, 062506-9063, 062506-9072, 062506-9018, 062506-9129, 062506-9028, 062506-9039, 062506-9152, 062506-9017, 062506-9029, 062506-9042) (Figure 1). Wetlands and streams outside the study area were not formally delineated; these areas were assessed based on characteristics visible from public rights-of-way and on information obtained from existing documents and studies, maps, and aerial photographs. This includes the portion of Evans Creek on WSDOT's SR520 Eastside Wetlands Mitigation Project property (parcel 062506-9159, 062506-9035).

Wetlands and streams were identified through a two-step process. HDR biologists first reviewed existing documents, including soil surveys, wetland and stream inventories, aerial photographs, and other reports that concern wetlands and streams in the study area and project vicinity. After this review, HDR biologists completed a thorough field investigation of the study area that included wetland and stream identification, delineation, and classification.

2.2 Review of Existing Information

Existing documents reviewed for this wetland and stream study included the following:

- King County DNRP NE Novelty Hill Road Project (CIP 100992)
- A Catalog of Washington Streams and Salmon Utilization, Volume 1, Puget Sound (Williams et al. 1975)
- City of Redmond (2011) Critical Areas Map 64.4 - Wetlands
- U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS) Web Soil Survey (2013a)
- U.S. Fish and Wildlife Service (USFWS) Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in King County, Washington (2013)
- USFWS National Wetland Inventory Web site (2013)
- Washington State Department of Fish and Wildlife (WDFW) Priority Habitat and Species List (2013a)
- WDFW SalmonScape Web site (2013b)
- Washington State Department of Natural Resources (WDNR) Natural Heritage Information Request Self-Service System (WDNR 2013)

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- Washington State Department of Transportation (WSDOT) Draft Wetland Assessment Report, Medina to SR202: Eastside Transit and HOV Project-Keller Wetland Mitigation Site (2010).

These documents provide background information on the soils, hydrology, land use, and wetlands and streams in the study area.

2.3 Field Investigation

The field investigation consisted of an initial field reconnaissance followed by more detailed verification/delineation of wetlands and streams in the study area. HDR biologists conducted the field investigations on June 13, 14, 21 and July 23, 2013.

For the month prior to field work (May 21 through June 21, 2013) Weather Underground (2013) recorded a total of 1.17 inches of precipitation in Seattle (Boeing field), Washington which is approximately 22 miles from the project site. This monthly precipitation total is within the normal range of precipitation for May/June (USDA NRCS 2000). As a result, the hydrology observed during the June field visit represents normal conditions for this month.

Wetlands

Wetland 1, named for the purposes of this study, is the largest wetland identified in the study area. HDR biologists field-verified wetland boundaries along the eastern border of Wetland 1 (parcels 062506-9017, 062506-9029, 062506-9042) previously delineated by King County (2008). Biologists evaluated these boundaries using survey data from the previous delineation; these data were downloaded onto a hand-held, differentially-corrected global positioning system (GPS) device (a Trimble Geo XT 2005). This device is capable of sub-meter accuracy. Biologists used the GPS device to navigate along the boundary of the identified wetland and then determined whether this surveyed boundary accurately reflected current field conditions and satisfies delineation requirements. Four new formal data plots were established in the previously identified wetland to reflect current field conditions, and photographs were taken of the wetland.

HDR biologists delineated the remaining wetland boundary in the field (parcels 062506-9060, 062506-9045, 062506-9020, 062506-9041, 062506-9044, 062506-9063, 062506-9072, 062506-9018, 062506-9129, 062506-9028, 062506-9039, 062506-9152). Fourteen formal data plots were established in the remainder of Wetland 1 and photographs were taken.

Wetlands fringing Evans Creek within parcels 062506-9044, 062506-9018, 062506-9129, 062506-9039 (hereafter called “Evans Creek Wetlands”) were also delineated. Five formal data plots were established to determine the boundary of these wetlands and photos were taken.

All wetland boundaries delineated by HDR were marked with sequentially-numbered flagging tape. Wetland boundaries and data plot locations were surveyed with the GPS device as well by a licensed land surveyor. The surveyed boundaries were incorporated into project base maps. Biologists delineated wetlands using the three parameter methods described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), as updated by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western*

Mountains, Valleys and Coast Region (USACE 2010). A detailed description of the field methods used in this study is provided in Appendix A. Wetland boundaries outside the study area were approximated using aerial photographs and professional judgment based on the field reconnaissance.

The City of Redmond requires that wetlands be rated using the state wetland rating system as described in *Washington State Wetland Rating System for Western Washington – Revised*, Washington State Department of Ecology Publication # 04-06-025 (Hruby 2004). Using this system, wetlands were rated in the field by using the Wetlands Rating Field Data Form provided with the rating system manual (Appendix D). Table 1 lists the rating criteria for the City of Redmond. A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided in the general description for each wetland.

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Table 1. Wetland Rating System for the City of Redmond

Regulatory Agency	Category			
	I	II	III	IV
Washington State Department of Ecology[a]	Category I wetlands: Represent a unique or rare wetland type; or Are more sensitive to disturbance than most wetlands; or Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or Provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. Relatively undisturbed estuarine wetlands over one acre in size; or 2. Natural Heritage Wetlands, specifically, Wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and Wetlands that support state-listed threatened or endangered plants; 3. Bogs; 4. Mature and old-growth forested wetlands over one acre in size; 5. Wetlands in coastal lagoons; and 6. Wetlands that perform many functions very well, as indicated by a score of 70 or more points out of 100 on the wetland rating form.	Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. Estuarine wetlands less than one acre in size, or disturbed estuarine wetlands larger than one acre; 2. Interdunal wetlands greater than one acre; and 3. Wetlands scoring between 51 and 69 points out of 100 on the wetland rating form.	Category III wetlands provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. Wetlands scoring between 30 and 50 points out of 100 on the wetland rating form; and 2. Interdunal wetlands between 0.1 acre and 1.0 acre in size.	Category IV wetlands have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. Wetlands scoring less than 30 points out of 100 on the wetland rating form.

[a] Hruby (2004)

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Streams

HDR biologists conducted a stream habitat survey of Evans Creek within the study area on June 13 and 21, 2013. The survey consisted of general stream habitat classifications, dominant substrate characterization, general stream bank and riparian habitat characterization, and a catalog of large woody debris (LWD) abundance. The wetted and bankfull width, bank conditions and average water depth were recorded at sties along Evans Creek and the ordinary high water mark (OHWM) was delineated.

HDR biologists, identified the ordinary high water mark (OHWM) on freshwater streams in the study area using the USACE (2005) guidance for OHWM identification. The USACE (2005) defines "ordinary high water mark" as:

> *"that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."*

HDR biologists looked for physical indicators including, but not limited to, a natural scour line impressed on the bank, distribution of upland and water tolerant vegetation, wracking of litter and debris, vegetation matted down, bent or absent, and bed and banks. Blue and white flags were used to mark OHWM on the right and left bank of streams identified in the field. The OHWM flags were surveyed by a licensed surveyor.

Two streams, Evans Creek and a tributary to Evans Creek (Tributary 08.0107), were identified in the study area. Tributary 08.0107 is located in the southeast portion of Wetland 1. During the wetland and stream field investigation the lower reaches of this stream were inundated by backwater from an active beaver dam. Because this reach of stream was inundated, no stream habitat condition or OHWM were delineated within the study area. Tributary 08.0107 flows southwesterly and was recently enhanced by King County as part of the mitigation for the King County DNRP NE Novelty Hill Road Project (King County 2009).

Evans Creek and Tributary 08.0107 are classified according to local ordinance requirements. Streams within Redmond city limits are assigned a class based on the city's stream classification system (RZC 21.64.020). Criteria for this classification system are summarized in Table 2. The stream types shown in this report are based on the stream reaches in the project area; upstream and downstream reaches may be rated higher or lower. Fish presence was determined through the review of previous studies, an assessment of the available habitat, and the hydrologic condition of all identified surface waters.

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Table 2. Summary of the Stream Classification System for the City of Redmond

Stream Class	Definition[a]
I	"Class I" streams are those streams identified as "Shorelines of the State" under the City of Redmond Shoreline Master Program.
II	"Class II" streams are those natural streams that are not Class I and are either perennial or intermittent and have salmonid fish use or the potential for salmonid fish use.
III	"Class III" streams are those natural streams that are not Class I or Class II and are either perennial or intermittent and have one of the following characteristics: 1. Non-salmonid fish use or the potential for non-salmonid fish use; or 2. Headwater streams with a surface water connection to salmon-bearing or potentially salmon-bearing streams (Class I or II).
IV	"Class IV" streams are those natural streams that are not Class I, Class II, or Class III. They are either perennial or intermittent, do not have fish or the potential for fish, and are non-headwater streams.
Intentionally Created Streams	These are manmade streams defined as such in these regulations and do not include streams created as mitigation. Purposeful creation must be demonstrated to the Committee through documentation, photographs, statements, and/or other evidence. Intentionally created streams may include irrigation and drainage ditches, grass-lined swales, or other artificial watercourses unless they are used by salmonid fish or created for the purpose of stream mitigation.

[a] *Definitions are summarized from Redmond Zoning Code 21.64.020*

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Chapter 3: Results

3.1 Wetlands within the Study Area

HDR biologists delineated a total of 12 wetlands in the study area and verified the northeastern boundary of the previously-delineated Wetland 1 in the study area. The western and northern off-site boundaries of Wetland 1 were approximated using aerial photographs and professional judgment based on the field reconnaissance.

Wetlands were distinguished from adjoining uplands by the presence of indicators for wetland hydrology, hydric soils, and hydrophytic vegetation. Wetland delineation data sheets are provided in Appendix B, and photographs are provided in Appendix C. WDOE rating forms for wetlands in the study area are provided in Appendix D. Table 3 summarizes the size, rating, Cowardin Classification, and City of Redmond buffer width of wetlands in the study area. Wetland 1 encompasses a large complex wetland system that is more than 100 acres in size and Wetlands ECW 1 through ECW 11 are small pockets of riverine wetland that were identified along the existing channelized portion of Evans Creek.

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Table 3. Wetland Size, Rating, and Classification for Wetlands in the Study Area

Wetland Name	Wetland Size in Study Area[a]	Wetland Rating City of Redmond[b]	Hydrogeomorphic Classification	Cowardin Classification[c]
1	70.1 acres (105 acres total)	Dual Rating: Category I/II	Riverine/Slope/ Depressional	PFO1/4/PSS1/PEM1
ECW1	<0.01 acres (160 s.f.)	Category III (rated as one Assessment Unit [AU]1)[d]	Riverine	PEM1
ECW2	<0.01 acres (46 s.f.)			PFO1
ECW3	<0.01 acres (65 s.f.)	Category III (AU2)	Riverine	PSS1/PEM1
ECW4	<0.01 acres (59 s.f.)	Category III (AU3)	Riverine	PEM1
ECW5	<0.01 acres (215 s.f.)	Category III (AU4)	Riverine	PEM1
ECW6	<0.01 acres (121 s.f.)			PSS1
ECW7	<0.01 acres (234 s.f.)			PEM1
ECW8	<0.01 acres (368 s.f.)			PEM1
ECW9	<0.01 acres (298 s.f.)	Category III (AU5)	Riverine	PEM1
ECW10	<0.01 acres (110 s.f.)			PEM1
ECW11	<0.01 acres (216 s.f.)			PEM1

[a] Wetland size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance.
[b] Wetland ratings are based on City of Redmond Zoning Code 21.64.030.
[c] Cowardin et al. (1979). All wetlands are palustrine.
PSS1 = palustrine, scrub-shrub, broad-leaved deciduous; PFO1/4 = palustrine forested broad-leaved deciduous/coniferous; PEM1 = palustrine emergent persistent
[d] According to the WDOE Wetland Rating System (Hruby 2004), where wetlands occur on a river or stream less than 50 feet wide and within 100 feet of each other, those wetlands are to be rated as one assessment unit.

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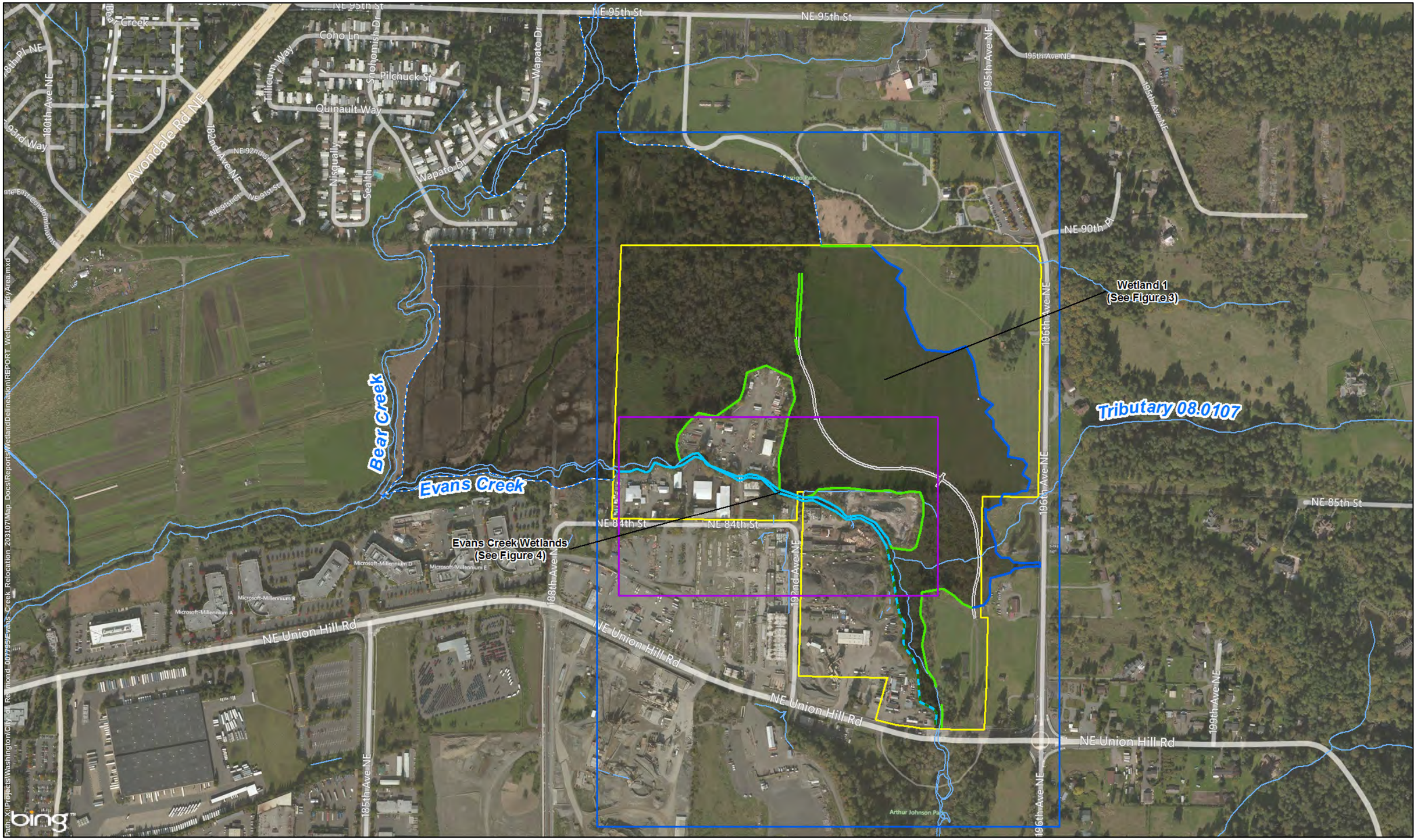

Data Source: Parcels - King County GIS; Streams - NHD; Wetland Boundary - King County DNRP 2008; Aerial - ESRI ArcGIS Online. Map information was compiled from the best available public sources. HDR does not warrant that the information is accurate or complete.

HDR

0 125 250 500 Feet

City of Redmond Stream Inventory

Study Area

Existing Trail

King County DNRP 2008

Approximate Wetland Boundary

Delineated June/July 2013 by HDR

Stream OHWM Line

Wetland Boundary

Stream OHWM Line/Wetland Boundary

Figure 3: Wetland 1

Figure 4: Evans Creek Wetlands

Figure 2 - Wetlands in the Project Vicinity

Wetland and Stream Delineation Report
Evans Creek Relocation - Redmond, WA

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Path: X:\Projects\Washington\City of Redmond 007795\Evans Creek Relocation 203107\Map Docs\Reports\WetlandDelineationREPORT WetlandDetail.mxd

Data Source: Parcels - King County GIS; Streams - NHD; Aerial - ESRI ArcGIS Online. Map information was compiled from the best available public sources. HDR does not warrant that the information is accurate or complete.

- Figure 4: Evans Creek Wetlands
- City of Redmond Stream Inventory
- Approximate Hydrogeomorphic Boundary
- Study Area
- Mature Forest
- Existing Trail
- King County DNRP 2008
- Approximate Wetland Boundary

Delineated June/July 2013 by HDR

- Stream OHWM Line
- Wetland Boundary
- Stream OHWM Line/Wetland Boundary

Delineated June/July 2013 by HDR

- Beaver Dam
- Flag Point
- Wetland

HDR

N

0 50 100 200 Feet

Figure 3 - Wetland 1 Detail

Wetland and Stream Delineation Report
Evans Creek Relocation - Redmond, WA

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Data Source: Parcels - King County GIS; Streams - NHD; Aerial - ESRI ArcGIS Online. Map information was compiled from the best available public sources. HDR does not warrant that the information is accurate or complete.

HDR

0 50 100 200 Feet

City of Redmond Stream Inventory

Study Area

Existing Trail

Wetland Boundary King County DNRP 2008

Approximate Wetland Boundary

Delineated June/July 2013 by HDR

Stream OHWM Line

Wetland Boundary

Stream OHWM Line/Wetland Boundary

Beaver Dam

Flag Point

Wetland

Figure 4 - Evans Creek Wetlands

Wetland and Stream Delineation Report
Evans Creek Relocation - Redmond, WA

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Wetland 1

PFO1/4/PSS1/PEM1
Dual Rating: Category I/II
Approximately 70.1 acres in study area (105 acres total)

Wetland 1 is a wetland composed of multiple HGM classes including depressional, slope and riverine (See Figure 2). The slope portion is approximately 26.63 acres and located on the east side of Wetland 1. The depressional area is approximately 52.26 acres and comprises the largest area of Wetland 1 located in north and west area of the wetland. The riverine components of Wetland 1 are located in three areas; the southern edge of Wetland 1 along Evans Creek beginning at NE Union Hill Road, along the northwest boundary of Wetland 1 (outside of the study area) and along the southwest boundary of Wetland 1 adjacent to the WSDOT parcels.

Numerous activities – human and otherwise - have altered the hydrology and vegetation in Wetland 1. Agricultural activities including ditching and regular tilling were most prevalent in the east portion of the wetland and off-site on WSDOT's SR 520 Eastside Wetlands Mitigation Project parcel. Currently, numerous abandoned ditch lines are still evident in the eastern portion of the wetland within the study area, and weedy species such as reed canarygrass have recruited into fallow pastures. Industrial development in parcels to the south of Wetland 1 has likely diminished the contribution of overbank flooding from Evans Creek into Wetland 1.

During field investigations, HDR biologists documented one large, intact beaver dam on Evans Creek and one partial beaver dam on a contributing basin in the southeast portion of Wetland 1 (Figure 3). Increased inundation behind these dams has caused mortality of deciduous trees (Oregon ash) that are not adapted to the new prolonged flooded conditions. Based on review of historic aerial photos from 1940, 1990 and 2013 (WDOE 2014, Google Inc. 2012), this portion of Wetland 1 was mostly deciduous forest until 2005, after which it transitioned to predominantly emergent/scrub-shrub vegetation.

Vegetation

Wetland 1 is comprised of palustrine forested, scrub-shrub, and emergent habitat types (Cowardin et al. 1979). The forest community is centrally located in the depressional area of Wetland 1 (mainly on parcel 062506-9152, Figure 2). Dominant tree species in this community include black cottonwood (*Populus balsamifera,* FAC). Shrub species include: Black twinberry (*Lonicera involucrata,* FAC), Salmonberry (*Rubus spectabilis,* FAC), Douglas spirea (*Spiraea douglasii,* FACW), Trailing blackberry (*Rubus ursinus,* FACU). Understory, herbaceous vegetation was dominated by Pacific water-dropwort (*Oenanthe sarmentosa,* OBL). Other tree species observed in the palustrine forested area include Western red cedar (*Thuja plicata,* FAC), Red alder (*Alnus rubra,* FAC) and Pacific willow (*Salix lucida ssp. lasiandra,* FACW) (Appendix B, Sample Plots 3 and 4; Appendix C, Photos 1 through 3). The presence of these species meets the wetland vegetation criteria.

The emergent community in the slope portion of Wetland 1 is located on the west side of the study area (parcels 062506-9017, 062506-9029, 062506-9042; Figure 2). Vegetation in the easternmost portion of this wetland is dominated by Tall buttercup (*Rununculus acris,* FAC), Reed canary grass (*Phalaris arundinacea,* FACW), and Colonial bentgrass (*Agrostis capillaris,* FAC). Reed canarygrass becomes predominant in the lowest portion of this area in the vicinity of the existing boardwalk trail (Appendix B, Plots E-1 E-3 and W1-Mid-4, Appendix C, Photos 4 through 7). The presence of these species meets the wetland vegetation criteria.

The riverine portion of Wetland 1 located in the southwest portion of Evans Creek in the study area is characterized as palustrine emergent habitat dominated by Reed canarygrass (Appendix B, Sample Plot W1-3; Appendix C, Photo 8). Most of this riverine area is on the WSDOT parcel but the portion in the study area is located on parcels 062506-9039, 062506-9129 and 062506-9152. The presence of these species meets the wetland vegetation criteria.

Palustrine scrub-shrub and palustrine emergent habitat was observed in the riverine area of Wetland 1 in the southeast portion of the study area (parcels 062506-9060, 062506-9020, 062506-9041, 062506-9045, 06256-9044). Dominant shrub vegetation in is Pacific willow, scattered Black cottonwood, Salmonberry, Creeping buttercup, Reed canary grass and Douglas spirea. Hebaceous plants found growing in this area include:, Tall manna grass (*Glyceria elata*, FACW), Skunk cabbage (*Lysichiton americanus*, OBL) Western touch me not (*Impatiens noli-tangere,* FACW), Bittersweet nightshade (*Solanum dulcamara,* FAC) and Soft rush (*Juncus effusus,* FACW) (Appendix B, Sample Plots 2, ECW1, ECW3, W1-1A, W1-Mid-1, and W1-Mid-3; Appendix C, Photos 9 and 10).

Soils

Soils in Wetland 1 are mapped as Puget Silty Clay Loam and Sultan Silt Loam (NRCS 2013). The typical soil profile observed in the depressional area of Wetland 1 is 5 inches of black (10YR2/1) silt loam over 15 inches of grayish brown (10YR5/2) silty loam with no redoximorphic features. Hydrogen sulfide odor was present at the soil surface and meets the hydric soil indicator for this area.

The typical soil profile in the southern portion of the slope area of Wetland 1 is 13 inches of dark gray (10YR4/1) silty clay over 7 inches of dark yellowish brown (10YR4/4) silty loam with redoximorphic features. Soils meet hydric soil indicators for a depleted matrix. Soils in the northern portion of the slope consist of 20 inches of grayish brown (2.5Y5/2) silty clay with redoximorphic features. This soil profile meets hydric soil indicator for a depleted matrix.

The typical soil profile in the riverine area in the southwest area of the study area is 6 inches of dark grayish brown (10YR4/2) mucky loam with no redoximorphic features. This soil profile meets hydric soil indicator for a depleted matrix.

The typical soil profile observed within the riverine area in the southeast portion of the study area was 5 inches of very dark grayish brown (10YR 3/2) silt loam over 13 inches of dark gray (10YR 4/1) gravelly silty loam with redoximorphic features. The soils near the industrial sites (parcel 062506-9044) exhibited a gleyed profile with 14 inches of dark grayish olive (10Y4/1) over 8 inches of dark grayish green (5GY4/1) soils with no redoximorphic features. The

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presence of hydrogen sulfide was present and this is a primaryhydric soil indicator for these soils.

Hydrology

Wetland 1 is primarily groundwater fed from the large contributing basin as well as partially fed by Evans Creek and Tributary 08.0107. Soils in the depressional area of Wetland 1 were saturated to the surface, the water table was observed at the surface and surface water was measured at 0.5 to 1 inch. Saturated soils, a high water table and presence of surface water within 12 inches meet the criteria for wetland hydrology.

In the slope area in the easternmost portion of Wetland 1, no primary hydrology indicators were observed at Sample Plots E-1 and E-3, but drainage patterns and saturation are visible on aerial imagery which indicates that hydrology is present at the sample plot locations during the growing season. In the lowest portion of the slope wetland area near the Evans Creek Trail boardwalk (Sample Plot W1-Mid-4), inundation of up to 5 inches was observed.

Soils in the riverine area in the southwest portion of Wetland 1 have a water table present at the surface. The presence of a high water table meets primary wetland hydrologic criteria. Soils in the riverine area in the southeast area of Wetland 1 are saturated to the surface and a water table observed within 5 inches of the soil surface. Saturation and a high water table meet the criteria for wetland hydrology.

Wetland Rating

Wetland 1 receives a dual rating as Category I/II according to the Washington State Department of Ecology (Ecology) rating system (see Table 1). The portion of that Wetland 1 is rated as a Category I wetland is located in the forested community north of the Skanska property on parcel 062506-9152. Based on the tree survey conducted for this project, approximately 1.8 acres of this area has 25 mature western red cedar and cottonwood trees that exceed 21 inches average diameter. Furthermore, historical photography of the study area (WDOE 2014, Google Inc. 2012) indicates that this area had an intact forested community in 1940, and has not been logged in the subsequent 70 years. Mature forested wetlands automatically receive a Category I rating under the Ecology manual; the spatial extent of the Category 1 wetland is the area that meets the criteria for mature forest (Hruby 2004).

The remainder of Wetland 1 does not meet the criteria for a mature forested wetland and thus was evaluated for its functions as allowed in the Ecology rating system. Wetland 1 receives a moderate score for water quality function (24/32 points), a low score for hydrologic function (6/32 points), and a moderate score for habitat function (25/36 points). Wetland 1 has a moderate potential to provide water quality functions because the wetland has a permanently flowing outlet, greater than 95 percent of the area is persistent, ungrazed, vegetation and a quarter of the wetland area is seasonally ponded. Surrounding urban land use provides opportunity for Wetland 1 to perform water quality functions. Wetland 1 has a low potential to provide hydrologic functions because it has little storage capacity during wet periods and Wetland 1 is relatively small based on the size of the basin, which is at least 100 times greater. Wetland 1 does provide some hydrologic functions because it drains to Bear Creek which has

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flooding problems. Wetland 1 also has some potential and opportunity to provide habitat functions because it has multiple vegetation structures, three types of hydroperiods present and a richness of plant species. Special habitat features in Wetland 1 include large, downed woody debris, standing snags, stable steep and undercut banks and at least ¼ acre of thin stemmed persistent vegetation. Wetland 1 does not have an undisturbed vegetated corridor that connects to other habitat types. In addition, Wetland 1 priority habitats located nearby include old growth trees located north of the Skanska property (parcel 062506-9018) snags, riparian and instream habitats.

Evans Creek Wetlands

(ECW1, ECW2, ECW3, ECW4, ECW5, ECW6, ECW7, ECW8, ECW9, ECW10, ECW11)

PFO1, PSS1, PEM1
Category III
Approximately 0.04 acres total

Wetlands ECW1, ECW2, ECW3, ECW4, ECW5, EWC6, ECW7, ECW8, ECW9, ECW10, ECW11 (named "Evans Creek Wetlands" collectively) are riverine wetlands that fringe the confined portion of Evans Creek in the south/southwest portion of the of the study area (Figure 4, Appendix C Photos 11-19). Seasonal overbank flooding from Evans Creek supports positive wetland hydrology of these small wetlands. Since these wetlands are supported by overbank flooding, the landward boundaries correspond to the OHWM of Evans Creek. They are described as Palustrine wetlands because they are dominated by persistent emergent, trees and shrubs.

Vegetation

Emergent vegetation consisting of dense reed canary grass is predominant in the Evans Creek Wetlands (Appendix B, Sample Plots ECW1-1, ECW2, ECW3-1). Patches of forested and scrub-shrub vegetation are also present. Other vegetation observed in the Evans Creek Wetlands consisted of Pacific willow, Red alder, Salmonberry, Douglas spirea, and Creeping buttercup (*Ranunculus repens,* FAC). The presence of these species meets the criteria for hydrophytic vegetation.

Soils

The typical soil profile observed in the Evans Creek Wetlands complex consist of 7 inches of dark grayish brown (10YR4/2) silty loam overlying 13 inches of dark gray (2.5Y4/1) silty loam with redoximorphic features. Presence of hydrogen sulfide meets the hydric soil indicator for this soil profile. Soils in this area also exhibited gleyed features. The soil profile in Sample Plot ECW3-1 consisted of a silty loam overlying 10 inches of very dark grayish brown (10YR3/2) sand with no redoximorphic features. The presence of sulfidic odor meets the hydric soil indicator for these soils.

Hydrology

Soils in the Evans Creek Wetlands complex were saturated to the surface with free water at 10 inches (Sample Plot ECW3-1). Sample Plot ECW2 is saturated to 5 inches from the surface. The presence of saturation and surface water meet indicators of primary hydrology in this area.

Wetland Rating

The Evans Creek Wetlands were grouped and rated as 6 assessment units using the Ecology rating methodology. Wetland assessment units were determined based on breaks in wetland vegetation along Evans Creek; those wetlands within 100 feet of each other were grouped and rated as one assessment unit (Hruby 2004; Table 3). All of these wetlands received a low score (12/32 points) for water quality, a moderate score (16/32) for hydrologic function, and a low score (13 to 15/36 points) for habitat functions. Because these wetlands are small, narrow features along Evans Creek, they do not have substantial storage available to detain water from overbank flooding. However, the presence of dense herbaceous vegetation acts to slow water velocities and to trap sediments and associated pollutants, which improves the wetlands' potential to provide water quality and hydrologic functions (Hruby 2004). Because of the heavily developed land use surrounding these wetlands, they have the opportunity to provide water quality and hydrologic functions. All of the Evans Creek Wetlands received low scores for habitat functions dues to low diversity in plant species, structure, and habitat features, and landscape position in a heavily developed area that generally limits opportunity for the wetlands to provide habitat functions.

3.2 Streams within the Study Area

The study area is located in the Bear and Evans Creek basin of the Cedar–Sammamish Watershed (WRIA 8). Evans Creek and Tributary 08.0107 are further located in the Evans Creek sub basin which is approximately 9,800 acres. Evans Creek is approximately 8.2 miles long (Williams et al. 1975) and Tributary 08.0107 is approximately 600 feet long. Table 4 summarizes the size, rating, and classification of Evans Creek within the study area. Photographs of Evans Creek are provided in Appendix C.

Table 4. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Class[a]	USACE Jurisdiction[b]	Average Width in Study Area (ft)[c]	Approximate Length in Study Area (ft)[c]
Evans Creek	Bear Creek	Class I	RPW	20	2700
Tributary 08.0107	Evans Creek	Class II	RPW	n/a	450

[a] Redmond Zoning Code 21.64.020
[b] RPW = Relatively Permanent Water
[c] Average widths and approximate lengths were determined based on existing survey data and field observations.

Evans Creek

The existing Evans Creek is located on the southern border of the project site (Figures 3 and 4). As indicated in Table 4, Evans Creek is rated as a Class I stream per the City of Redmond Zoning Code (RZM 21.64.020). Evans Creek flows northward after it crosses under NE Union Hill Rd for approximately 1252 feet where it then flows west across the study area for approximately 2657 feet and discharges into Bear Creek offsite.

HDR biologists conducted a stream habitat survey beginning downstream of the large beaver dam (Figure 3; Appendix C Photo 20 and 21) and continuing downstream for the length of the

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project site ending at the WSDOT-owned parcel (062506-9159). Due to the large inundated area upstream of the beaver dam (Photo 22), that section of stream was only qualitatively assessed as there was no easily defined channel for measurements. The stream was measured at 10 evenly spaced transects.

The surveyed stream reach had few bends and was mostly confined in a deep ditch between industrial property sites (parcels 062506-9044, 06250-6906, 062506-9072, 062506-9063, 062506-9018, 062506-9129, 062506-9028). Upstream of the recycling site (parcel 062506-9044) the stream channel is confined on the left bank by a steep bank, but fairly unconfined on the right bank bordering Wetland 1. The surveyed reach is a low gradient stream with a slope of about 1 to 2 percent.

The surveyed reach was almost completely composed of glide habitat. A few small pools were identified in the reach but riffles were generally lacking throughout. The channel width downstream of the beaver dam was fairly uniform with an average bankfull width of approximately 20 feet. The channel is fairly confined within steep vegetated banks for most of the surveyed length. The average wetted width at the time of the survey was approximately 16 feet. The maximum water depth measured at the time of the survey was in a small pool 4 feet deep. The average water depth of the surveyed reach was 2.3 feet, and the minimum thalweg depth was 0.5 feet. The substrate composition within the surveyed reach was mostly sand and silt (77 percent) with only a few small areas of gravel. The majority of all substrate (95 percent) was composed of particles less than 4 inches in size. The areas of embedded gravel were typically located under the small bridges (parcel 062506-9018, 062506-9044) that cross the stream channel.

Riparian vegetation observed on the west side of Evans Creek primarily consisted of Pacific willow, Sitka willow, Tall buttercup, Common velvetgrass (*Holcus lanatus*), Reed canary grass, Common rush, Kentucky bluegrass (*Poa pratensis*), Tall fescue (*Festuca arundinacea*), Bird's foot trefoil (*Lotus corniculatus*), Creeping buttercup, Skunk cabbage, Yellow iris, Cattail, Forget-me-not, Field mint (*Mentha arvensis*), Pacific ninebark (*Physocarpus capitatus*), Vetch (*Vicia* spp.), Salmonberry, Douglas spirea, and Tall managrass.

Low numbers of LWD were observed in Evans Creek between the NE Union Hill Road bridge and the downstream end of the project area. During the stream survey along approximately 0.5 miles of Evans Creek, a total of 32 logs or fallen trees were recorded that were of adequate size to be classified as LWD and provide fish habitat cover and flow refuge functions. There is slightly less than the >80 pieces of LWD (>24 inches diameter >50 feet) per mile of stream channel that the NMFS matrix of pathways and indicators lists as properly functioning for NW streams (NMFS 1996). Approximately 164 feet downstream and northeast of the large beaver dam, there was a smaller woody debris dam approximately 1 to 2 feet high and the river flowed freely over the top. Evidence indicated that this small debris dam was also constructed by beavers (see photo 23) and could potentially pose a passage barrier during low flows, but it did not appear to represent a barrier during the time of the investigation based the presence of many open spaces of flowing water under, through, and around the logs. The riparian areas in the stream reach downstream of the beaver dam have a mature canopy in many places that

does provide shade and thermal refuge, but are very narrow, with developed industrial land within a few feet of the stream bank. Due to the very narrow riparian corridor, future LWD recruitment is limited along this reach.

Evans Creek is classified at a fish bearing stream by the City of Redmond. Fish species documented to occur in Evans Creek within the project area include fall chinook, coho, sockeye, winter steelhead and coast resident cutthroat trout (WDFW 2013a; WDFW 2013b). Coho, chinook, and steelhead are documented to breed and spawn in Evans Creek within the study area. Sockeye salmon are documented to spawn and migrate within the study area. These fish species prefer areas of mid-velocity water with small to medium sized gravels, large woody debris, aquatic vegetation and side channels with undercut banks (NOAA 2005). The majority of the surveyed reach consisted of glide habitat which provides migratory corridors and transports nutrients as well as creates drift feeding opportunities for rearing juveniles, and helps maintain water temperatures. Riffle habitat provides oxygenated water and removes fine sediments for spawning habitat and pool habitats provide resting areas and cover for both upstream and downstream migrating life stages, as well as refugia in deeper, cooler water for periods of low water levels and over-wintering habitat. Some small pools were identified in the surveyed reach but in general, riffle and pool habitat is generally lacking. A lack of fine sediment in the substrate is an important component of spawning habitat. The substrate in the surveyed reach consisted mainly of sand and silt (77 percent) with only a small area of gravel. This substrate composition is less than ideal for spawning salmon. LWD is important in western Washington streams in that it provides cover for fish and contributes to stream complexity, which is beneficial to salmonids. Low numbers of LWD were observed in the surveyed reach of Evans Creek. In addition, the riparian areas in the stream reach downstream of the beaver dam have a mature canopy in many places that does provide shade and thermal refuge, but are very narrow, with developed industrial land within a few feet of the stream bank. Due to the very narrow riparian corridor, future LWD recruitment is limited along this reach.

Coast resident cutthroat trout are documented to migrate through Evans Creek within the study area. This fish specie seeks smaller streams where the flow is minimal and the substrate is small, almost sand. The sand and silt substrate identified in the surveyed reach are ideal for cutthroat trout habitat.

Tributary 08.0107

Tributary 08.0107 is a small tributary to Evans Creek and originates in a wetland east of the intersection of 208th Avenue NE and NE 85th Street where it is then conveyed on the east side and passes beneath 196th Avenue NE and on to Evans Creek. Tributary 08.0107 flows through the recently completed Bear-Evans Valley South mitigation site (King County 2009) located on two parcels on the west side of 196th Avenue NE adjacent to the project study area. Mitigation in 2010 as a result of the Novelty Hill Road project included relocating the tributary out of a roadside ditch into an enhanced stream channel.

The ordinary high water mark of Tributary 08.0107 was not delineated by HDR biologists at the time of the field study due to inundation by a small downstream beaver dam (Figure 3). The instream reach habitat is best described as low or high gradient riffle. Channel gradient

between 196th and Evans Creek is less than 1 percent. Vegetation of the tributary within the study area includes Reed canary grass and Bittersweet nightshade. Anadromous salmonids can access this tributary and use it for rearing and refuge but there have been no observations of salmon spawning in this tributary (King County 2009). This tributary is considered as a Class II stream under the City of Redmond Code.

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Appendix A – Wetland Delineation Methodology

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Wetlands are defined as areas saturated or inundated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. The methods used to delineate the on-site wetlands conform to methods described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region* (USACE 2010). All delineated wetlands were instrument-surveyed and mapped on project base maps.

To be considered a wetland, an area must have hydrophytic vegetation, hydric soils, and wetland hydrology. HDR staff collected data on these parameters in areas representative of typical site conditions. Staff collected additional data in associated uplands, as needed, to confirm wetland and stream boundaries. Wetland boundaries and wetland data plot locations in the study area were marked with sequentially-numbered, bright pink flagging.

Vegetation

The dominant plants and their wetland indicator status were evaluated to determine if the vegetation was hydrophytic. To determine which plants were dominate at a sample plot biologists applied the 50/20 rule per Corps recommendations. Under this guidance absolute cover estimates were made for each species found rooted within the sample plot, for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). The species that had the most cover was included along with the next species until the absolute cover of these totaled more than 50 percent of the total absolute cover. Any other species that represented at least 20 percent of the total absolute cover was also included as a dominant species for that vegetative stratum.

Sample plots varied in size depending on site topography and habitat complexity. The objective of establishing a plot was to depict particular plant associations that reflect specific water regimes or other ecological factors. So, on steep-sided riparian areas, a plot may consist of a narrow strip along the waters edge or within a floodplain a plot may be a standard 30-foot circle.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions. To meet the hydrophytic vegetation criterion, more than 50 percent of the dominant plants in each stratum must be Facultative, Facultative Wetland, or Obligate, based on the wetland indicator category assigned to each plant species by the Corps NWPL of the US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Remote Sensing and Geographic Information System (http://www.crrel.usace.army.mil/). Table A-1 lists the definitions of the indicator categories.

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Table A-1. Definitions of Wetland Plant Indicator Categories used to Determine the Presence of Hydrophytic Vegetation

Wetland Indicator Category	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occur in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2012).

HDR biologists identified plants to species in the field and estimated percent cover of dominant plants. Scientific and common plant names follow currently accepted nomenclature. Most names are consistent with *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973) and the PLANTS Database (USDA NRCS 2013). During the field investigation, staff observed and recorded the dominant plant species on data sheets for each data plot.

Soils

Generally, an area must contain hydric soils to be a wetland. Hydric soil forms when soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (12 inches). Biological activities in saturated soil result in reduced oxygen concentrations and organisms turn to anaerobic processes for metabolism. Over time, anaerobic biological processes result in certain soil color patterns, which are used as indicators of hydric soil. Typically, low-chroma colors are formed in the soil matrix, and bright-colored redoximorphic features form within the matrix. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the subsurface (USDA NRCS 2010).

HDR staff examined soils by excavating sample pits to a depth of 20 inches to observe soil profiles, colors, and textures. In some case, a shallower soil pit was adequate to document hydric soil indicators. Munsell color charts (Munsell Color 2009) were used to describe soil colors.

Hydrology

Project staff examined the area for evidence of hydrology. Wetland hydrology criteria were considered to be satisfied if it appeared that the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5 percent of the

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growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the U.S. Department of Agriculture Natural Resource Conservation Service (USDA NRCS) (2002). Using the USDA NRCS (2002) WETS table for the nearest station (Hoquiam, Washington), the growing season was approximated to be typically between January 31 December 22, or a total of 326 days. The WETS table for Aberdeen (next nearest station) lists a shorter growing season for this temperature /probability (304 days, typically from February 12 through February 12).

Wetland hydrology indicators are divided into two categories – primary and secondary indicators (USACE 2010). Primary indicators of hydrology include surface inundation, high water table, and saturated soils. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. If the absence of a primary indicator, observation of two or more secondary indicators is required to conclude that wetland hydrology is present. Secondary indicators of hydrology include drainage patterns, water-stained leaves, and geomorphic setting (USACE 2010).

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Appendix B – Wetland Data Sheets

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP 1

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): None Slope(%) 2%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
SP 1 is located ~10-20 feet west of the boardwalk. 2 out of 3 indicators are absent. Sample plot is not in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Festuca arundinacea	70	Y	FAC
Alopecurus pratensis	10	N	FAC
Cirsium arvense	5	N	FAC
Galium aparine	5	N	FACU
Holcus lanatus	5	N	FAC
Vicia sativa	5	N	UPL
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	90	x 3 =	270
FACU species	5	x 4 =	20
UPL species	5	x 5 =	25
Column Totals:	100 (A)		315 (B)

Prevalence Index = B/A= 3.15

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- ____ Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets the dominance test.

SOIL

Sampling Point: SP 1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 11	10YR 3 / 2	100					Gravelly sility loam	
11 to 14	10YR 3 / 3	100					Gravelly sility loam	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: Gravel

Depth (inches): 14"

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Soils do not meet criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	>14"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	>14"

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary indicators of wetland hydrology are present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP 2

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) 0

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot is 6 feet away from sample plot 1. Approximatley 1-2 feet lower in elevation. All 3 criteria are met, sample plot is within a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Salix lasiandra	30	Y	FACW
	30	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	50	Y	FACW
Juncus effusus	20	Y	FACW
Festuca arundinacea	10	N	FAC
Poa pratensis	10	N	FAC
Holcus lanatus	5	N	FAC
Vicia sativa	5	N	UPL
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	25	x 3 =	75
FACU species	0	x 4 =	0
UPL species	5	x 5 =	25
Column Totals:	130 (A)		300 (B)

Prevalence Index = B/A= 2.31

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation meets the dominance test and prevalence index.

SOIL

Sampling Point: SP 2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 5	10YR 3 / 2	100	NONE				SILT LOAM	
5 to 18	10YR 4 / 1	95	10YR4/6	5	C	M	GRAVELLY SILTY LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: Gravel

Depth (inches): 18"

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet depleted matrix indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	5"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
A high water table and presence of saturation meet wetland hydrology criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP 3

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): None Slope(%) 0

Subregion (LRR): A Lat: 47.680915 Long: -122.08464 Datum: WGS84

Soil Map Unit Name: Puget Sility Clay Loam NWI Classification: PFO/PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located in the forested area in north-central portion of Wetland 1. All 3 criteria are met, sample plot is located in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Populus balsamifera	20	Y	FAC
	20	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Lonicera involucrata	15	Y	FAC
Rubus spectabilis	15	Y	FAC
Acer circinatum	5	N	FAC
Ribes divaricatum	5	N	FAC
	40	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Oenanthe sarmentosa	80	Y	OBL
Mysotis arvensis	10	N	FACW
Athyrium filix-femina	5	N	FAC
Lysichiton americanus	5	N	OBL
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	10	x 2 =	20
FAC species	65	x 3 =	195
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	160 (A)		300 (B)

Prevalence Index = B/A= 1.88

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets the dominance test and prevalence index.

SOIL

Sampling Point: SP 3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 5	10YR 2 / 1	100	None				SILT LOAM	
5 to 20	10YR 5 / 2	100	None				SILT LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Presence of hydrogen sulfide is indicator of hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No	____	Depth (inches):	1"
Water Table Present?	Yes	X	No	____	Depth (inches):	Surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	Surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Surface water, high water table and saturation meet the primary wetland hydrology critieria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP 4

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): None Slope(%) 0

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PFO/PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located ~10 feet west of paved trail at edge of the forested area. All 3 criteria are met; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Populus balsamifera	30	Y	FAC
Alnus rubra	5	N	FAC
	35	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Populus balsamifera	20	Y	FAC
Spiraea douglasii	10	Y	FACW
Acer circinatum	5	N	FAC
Alnus rubra	5	N	FAC
Cornus alba	5	N	FACW
Rubus spectabilis	5	N	FAC
Thuja plicata	5	N	FAC
Rubus divaricatus	3	N	FAC
Rubus parviflorus	2	N	FACU
	60	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Oenanthe sarmentosa	70	Y	OBL
Myosotis arvensis	10	N	FACU
Ranunculus repens	10	N	FAC
Athyrium filix-femina	5	N	FAC
Equisetum telmateia	5	N	FACW
Veronica spp.	5	N	
	105	=Total Cover	
Vine Stratum (Plot size: 30 Ft)			
Rubus ursinus	3	Y	FACU
	3	=Total Cover	

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	20	x 2 =	40
FAC species	93	x 3 =	279
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	198 (A)		449 (B)

Prevalence Index = B/A= 2.27

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets hydrophytic vegetation indicators.

SOIL

Sampling Point: SP 4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 11	10YR 2 / 1	100	None				SILT LOAM	
11 to 20	10YR 4 / 1	100	None				SILTY CLAY LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Hydrogen sulfide was present at surface and meets hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No	____	Depth (inches):	0.5"
Water Table Present?	Yes	X	No	____	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Surface water, high water table and saturation meet wetland hydrology indicators.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP 5

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): None Slope(%) 10%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Sility Clay Loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample plot is 5 feet east from SP4 (weltand plot) and ~1-2 feet higher in elevation. Appears to be fill from berm along the trail. 2 out of 3 wetland criteria are absent, sample plot is not in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Populus balsamifera	40	Y	FAC
	40	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Alnus rubra	20	Y	FAC
Rubus arcticus	10	Y	FAC
Populus balsamifera	5	N	FAC
Rubus spectabilis	5	N	FAC
Rosa nutkana	2	N	FAC
	42	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Equisetum telmateia	20	Y	FACW
Myosotis arvensis	10	Y	FACU
Tellima grandiflora	10	Y	FACU
Galium aparine	5	N	FACU
Ranunculus repens	5	N	FAC
	50	=Total Cover	
Vine Stratum (Plot size: 30 Ft)			
Rubus ursinus	10	Y	FACU
	10	=Total Cover	

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	87	x 3 =	261
FACU species	35	x 4 =	140
UPL species	0	x 5 =	0
Column Totals:	142 (A)		441 (B)

Prevalence Index = B/A= 3.11

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- ____ Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation meets the dominance test for hydrophytic vegetation indicators.

SOIL

Sampling Point: SP 5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 14	10YR 4 / 2	100	None				LOAMY SAND	
14 to 21	10YR 3 / 1	100	None				Gravelly Sandy Loam	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Soils do not meet hydric indicators.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	____	No	X	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	14"

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary hydrology indicators are present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 7/23/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP E-1

Investigators: Maki Dalzell/ Dangelei Fox Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): None Slope(%) ~1%

Subregion (LRR): A Lat: 47.678923 Long: -122.07964 Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot E-1 is verification for King County delineation located on eastern boundary of Wetland 1. Site gently slopes down towards Evans Creek. All 3 criteria are present; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Ranunculus acris	30	Y	FAC
Phalaris arundinacea	25	Y	FACW
Agrostis capillaris	15	N	FAC
Juncus effusus	10	N	FACW
Vicia tetrasperma	10	N	UPL
Lotus corniculatus	5	N	FAC
	95	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	35	x 2 =	70
FAC species	50	x 3 =	150
FACU species	0	x 4 =	0
UPL species	10	x 5 =	50
Column Totals:	95 (A)		270 (B)

Prevalence Index = B/A= 2.84

Hydrophytic Vegetation Indicators:

____ Rapid Test for Hydrophytic Vegetation

X Dominance Test > 50%

X Prevalence Index ≤ 3.0

____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance and prevalence test for hydrophytic vegetation.

SOIL

Sampling Point: SP E-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 13	10YR 4 / 1	97	7.5YR4/4	3	C	M	SILTY CLAY	
13 to 20	2.5Y 4 / 1	95	10YR4/4	5	C	M	SILT LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet hydric soil indicators for a depleted matrix.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☑ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	>20
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	>20

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Saturation is visible on aerial imagery from 2006-2012 on Google Earth Imagery. Visible saturation and the FAC-Neutral Test meet secondary wetland hydrology indiactors

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 7/23/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP E-2

Investigators: Maki Dalzell/ Dangelei Fox Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): Concave Slope(%) 1%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Sultan silt loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No

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

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

Hydrophytic Vegetation Present?	Yes X	No	
Hydric Soil Present?	Yes	No X	**Is the Sampled Area within a Wetland?** **Yes** **No X**
Wetland Hydrology Present?	Yes	No X	

Remarks:
Sample plot is verification plot for King County wetland delineation on east boundary of Wetland 1. 2 out of 3 criteria are absent; sample plot is not within a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Agrostis capillaris	40	Y	FAC
Holcus lanatus	25	Y	FAC
Phalaris arundinacea	25	Y	FACW
Festuca arundinacea	5	N	FAC
Juncus effusus	2	N	FACW
Ranunculus acris	2	N	FAC
Vicia tetrasperma	1	N	UPL
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	27	x 2 =	54
FAC species	72	x 3 =	216
FACU species	0	x 4 =	0
UPL species	1	x 5 =	5
Column Totals:	100 (A)		275 (B)

Prevalence Index = B/A= 2.75

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets dominance and prevalence test.

SOIL

Sampling Point: SP E-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 18	7.5YR 3 / 1	100	NONE				FINE SANDY LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
No hydric soil indicators are present in the sample plot.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	>18"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	>18"

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No wetland hydrology indicators are present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 7/23/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP E-3

Investigators: Maki Dalzell/ Dangelei Fox Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Hillslope Local Relief (concave, convex, none): Concave Slope(%) 2-3%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot is a verification plot of King County delineation on east side of Wetland 1 boundary. All 3 indicators are present; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	30	Y	FACW
Agrostis capillaris	20	Y	FAC
Alopecurus pratensis	10	N	FAC
Holcus lanatus	10	N	FAC
Vicia tetrasperma	10	N	UPL
Anthoxanthum odoratum	5	N	FACU
Lotus corniculatus	5	N	FAC
Ranunculus acris	5	Y	FAC
Trifolium pratense	2	N	FACU
	97	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	50	x 3 =	150
FACU species	7	x 4 =	28
UPL species	10	x 5 =	50
Column Totals:	97 (A)		288 (B)

Prevalence Index = B/A= 2.97

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets the dominance and prevalence test.

SOIL

Sampling Point: SP E-3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 20	2.5Y 5 / 2	95	10YR5/6	5	C	M	SILTY CLAY	Redox becomes more prominent as it gets deeper

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the depleted matrix hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☑ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☑ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	>20"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	>20"

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Presence of drainage patterns and saturation is visible on aerial imagery meet wetland hydrology criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 7/23/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP E-4

Investigators: Maki Dalzell/ Dangelei Fox Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Terrace Local Relief (concave, convex, none): Concave Slope(%) 5%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Sultan silt loam NWI Classification: NONE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample plot is a verification plot for King County delineation on the east boundary of Wetland 1. 2 out of 3 criteria are absent; sample plot is not within a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Agrostis capillaris	40	Y	FAC
Cirsium arvense	35	Y	FAC
Lolium perenne	10	N	FAC
vicia tetrasperma	10	N	FAC
Phalaris arundinacea	3	N	FACW
Alopecurus pratensis	2	N	FAC
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	3	x 2 =	6
FAC species	97	x 3 =	291
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		297 (B)

Prevalence Index = B/A= 2.97

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation meets the dominance and prevalence test.

SOIL

Sampling Point: SP E-4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 6	10YR 2 / 2	100	NONE				Gravelly loam	
6 to 11	2.5Y 4 / 3	95	2.5Y4/4	5		PL	SANDY LOAM	
11 to 16	2.5Y 4 / 2	90	10YR3/6	10	C	M	SANDY LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
No hydric soil indicators are present in the sample plot.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	>18"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	>18"

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary wetland hydrology indicators are observed in the sample plot.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-1A

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located on southeast portion of Skanska parcel (062506-9018) near Evans Creek. Meets all 3 wetland critiera; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Ranunculus repens	50	Y	FAC
Phalaris arundinacea	30	Y	FACW
Impatiens noli-tangere	10	N	FACW
	90	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	50	x 3 =	150
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		230 (B)

Prevalence Index = B/A= 2.56

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP W1-1A

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 10	10YR 3 / 2	100	None				FINE SANDY LOAM	
10 to 13	10YR 4 / 1	90	7.5YR4/4	10	C	M	VERY FINE SANDY LOAM	
13 to 18	10YR 4 / 1	80	7.5YR4/4	20	C	M	SAND	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet hdyric soil indicators for a depleted matrix.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	_____
Water Table Present?	Yes	____	No	X	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	12"

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Area meets primary wetland hydrological criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-2A

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample plot is 1 foot higher than SP1W-1A located in SE portion of SKANSKA parcel. Sample plot does not meet criteria for wetland indicators, sample plot is not located in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Oemleria cerasiformis	20	Y	FACU
	20	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Geum rossii	10	Y	FACU
Ranunculus repens	5	Y	FAC
	15	=Total Cover	
Vine Stratum (Plot size: 30 Ft)			
Rubus armeniacus	25	Y	FACU
	25	=Total Cover	

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	5	x 3 =	15
FACU species	55	x 4 =	220
UPL species	0	x 5 =	0
Column Totals:	60 (A)		235 (B)

Prevalence Index = B/A= 3.92

Hydrophytic Vegetation Indicators:

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test > 50%

____ Prevalence Index ≤ 3.0

____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Area does not meet hydrophytic vegetation criteria.

SOIL

Sampling Point: SP W1-2A

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 8	10YR 4 / 3	100	NONE				VERY GRAVELLY LOAMY SAND	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Shovel refusal below 8". Area likely a fill pad. No primary or secondary hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	_____
Water Table Present?	Yes	____	No	X	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	____	No	X	Depth (inches):	_____

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary hydrologic indicators present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-3

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Convcave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located in central portion of Wetland 1 on SKANSKA parcel. Sample plot meets all 3 criteria for wetland indicators; sample plot is located in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	95	Y	FACW
Impatiens noli-tangere	5	N	FACW
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A= 2.00

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance and prevalence test for hydrophytic vegetation.

SOIL

Sampling Point: SP W1-3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 6	10YR 4 / 2	100	None				MUCKY LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:
Meets criteria for loamy mucky mineral (F1).

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? Yes X No ____

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

Remarks:
No inundation at sample plot. Presence of a high water table meets primary wetland hydrologic criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-Mid-1

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located upstream of beaver ponds. Sapmple plot meets 2 out of 3 wetland indicators; sample plot is located in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Solanum dulcamara	30	Y	FAC
Impatiens noli-tangere	25	Y	FACW
Phalaris arundinacea	25	Y	FACW
Myosotis scorpioides	10	N	FACW
	90	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		210 (B)

Prevalence Index = B/A= 2.33

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP W1-Mid-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Soils not sampled due to high water table at 19".

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No	____	Depth (inches):	19"
Water Table Present?	Yes	X	No	____	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Water impounded by beaver dam. Sample plot meets primary wetland hydrology criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-Mid-2

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Hillslope Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Sility Clay Loam NWI Classification: NONE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample plot located on fill slope upslope and west of sample plot W-Mid-1. Does not meet criteria for wetland indicators.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Polygonum cuspidatum	50	Y	FACU
	50 =Total Cover		
Herb Stratum			
Vine Stratum (Plot size: 30 Ft)			
Hedera Helix	75	Y	FACU
Rubus armeniacus	50	Y	FACU
	125 =Total Cover		

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	175	x 4 =	700
UPL species	0	x 5 =	0
Column Totals:	175 (A)		700 (B)

Prevalence Index = B/A= 4.00

Hydrophytic Vegetation Indicators:

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test > 50%

____ Prevalence Index ≤ 3.0

____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Area does not meet hydrophytic vegetation criteria.

SOIL

Sampling Point: SP W1-Mid-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Soils were not sampleable due to compaction. Fill slope, shovel refusal at surface.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	_____
Water Table Present?	Yes	____	No	X	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	____	No	X	Depth (inches):	_____

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary hydrology indicators were present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-Mid-3

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Sility Clay Loam NWI Classification: PSS1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot downstream of beaver dam, in PSS1 portion of Wetland 1. Meets all wetland criteria; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Salix lucida	25	Y	FACW
	25	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Spiraea douglasii	15	Y	FACW
Rubus spectabilis	5	Y	FAC
	20	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Glyceria elata	30	Y	FACW
Impatiens noli-tangere	25	Y	FACW
Lysichiton americanus	20	Y	OBL
Athyrium filix-femina	5	N	FAC
Phalaris arundinacea	5	N	FACW
	85	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across all Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	100	x 2 =	200
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		250 (B)

Prevalence Index = B/A= 1.92

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance and prevalence test for hydrophytic vegetation.

SOIL

Sampling Point: SP W1-Mid-3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc [2]	Texture	Remarks

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils are too wet to sample. No organic soil observed at surface. Hydric soils presumed present based on hydrology and hydrophytic vegetation.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No	____	Depth (inches):	6"
Water Table Present?	Yes	X	No	____	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Water is sheet flowing through sample plot. Primary hydrology indicators are present.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/13/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP W1-Mid-4

Investigators: Lisa Danielski Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: 47.67895 Long: -122.08266 Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plost located in PEM1 community south of existing boardwalk. Meets all 3 criteria for wetland indicators; sample plot located in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum			
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	100	Y	FACW
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A= 2.00

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Sample plot located in Phalaris field. Area meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP W1-Mid-4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils too wet to sample, but are mineral. Hydric soil assumed present based on hydrology and hydrophytic vegetation.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No	____	Depth (inches):	4-5"
Water Table Present?	Yes	X	No	____	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Approximately 4-5" of inundation. Appears to just be ponding; no sheet flow. Sample plot meets wetland hydrology criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW1

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget siltyclay loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located near evans creek. All 3 wetland indicators are present; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Rubus spectabilis	20	Y	FAC
	20 =Total Cover		
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	95	Y	FACW
Impatiens noli-tangere	5	N	FACW
	100 =Total Cover		
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	120 (A)		260 (B)

Prevalence Index = B/A= 2.17

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 10	10YR 3 / 2	100	None				SILT LOAM	
10 to 20	2.5Y 4 / 1	97	10YR4/4	3			SILT LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the depleted matrix hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches):	10"
Water Table Present?	Yes	X	No		Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Sample plot meets primary wetland hydrology indicator.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW1-1

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located on 062506-9044 near Evans Creek. All 3 wetland criteria are present; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Rubus spectabilis	20	Y	FAC
Salix lasiandra	10	Y	FACW
	30	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	60	Y	FACW
Ranunculus repens	15	N	FAC
Iris pseudacorus	10	N	OBL
Lysichiton americanus	10	N	OBL
Impatiens noli-tangere	5	N	FACW
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	75	x 2 =	150
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		275 (B)

Prevalence Index = B/A= 2.12

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW1-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 7	10YR 4 / 2	100	None				SILT LOAM	
7 to 20	2.5Y 4 / 1	95	10YR3/3	5			SILT LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the hydrogen sulfide and depleted matrix hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	____	No	X	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	Surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Hydrogen sulfide odor present at 13". Sample plot is 1 foot higher than chanel. Sample plot meets primary wetland hydrology indicator.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW1-2

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Local Relief (concave, convex, none): Slope(%) 3%

Subregion (LRR): A Lat: Long: Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No

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

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

Hydrophytic Vegetation Present?	Yes X	No	
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes	No X	

Is the Sampled Area within a Wetland? **Yes** ____ **No** **X**

Remarks:
Sample plot located on parcel 062506-9044 Sample plot meets 2 out of 3 criteria; sample plot is located on boundary of Wetland 1.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Salix lasiandra	20	Y	FACW
Rubus spectabilis	5	Y	FAC
	25	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Urtica dioica	40	Y	FAC
Ranunculus repens	30	Y	FAC
Tolmiea menziesii	30	Y	FAC
Polystichum munitum	20	Y	FACU
Phalaris arundinacea	5	N	FACW
Impatiens noli-tangere	2	N	FACW
	127	=Total Cover	
Vine Stratum (Plot size: 30 Ft)			
Rubus armeniacus	30	Y	FACU
	30	=Total Cover	

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across all Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71.4% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	27	x 2 =	54
FAC species	105	x 3 =	315
FACU species	50	x 4 =	200
UPL species	0	x 5 =	0
Column Totals:	182 (A)		569 (B)

Prevalence Index = B/A= 3.13

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- ____ Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** **X** **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW1-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 14	10YR 3 / 2	100					SILT LOAM	
14 to 18	2.5Y 4 / 1	97	10YR4/4	3			SILT LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the depleted matrix hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	____	No	X	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	16"

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary wetland hydrologic indicators are present in the sample plot.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW2

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located on Parcel 062506-9044 near Evans Creek. Meets all 3 wetland critiera; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Alnus rubra	30	Y	FAC
	30	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Spiraea douglasii	20	Y	FACW
Salix scouleriana	4	N	FAC
	24	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	80	Y	FACW
Convolvulus arvensis	15	N	UPL
Impatiens noli-tangere	5	N	FACW
	100	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	105	x 2 =	210
FAC species	34	x 3 =	102
FACU species	0	x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	154 (A)		387 (B)

Prevalence Index = B/A= 2.51

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 5	10YR 2 / 2	100	None				SILT LOAM	
5 to 13	10YR 4 / 2	5	10YR3/4	95	C	M	SILT LOAM	
13 to 20	2.5Y 5 / 2	70	10YR4/6	93	C	M	LOAMY SAND	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the depleted matrix hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	____	No	X	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	5"

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Meets primary wetland hydrology indicator.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW3

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floddplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located on parcel 062506-9020 near Evans Creek. Meets all 3 wetland critiera; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum (Plot size: 30 Ft)			
Populus balsamifera	5	Y	FAC
	5	=Total Cover	
Shrub Stratum (Plot size: 30 Ft)			
Salix lasiandra	45	Y	FACW
	45	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Phalaris arundinacea	80	Y	FACW
Iris pseudacorus	10	N	OBL
Impatiens noli-tangere	5	N	FACW
	95	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	130	x 2 =	260
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	145 (A)		285 (B)

Prevalence Index = B/A= 1.97

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 14	10Y 4 / 1	100	None				SILT LOAM	
14 to 22	5GY 4 / 1	100	None				SAND	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Soils meet the hydrogen sulfide hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches):	surface
Water Table Present?	Yes		No	X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Area meets primary wetland hydrologic criteria.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW3-1

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Sample plot located on parcel 062506-9044. Meets all 3 wetland critiera; sample plot is in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Salix lasiandra	20	Y	FACW
	20	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Ranunculus repens	70	Y	FAC
Phalaris arundinacea	50	Y	FACW
Scirpus microcarpus	10	N	OBL
Solanum dulcamara	10	N	FAC
Galium trifidum	5	N	FACW
Iris pseudacorus	5	N	OBL
	150	=Total Cover	
Vine Stratum			

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	75	x 2 =	150
FAC species	80	x 3 =	240
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	170 (A)		405 (B)

Prevalence Index = B/A= 2.38

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Area meets dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW3-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 10	10YR 3 / 2	100	None				SILT LOAM	
10 to 20	10GY 4 / 1	100	None				SAND	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:
Presence of sulfuric odor at 10" meets hydric soil indicator.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	____
Water Table Present?	Yes	X	No	____	Depth (inches):	10"
Saturation Present? (includes capillary fringe)	Yes	X	No	____	Depth (inches):	Surface

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:
Water table and presence of saturation to the surface meet primary indicators for wetland hydrology.

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

Project/Site: Evans Creek City/County: Redmond Sampling Date: 6/21/2013

Applicant/Owner: City of Redmond State: WA Sampling Point: SP ECW3-2

Investigators: Maki Dalzell Section, Township, Range S 6 T 25N R 6E

Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope(%) ____

Subregion (LRR): A Lat: ____ Long: ____ Datum: WGS84

Soil Map Unit Name: Puget Silty Clay Loam NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If No, explain in Remarks)

Are Vegetation ____, Soil ____, Hydrology ____, significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

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

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample plot located in upland on parcel 062506-9044. Does not meet 2 out of 3 wetland critiera; sample plot is not in a wetland.

VEGETATION– Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Status
Tree Stratum			
Shrub Stratum (Plot size: 30 Ft)			
Salix lasiandra	50	Y	FACW
Crataegus douglasii	3	N	FAC
	53	=Total Cover	
Herb Stratum (Plot size: 6 Ft)			
Ranunculus repens	10	Y	FAC
Epilobium ciliatum	5	Y	FACW
Phalaris arundinacea	5	Y	FACW
	20	=Total Cover	
Vine Stratum (Plot size: 30 Ft)			
Rubus armeniacus	20	Y	FACU
	20	=Total Cover	

% Bare Ground in Herb Stratum

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	13	x 3 =	39
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	93 (A)		239 (B)

Prevalence Index = B/A= 2.57

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- X Dominance Test > 50%
- X Prevalence Index ≤ 3.0
- ____ Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation (Explain)

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

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation meets the dominance test and prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: SP ECW3-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
0 to 14	10YR 3 / 2	100	None				LOAM	

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

Hydric Soil Indicators:

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

Indicators for Problematic Hydric Soils: [3]

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

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

☐ **Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:
Shovel refusal at 14". No hydric soil indicators are present in the sample plot.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imag.(C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Paised Ant Mounds (D6) (LRR A)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	____	No	X	Depth (inches):	_____
Water Table Present?	Yes	____	No	X	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	____	No	X	Depth (inches):	_____

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:
No primary or secondary hydrologic indcators are present.

Appendix C – Wetland and Stream Photographs

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Wetland and Stream Photographs

Photo 1: Wetland 1, NE corner, facing southwest into depressional PFO area.

Photo 2: Wetland 1, mature forested vegetation including: Red alder, Cottonwood and Western red cedar.

Photo 3: Facing west from Sample Plot 3. PFO portion of Wetland 1.

Photo 4: Wetland 1 slope portion of wetland near Sample Plot E-3, facing north.

Photo 5: Slope portion of Wetland 1, facing southeast near Sample Plot E-1.

Photo 6: Vegetation in Wetland 1 near Sample Plot E-1; Reed canary grass, Colonial bentgrass, Velvet grass, Creeping buttercup, Sweet vernal grass and Foxtail grass.

Photo 7: Wetland 1, Reed canary grass dominated Sample Plot W1-Mid-4 facing south.

Photo 8: Wetland 1, Sample Plot W1-3 dominated by Reed canary grass.

Photo 9: Facing east at Beaver pond near W1-Mid-3.

Photo 10: Wetland 1, Sample plots W1-1A and W1-2A

Photo 11: Wetland ECW1. Vegetation includes reed canary grass, Stinging nettle, Blackberry and Pacific willow, facing upstream.

Photo 12: Wetland ECW2. Vegetation includes Reed canary grass, Lady fern, Douglas spirea, Salmonberry, Impatiens and Red alder, facing downstream.

Photo 13: Wetland ECW3. Vegetation includes Reed canary grass, Willowherb, Blackberry and Pacific willow, facing upstream.

Photo 14: Wetland ECW5. Vegetation includes Reed canary grass, Creeping buttercup and Salmonberry, facing downstream.

Photo 15: Wetland ECW6. Vegetation includes Reed canary grass, Lady fern, Veronica, Hawthorn and Soulers willow, facing downstream.

Photo 16: Wetland ECW8. Vegetation includes Reed canary grass, Bittersweet nightshade and Bulrush, facing downstream.

Photo17: Wetland ECW9. Vegetation includes Reed canary grass, Impatiens and Pacific willow, facing downstream.

Photo 18: Wetland ECW10. Vegetation includes Reed canary grass, Bulrush, Impatiens, Yellow iris and Scoulers willow, facing downstream.

Photo 19: Wetland ECW11. Vegetation includes Reed canary grass, Skunk cabbage, Douglas spirea, Salmonberry and Pacific willow, facing upstream.

Photo 20: Large beaver dam on Evans Creek facing upstream.

Photo 21: Typical stream section of Evans Creek downstream of beaver dam facing downstream.

Photo 22: Inundated area of Evans Creek upstream of beaver dam facing downstream.

Photo 23: Small beaver dam on Evans Creek facing downstream.

Appendix D – Ecology Rating Forms

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Wetland name or number WL 1

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): Wetland 1 Date of site visit: June 13,14,21 2013

Rated by Maki Dalzell/ Lisa Danielski Trained by Ecology? Yes X No___ Date of training March 2006

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure 1 Estimated size ~approx. 105 acres

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II X___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	24
Score for Hydrologic Functions	6
Score for Habitat Functions	25
TOTAL score for Functions	55

Category based on SPECIAL CHARACTERISTICS of wetland

I X II___ Does not Apply___

Final Category (choose the "highest" category from above) I/II Dual rating

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	X
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest	X	**Slope**	X
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above		Check if unit has multiple HGM classes present	X

Wetland name or number WL 1

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number WL 1

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
_N_ The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;
_N_ 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?
_Y_ The wetland is on a slope (*slope can be very gradual*),
_N_ 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.
_N_ The water leaves the wetland **without being impounded**?
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 <3ft diameter ~~and less than 1 foot deep~~).*
NO - go to 5 **YES –** The wetland class is **Slope** Northeast portion of wetland is slope

Wetland name or number WL 1

5. Does the entire wetland unit **meet all** of the following criteria?

N The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

Y The overbank flooding occurs at least once every two years.

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

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

Portions of wetland fringing Evans Creek are riverine

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**

North-central portions of wetland are 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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 rated as depressional per Tom Hruby (pers. comm. 10/31/13)

Wetland name or number WL 1

D	**Depressional and Flats Wetlands** **WATER QUALITY FUNCTIONS** - Indicators that the wetland unit functions to improve water quality	**Points** (only 1 score per box)
D	**D 1. Does the wetland unit have the <u>potential</u> to improve water quality?**	***(see p.38)***
D	D 1.1 Characteristics of surface water flows out of the wetland: Unit is a depression with no surface water leaving it (no outlet) points = 3 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 1 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 (*If ditch is not permanently flowing treat unit as "intermittently flowing"*) Provide photo or drawing	**Figure** 1 1
D	S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* 0-6+" organic soils in portion of wetland north of Skanska property YES points = 4 NO points = 0	4
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation > = 95% of area points = 5 Wetland has persistent, ungrazed, vegetation > = 1/2 of area points = 3 Wetland has persistent, ungrazed vegetation > = 1/10 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	**Figure** 1 5
D	D1.4 Characteristics of seasonal ponding or inundation. *This is the area of the wetland unit that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 yrs.* 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 Map of Hydroperiods	**Figure** ___ 2
D	**Total for D 1** *Add the points in the boxes above*	12
D	**D 2. Does the wetland unit have the <u>opportunity</u> to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft X Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 ft of wetland X A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging — Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other _____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p. 44)*** multiplier 2
D	**<u>TOTAL</u> - Water Quality Functions** Multiply the score from D1 by D2 ***Add score to table on p. 1***	24

Wetland name or number WL 1

D	**Depressional and Flats Wetlands** HYDROLOGIC FUNCTIONS - Indicators that the wetland unit functions to reduce flooding and stream degradation	**Points** (only 1 score per box)
	D 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.46)***
D	D 3.1 Characteristics of surface water flows out of the wetland unit Unit is a depression with no surface water leaving it (no outlet) points = 4 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 (*If ditch is not permanently flowing treat unit as "intermittently flowing"*) Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 0	0
D	D 3.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 The wetland is a "headwater" wetland" points = 5 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 Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft points = 0	3
D	D 3.3 Contribution of wetland unit 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 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 unit is in the FLATS class points = 5	0
D	**Total for D 3** *Add the points in the boxes above*	3
D	**D 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir etc. OR you estimate that more than 90% of the water in the wetland is from groundwater in areas where damaging groundwater flooding does not occur. *Note which of the following indicators of opportunity apply.* — Wetland is in a headwater of a river or stream that has flooding problems X Wetland drains to a river or stream that has flooding problems — Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p. 49)*** multiplier 2
D	**TOTAL - Hydrologic Functions** Multiply the score from D 3 by D 4 ***Add score to table on p. 1***	6

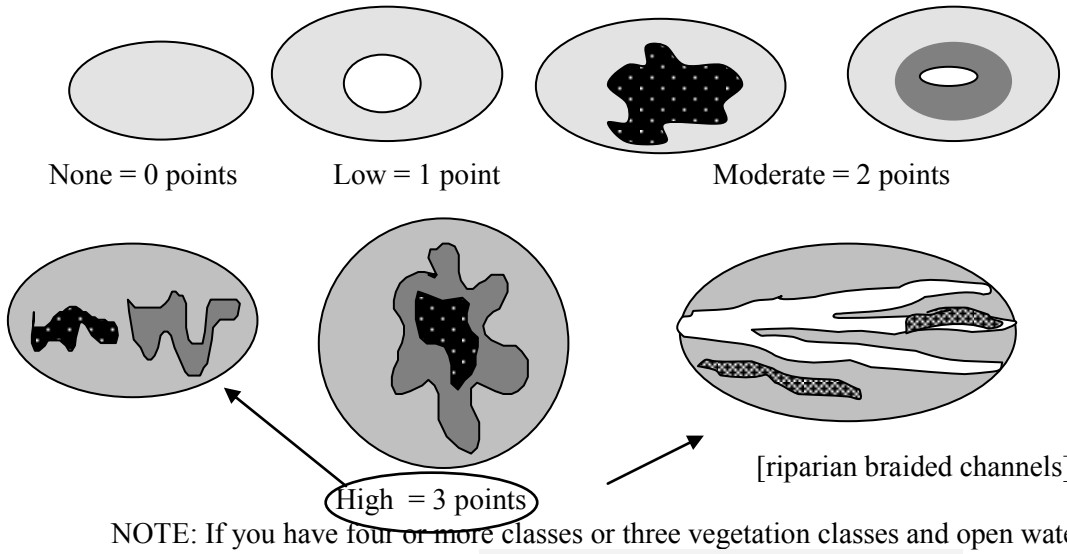
D 3.3 Entirety of Evans Creek drainage basin and portions of Bear Creek Drainage basin make up contributing watershed to wetland 1; totals over 10,000 acres

Wetland name or number WL 1

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed _X_Emergent plants _X_Scrub/shrub (areas where shrubs have >30% cover) _X_Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* _X_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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more — points = 4 3 structures — points = 2 2 structures — points = 1 1 structure — points = 0 Map of Cowardin vegetation classes	Figure 1 4
H 1.2. Hydroperiods ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated _X_Seasonally flooded or inundated ____Occasionally flooded or inundated _X_Saturated only 4 or more types present — points = 3 3 types present — points = 2 2 types present — point = 1 1 type present — points = 0 _X_ 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** Map of hydroperiods	Figure 1 2
H 1.3. Richness of Plant Species ***(see p. 75)*** 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)* *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 *List species below if you want to:* ALRU, FRLA, POBA, RUSP, Ribes, ACCI, COSE, SALA, SPDO, SASI, PHCA, Carex, LYSAM, ATFF, RARE, Glyceria, IMNT, IRPS, TYLA, JUEF, RAAC, HOLA, POPR, LOCO, FEAR, Vicia, GATR	2

Total for page 8

Wetland name or number WL 1

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** 1 3
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* X Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). X Standing snags (diameter at the bottom > 4 inches) in the wetland X Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) Along Evans Creek/Bear Creek X Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* X At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	5
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	16

Comments

Wetland name or number WL 1

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** X — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. — Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** 1 Vegetated buffers >50m are mowed/tilled. Riparian corridor along Evans/Bear Cr less than 50m wide 2
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? YES = **1 point** NO = **0 points**	0

Total for page 2

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock. _X_**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. **(**Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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:** Woodlands 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*). _X_**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*). _X_**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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. _X_**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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	4

Wetland name or number WL 1

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed NWI shows > 3 wetlands within 0.5 mi of WL1 points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	9
TOTAL for H 1 from page 14	16
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	25

Wetland name or number WL 1

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

Wetland name or number WL 1

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site X YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO ____not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No___ Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. X **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO ___not a forested wetland with special characteristics	Approx. 1.8 acre north of Skanska property has 25 mature trees (13.9/ acre) **Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	I

Wetland name or number Evans Creek Wetland AU1

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): ECW1 and ECW2 - wetlands are within 100' of each other Date of site visit: June 21, 2013

Rated by Dalzell/Danielski Trained by Ecology? Yes X No___ Date of training 2005

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure D-2 Estimated size 210 s.f.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	12
Score for Hydrologic Functions	16
Score for Habitat Functions	13
TOTAL score for Functions	41

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply X

Final Category (choose the "highest" category from above)

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number Evans Creek Wetland AU1

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?* The reach of Evans Creek in the AU is breeding area for Chinook, Coho, and Sockeye salmon. Reach has migrating cutthroat and steelhead trout.	X	
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number Evans Creek Wetland AU1

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES –** The wetland class is **Slope**

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 Evans Creek Wetland AU1

R	**Riverine and Freshwater Tidal Fringe Wetlands** WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1. Does the wetland unit have the potential to improve water quality?**	***(see p.52)***
R	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 > 1/2 area of wetland points = 4 If depressions > ½ of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/2 area of wetland points = 2 No depressions present points = 0	**Figure** D-2 0
R	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): Trees or shrubs > 2/3 the area of the unit points = 8 Trees or shrubs > 1/3 area of the unit points = 6 Ungrazed, herbaceous plants > 2/3 area of unit points = 6 Ungrazed herbaceous plants > 1/3 area of unit points = 3 Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 3
R	*Add the points in the boxes above*	3
R	**R 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 feet of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging x — Residential, urban areas, golf courses are within 150 ft of wetland — The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.53)*** multiplier 2
R	**TOTAL - Water Quality Functions** Multiply the score from R 1 by R 2 ***Add score to table on p. 1***	6

Comments

Wetland name or number Evans Creek Wetland AU1

R	**Riverine and Freshwater Tidal Fringe Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
	R 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.54)***
R	R 3.1 Characteristics of the overbank storage the unit provides: *Estimate the average width of the wetland unit 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 unit)/(average width of stream between banks).* If the ratio is more than 20 points = 9 If the ratio is between 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 Aerial photo or map showing average widths	**Figure** D-2 1
R	R 3.2 Characteristics of vegetation 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 NOT Cowardin classes): Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 4
R	*Add the points in the boxes above*	5
R	**R 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. x — There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding — Other_____ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.57)*** multiplier 2
R	**TOTAL - Hydrologic Functions** Multiply the score from R 3 by R 4 ***Add score to table on p. 1***	10

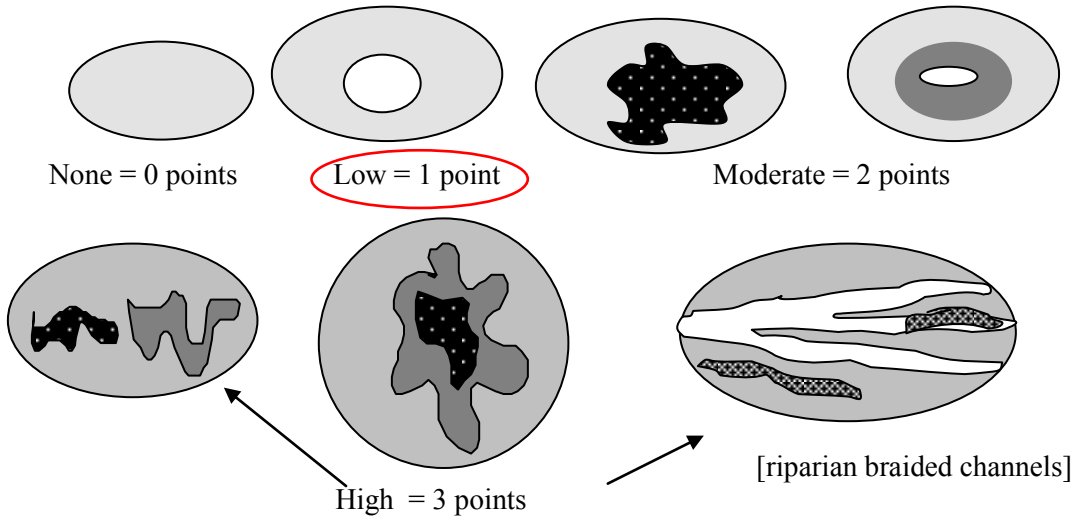
Comments

Wetland name or number Evans Creek Wetland AU1

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 <u>Vegetation structure</u> ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed _X_Emergent plants _X_Scrub/shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	**Figure** D-2 1
H 1.2. <u>Hydroperiods</u> ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated — 4 or more types present points = 3 _X_Seasonally flooded or inundated — 3 types present points = 2 ____Occasionally flooded or inundated — 2 types present point = 1 ____Saturated only — 1 type present points = 0 _X_ 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** Map of hydroperiods wetlands receive seasonal overbank flooding from Evans Creek	**Figure** D-2 1
H 1.3. <u>Richness of Plant Species</u> ***(see p. 75)*** 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)* *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 *List species below if you want to:*	1

Total for page 3

Wetland name or number Evans Creek Wetland AU1

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points [riparian braided channels] High = 3 points NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** D-2 1
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) in the wetland _x_Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) _x_Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ____At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	6

Comments

Wetland name or number Evans Creek Wetland AU1

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. x Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** D-2 1
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? Lake Sammamish is over 1.5 miles south of wetland AU YES = **1 point** NO = **0 points**	0

Total for page 1

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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. Mature forest stand in Wetland 1 is over 800 feet away ____**Oregon white Oak:** Woodlands 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*). x **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*). x **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number Evans Creek Wetland AU1

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0 Road crossings bisect connections to other Evans Creek wetlands	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	7
TOTAL for H 1 from page 14	6
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	13

Wetland name or number Evans Creek Wetland AU1

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	Not applicable

Wetland name or number Evans Creek Wetland AU2

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): ECW3 - no other wetlands within 100' feet along Evans Creek Date of site visit: June 21, 2013

Rated by Dalzell/Danielski Trained by Ecology? Yes X No___ Date of training 2005

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure D-2 Estimated size 65 s.f.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III III IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	12
Score for Hydrologic Functions	16
Score for Habitat Functions	13
TOTAL score for Functions	41

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply X

Final Category (choose the "highest" category from above) III

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number Evans Creek Wetland AU2

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?* The reach of Evans Creek in the AU is breeding area for Chinook, Coho, and Sockeye salmon. Reach has migrating cutthroat and steelhead trout.	X	
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number Evans Creek Wetland AU2

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES –** The wetland class is **Slope**

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 Evans Creek Wetland AU2

R	**Riverine and Freshwater Tidal Fringe Wetlands** WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1. Does the wetland unit have the potential to improve water quality?**	***(see p.52)***
R	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 > 1/2 area of wetland points = 4 If depressions > ½ of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/2 area of wetland points = 2 No depressions present points = 0	**Figure** D-2 0
R	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): Trees or shrubs > 2/3 the area of the unit points = 8 Trees or shrubs > 1/3 area of the unit points = 6 Ungrazed, herbaceous plants > 2/3 area of unit points = 6 Ungrazed herbaceous plants > 1/3 area of unit points = 3 Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 6
R	*Add the points in the boxes above*	6
R	**R 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 feet of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging x — Residential, urban areas, golf courses are within 150 ft of wetland — The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.53)*** multiplier 2
R	**TOTAL - Water Quality Functions** Multiply the score from R 1 by R 2 ***Add score to table on p. 1***	12

Comments

Wetland name or number Evans Creek Wetland AU2

R	**Riverine and Freshwater Tidal Fringe Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
	R 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.54)***
R	R 3.1 Characteristics of the overbank storage the unit provides: *Estimate the average width of the wetland unit 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 unit)/(average width of stream between banks).* If the ratio is more than 20 points = 9 If the ratio is between 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 Aerial photo or map showing average widths	**Figure** D-2 1
R	R 3.2 Characteristics of vegetation 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 NOT Cowardin classes): Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 4
R	*Add the points in the boxes above*	5
R	**R 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. x — There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding — Other_____ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.57)*** multiplier 2
R	**TOTAL - Hydrologic Functions** Multiply the score from R 3 by R 4 ***Add score to table on p. 1***	10

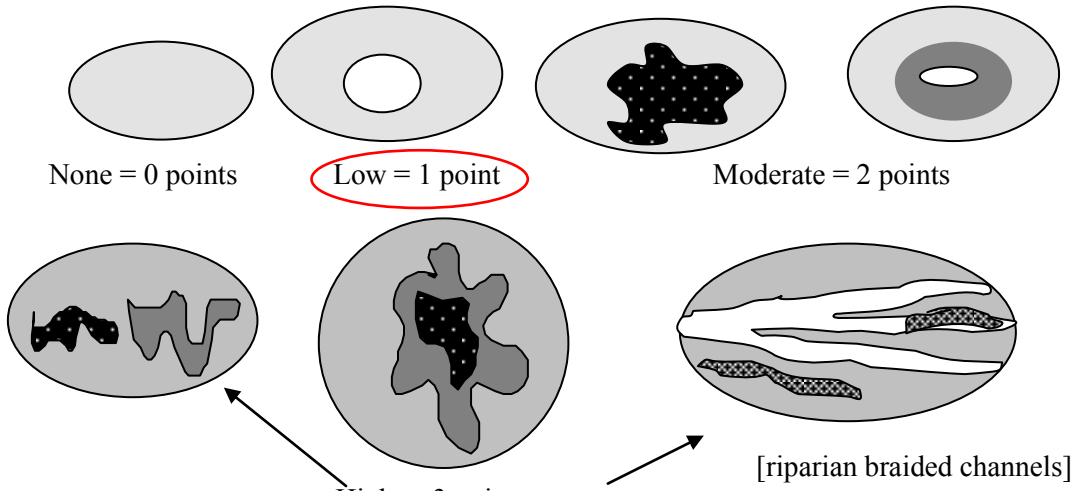
Comments

Wetland name or number Evans Creek Wetland AU2

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed _X_Emergent plants _X_Scrub/shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	**Figure** D-2 1
H 1.2. Hydroperiods ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated 4 or more types present points = 3 _X_Seasonally flooded or inundated 3 types present points = 2 ____Occasionally flooded or inundated 2 types present point = 1 ____Saturated only 1 type present points = 0 _X_ 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** Map of hydroperiods wetland receiveS seasonal overbank flooding from Evans Creek	**Figure** D-2 1
H 1.3. Richness of Plant Species ***(see p. 75)*** 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)* *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 *List species below if you want to:* 5 - 19 species points = 1 < 5 species points = 0	1

Total for page 3

Wetland name or number Evans Creek Wetland AU2

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** D-2 1
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) in the wetland _x_Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) _x_Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ____At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	6

Comments

Wetland name or number Evans Creek Wetland AU2

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. x Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** D-2 1
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? Lake Sammamish is over 1.5 miles south of wetland AU YES = **1 point** NO = **0 points**	0

Total for page 1

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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. Mature forest stand in Wetland 1 is over 800 feet away ____**Oregon white Oak:** Woodlands 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*). x **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*). x **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number Evans Creek Wetland AU2

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0 Road crossings bisect connections to other Evans Creek wetlands	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	7
TOTAL for H 1 from page 14	6
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	13

Wetland name or number Evans Creek Wetland AU2

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	Not applicable

Wetland name or number Evans Creek Wetland AU3

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): ECW4 - no other wetlands within 100' along Evans Creek Date of site visit: June 21, 2013

Rated by Dalzell/Danielski Trained by Ecology? Yes X No___ Date of training 2005

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure D-2 **Estimated size** 59 s.f.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III_x_ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	12
Score for Hydrologic Functions	16
Score for Habitat Functions	14
TOTAL score for Functions	42

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply_X_

Final Category (choose the "highest" category from above) III

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number Evans Creek Wetland AU3

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?* The reach of Evans Creek in the AU is breeding area for Chinook, Coho, and Sockeye salmon. Reach has migrating cutthroat and steelhead trout.	X	
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number Evans Creek Wetland AU3

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES –** The wetland class is **Slope**

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 Evans Creek Wetland AU3

R	**Riverine and Freshwater Tidal Fringe Wetlands** WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1. Does the wetland unit have the potential to improve water quality?**	***(see p.52)***
R	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 > 1/2 area of wetland points = 4 If depressions > ½ of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/2 area of wetland points = 2 No depressions present points = 0	**Figure** D-2 0
R	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): Trees or shrubs > 2/3 the area of the unit points = 8 Trees or shrubs > 1/3 area of the unit points = 6 Ungrazed, herbaceous plants > 2/3 area of unit points = 6 Ungrazed herbaceous plants > 1/3 area of unit points = 3 Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 3
R	*Add the points in the boxes above*	3
R	**R 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 feet of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging x — Residential, urban areas, golf courses are within 150 ft of wetland — The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.53)*** multiplier 2
R	**TOTAL - Water Quality Functions** Multiply the score from R 1 by R 2 ***Add score to table on p. 1***	6

Comments

Wetland name or number Evans Creek Wetland AU3

R	**Riverine and Freshwater Tidal Fringe Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
	R 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.54)***
R	R 3.1 Characteristics of the overbank storage the unit provides: *Estimate the average width of the wetland unit 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 unit)/(average width of stream between banks).* If the ratio is more than 20 points = 9 If the ratio is between 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 Aerial photo or map showing average widths	**Figure** D-2 1
R	R 3.2 Characteristics of vegetation 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 NOT Cowardin classes): Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 4
R	*Add the points in the boxes above*	5
R	**R 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. x — There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding — Other_____ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.57)*** multiplier 2
R	**TOTAL - Hydrologic Functions** Multiply the score from R 3 by R 4 ***Add score to table on p. 1***	10

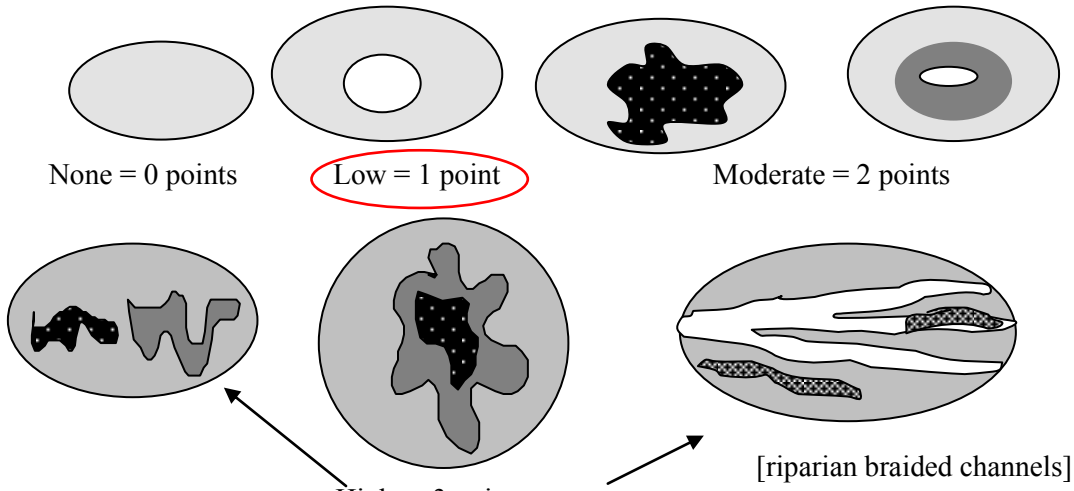
Comments

Wetland name or number Evans Creek Wetland AU3

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed _X_Emergent plants ____Scrub/shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	**Figure** D-2 0
H 1.2. Hydroperiods ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated — 4 or more types present points = 3 _X_Seasonally flooded or inundated — 3 types present points = 2 ____Occasionally flooded or inundated — 2 types present point = 1 ____Saturated only — 1 type present points = 0 _X_ 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** Map of hydroperiods wetlands receive seasonal overbank flooding from Evans Creek	**Figure** D-2 1
H 1.3. Richness of Plant Species ***(see p. 75)*** 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)* *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 *List species below if you want to:* 5 - 19 species points = 1 < 5 species points = 0	1

Total for page 2

Wetland name or number Evans Creek Wetland AU3

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** D-2 1
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) in the wetland _x_Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) _x_Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ____At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	5

Comments

Wetland name or number Evans Creek Wetland AU3

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. x Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** D-2 1
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? Lake Sammamish is over 1.5 miles south of wetland AU YES = **1 point** NO = **0 points**	0

Total for page 1

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. **(**Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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. Mature forest stand in Wetland 1 is over 800 feet away ____**Oregon white Oak:** Woodlands 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*). x **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*). x **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number Evans Creek Wetland AU3

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0 ECW4 has undisturbed connectivity to WL1, and Evans Creek Wetland AU4	5
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	9
TOTAL for H 1 from page 14	5
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	14

Wetland name or number Evans Creek Wetland AU1

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	Not applicable

Wetland name or number Evans Creek Wetland AU4

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): ECW5, ECW6, ECW7, ECW8 - wetlands are within 100' of each other Date of site visit: June 21, 2013

Rated by Dalzell/Danielski Trained by Ecology? Yes X No___ Date of training 2005

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure D-2 Estimated size 938 s.f.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	12
Score for Hydrologic Functions	16
Score for Habitat Functions	13
TOTAL score for Functions	41

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply X

Final Category (choose the "highest" category from above) III

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number Evans Creek Wetland AU4

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?* The reach of Evans Creek in the AU is breeding area for Chinook, Coho, and Sockeye salmon. Reach has migrating cutthroat and steelhead trout.	X	
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number Evans Creek Wetland AU4

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES –** The wetland class is **Slope**

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 Evans Creek Wetland AU4

R	**Riverine and Freshwater Tidal Fringe Wetlands** WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1. Does the wetland unit have the potential to improve water quality?**	***(see p.52)***
R	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 > 1/2 area of wetland points = 4 If depressions > ½ of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/2 area of wetland points = 2 No depressions present points = 0	**Figure** D-2 0
R	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): Trees or shrubs > 2/3 the area of the unit points = 8 Trees or shrubs > 1/3 area of the unit points = 6 Ungrazed, herbaceous plants > 2/3 area of unit points = 6 Ungrazed herbaceous plants > 1/3 area of unit points = 3 Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 3
R	*Add the points in the boxes above*	3
R	**R 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 feet of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging x — Residential, urban areas, golf courses are within 150 ft of wetland — The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.53)*** multiplier 2
R	**TOTAL - Water Quality Functions** Multiply the score from R 1 by R 2 ***Add score to table on p. 1***	6

Comments

Wetland name or number Evans Creek Wetland AU4

R	**Riverine and Freshwater Tidal Fringe Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
	R 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.54)***
R	R 3.1 Characteristics of the overbank storage the unit provides: *Estimate the average width of the wetland unit 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 unit)/(average width of stream between banks).* If the ratio is more than 20 points = 9 If the ratio is between 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 Aerial photo or map showing average widths	**Figure** D-2 1
R	R 3.2 Characteristics of vegetation 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 NOT Cowardin classes): Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 4
R	*Add the points in the boxes above*	5
R	**R 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. x — There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding — Other_____ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.57)*** multiplier 2
R	**TOTAL - Hydrologic Functions** Multiply the score from R 3 by R 4 ***Add score to table on p. 1***	10

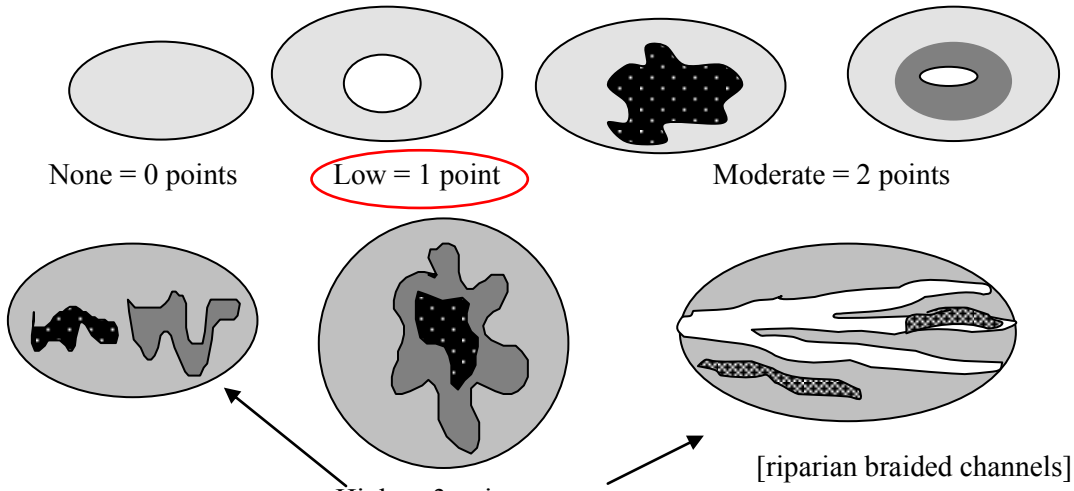
Comments

Wetland name or number Evans Creek Wetland AU4

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 <u>Vegetation structure</u> ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed __X__Emergent plants __X__Scrub/shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	**Figure** D-2 1
H 1.2. <u>Hydroperiods</u> ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated — 4 or more types present points = 3 __X__Seasonally flooded or inundated — 3 types present points = 2 ____Occasionally flooded or inundated — 2 types present point = 1 ____Saturated only — 1 type present points = 0 __X__ 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** Map of hydroperiods	**Figure** D-2 1
H 1.3. <u>Richness of Plant Species</u> ***(see p. 75)*** 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)* *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 *List species below if you want to:* 5 - 19 species points = 1 < 5 species points = 0	1

wetlands receive seasonal overbank flooding from Evans Creek

Total for page 3

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** D-2 1
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) in the wetland _x_Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) _x_Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ____At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	6

Comments

Wetland name or number Evans Creek Wetland AU4

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. x Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** D-2 1
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? Lake Sammamish is over 1.5 miles south of wetland AU YES = **1 point** NO = **0 points**	0

Total for page 1

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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. Mature forest stand in Wetland 1 is over 800 feet away ____**Oregon white Oak:** Woodlands 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*). x **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*). x **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number Evans Creek Wetland AU4

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. Road crossings and development bisect connections to other Evans Creek wetlands points = 0	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	7
TOTAL for H 1 from page 14	6
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	13

Wetland name or number Evans Creek Wetland AU4

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	Not applicable

Wetland name or number Evans Creek Wetland AU5

WETLAND RATING FORM – WESTERN WASHINGTON
Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): ECW9, ECW10,ECW11 - wetlands are within 100' of each other along Evans Creek Date of site visit: June 21, 2013

Rated by Dalzell/Danielski Trained by Ecology? Yes X No___ Date of training 2005

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes___ No X

Map of wetland unit: Figure D-2 Estimated size 624 s.f.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	12
Score for Hydrologic Functions	16
Score for Habitat Functions	15
TOTAL score for Functions	42

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply X

Final Category (choose the "highest" category from above)

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number Evans Creek Wetland AU5

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?* The reach of Evans Creek in the AU is breeding area for Chinook, Coho, and Sockeye salmon. Reach has migrating cutthroat and steelhead trout.	X	
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number Evans Creek Wetland AU5

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES –** The wetland class is **Slope**

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 Evans Creek Wetland AU5

R	**Riverine and Freshwater Tidal Fringe Wetlands** WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality	**Points** (only 1 score per box)
R	**R 1. Does the wetland unit have the potential to improve water quality?**	***(see p.52)***
R	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 > 1/2 area of wetland points = 4 If depressions > ½ of area of unit draw polygons on aerial photo or map Depressions present but cover < 1/2 area of wetland points = 2 No depressions present points = 0	**Figure** D-2 0
R	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): Trees or shrubs > 2/3 the area of the unit points = 8 Trees or shrubs > 1/3 area of the unit points = 6 Ungrazed, herbaceous plants > 2/3 area of unit points = 6 Ungrazed herbaceous plants > 1/3 area of unit points = 3 Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 6
R	*Add the points in the boxes above*	6
R	**R 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 feet of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging x — Residential, urban areas, golf courses are within 150 ft of wetland — The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.53)*** multiplier 2
R	**TOTAL - Water Quality Functions** Multiply the score from R 1 by R 2 ***Add score to table on p. 1***	12

Comments

Wetland name or number Evans Creek Wetland AU5

R	**Riverine and Freshwater Tidal Fringe Wetlands** HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream erosion	**Points** (only 1 score per box)
	R 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	***(see p.54)***
R	R 3.1 Characteristics of the overbank storage the unit provides: *Estimate the average width of the wetland unit 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 unit)/(average width of stream between banks).* If the ratio is more than 20 points = 9 If the ratio is between 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 Aerial photo or map showing average widths	**Figure** D-2 1
R	R 3.2 Characteristics of vegetation 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 NOT Cowardin classes): Forest or shrub for >1/3 area OR herbaceous plants > 2/3 area points = 7 Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area points = 4 Vegetation does not meet above criteria points = 0 Aerial photo or map showing polygons of different vegetation types	**Figure** D-2 7
R	*Add the points in the boxes above*	8
R	**R 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* — There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. x — There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding — Other_____ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is **2** **NO** multiplier is **1**	***(see p.57)*** multiplier 2
R	**TOTAL - Hydrologic Functions** Multiply the score from R 3 by R 4 ***Add score to table on p. 1***	16

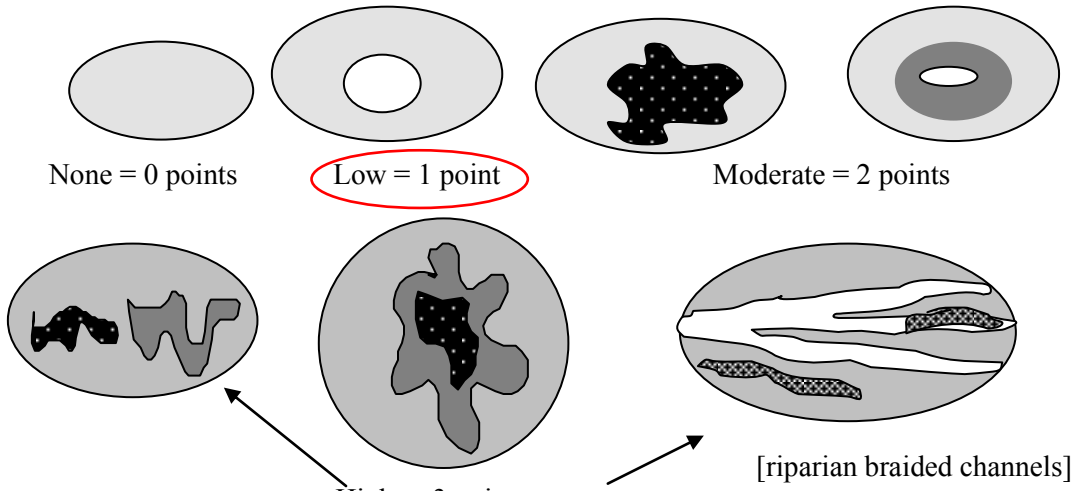
Comments

Wetland name or number Evans Creek Wetland AU5

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ____Aquatic bed _X_Emergent plants ____Scrub/shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	**Figure** D-2 0
H 1.2. Hydroperiods ***(see p. 73)*** *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 acre to count. (see text for descriptions of hydroperiods)* ____Permanently flooded or inundated — 4 or more types present points = 3 _X_Seasonally flooded or inundated — 3 types present points = 2 ____Occasionally flooded or inundated — 2 types present point = 1 ____Saturated only — 1 type present points = 0 _X_ 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** Map of hydroperiods wetlands receive seasonal overbank flooding from Evans Creek	**Figure** D-2 1
H 1.3. Richness of Plant Species ***(see p. 75)*** 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)* *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 *List species below if you want to:* 5 - 19 species points = 1 < 5 species points = 0	1

Total for page 2

Wetland name or number Evans Creek Wetland AU5

H 1.4. Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	**Figure** D-2 1
H 1.5. Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ____Standing snags (diameter at the bottom > 4 inches) in the wetland _x_Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) _x_Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ____At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	5

Comments

Wetland name or number Evans Creek Wetland AU5

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** North half of ECW buffers are contiguous with WL1 x — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0**. — Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure** D-2 4
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors*, *heavily used gravel roads*, *paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? Lake Sammamish is over 1.5 miles south of wetland AU YES = **1 point** NO = **0 points**	0

Total for page 4

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. **(**Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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. Mature forest stand in Wetland 1 is over 800 feet away ____**Oregon white Oak:** Woodlands 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*). x **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*). x **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats **= 4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat **= 1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number Evans Creek Wetland AU5

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0 Road crossings and development bisect connections to other Evans Creek wetlands	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	10
TOTAL for H 1 from page 14	5
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	15

Wetland name or number Evans Creek Wetland AU5

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

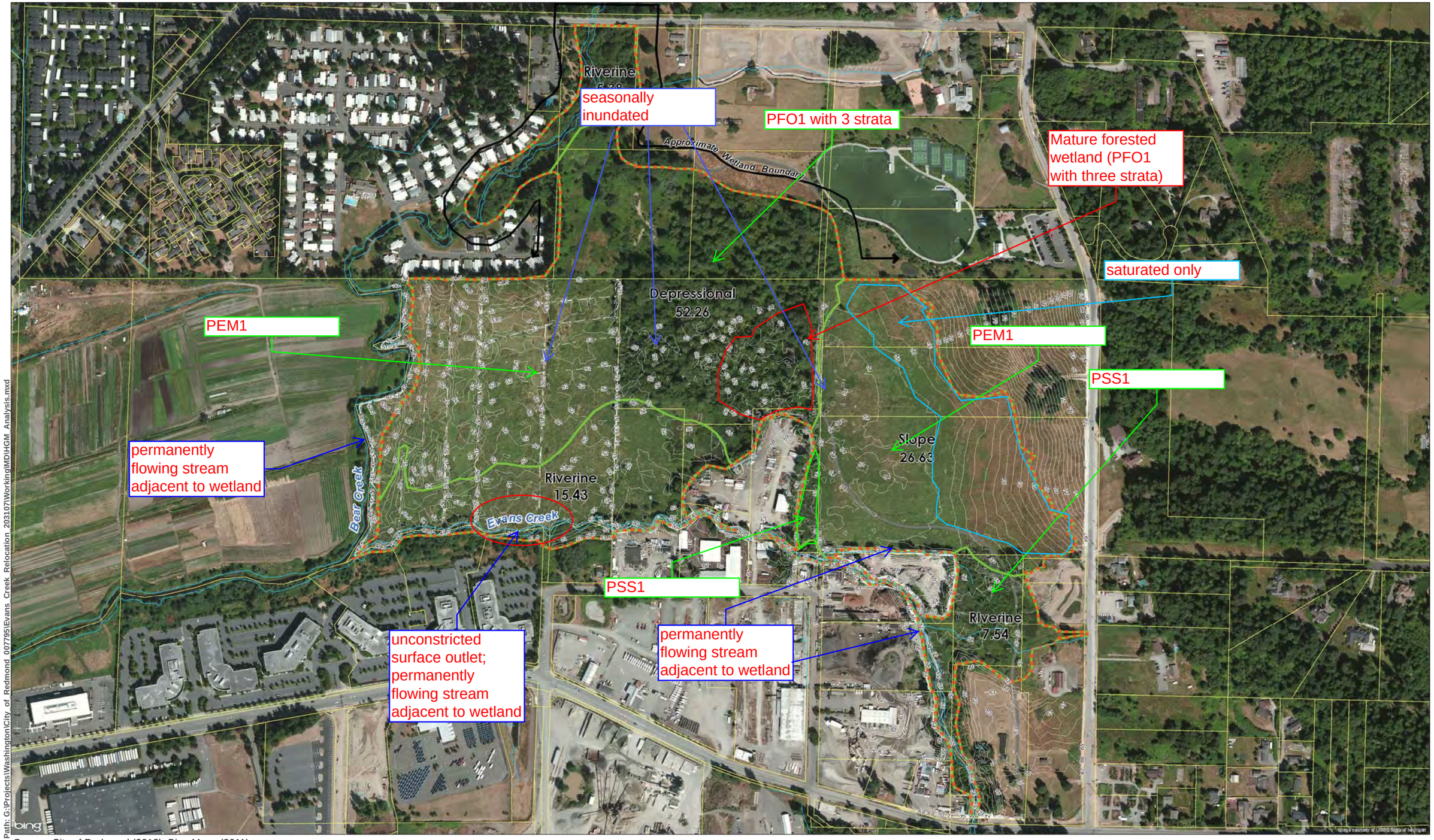
Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 *(see p. 86)* Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	Not applicable



Path: G:\Projects\Washington\City of Redmond 007795\Evans Creek Relocation 203107\Working\MDIHGM Analysis.mxd

Source: City of Redmond (2013), Bing Maps (2011)

Wetland Assessment Unit
Approximate HGM Boundary
Parcel
Stream

N

0 100 200 300 400 500 600 Feet

HDR

Wetlands in the Project Vicinity

WORKING DRAFT

Evans Creek Relocation - Redmond, WA

Appendix D - Geotechnical Report

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Geotechnical Engineering Services

Evans Creek Relocation Project
Redmond, Washington

for
City of Redmond and
HDR Engineering, Inc.

October 14, 2013

GeoEngineers

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Geotechnical Engineering Services

Evans Creek Relocation Project

File No. 0500-191-00

October 14, 2013

Prepared for:

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Attention: Beth Peterson, PE

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CRW:ETB:SDS:nld

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GeoEngineers

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INTRODUCTION

This report presents the results of our geotechnical engineering services for the planned Evans Creek Relocation Project located in Redmond, Washington. The project is located in the southeast quadrant of Section 6, Township 25 North, Range 6 West, Willamette Meridian. The site is shown relative to surrounding physical features on the Vicinity Map, Figure 1, and the Site Plan, Figure 2.

Our geotechnical engineering services were completed in general accordance with the Subconsultant Agreement between GeoEngineers, Inc. (GeoEngineers) and HDR Engineering, Inc. (HDR) dated February 28, 2013. The conclusions and recommendations provided in this report are preliminary and are subject to modification pending further discussion with the project team and additional subsurface information collected during final design. Our scope of work includes:

- Review geologic maps, topographical maps, and existing subsurface information in our files for the site and nearby properties, as available.
- Completing site reconnaissance and explorations to characterize the subsurface conditions along the planned channel alignment and within flood storage areas;
- Completing laboratory testing on selected soil samples obtained from the explorations;
- Evaluating pertinent physical and engineering characteristics of the soils based on the results of the field explorations, laboratory testing and our experience, and completing appropriate geotechnical analyses; and
- Prepare this report presenting our design conclusions and recommendations together with detailed boring logs, site plans and other supporting information for review.

PROJECT DESCRIPTION

Our understanding of the project is based on discussion with, and information provided by HDR, the City of Redmond (City) and other project team members, and our experience with similar projects. We understand that the project includes relocating approximately 3,000 linear feet of Evans Creek as part of an overall restoration project. The creek relocation will increase the vegetated buffers between the creek and the industrial developments currently located adjacent to the creek and enhance the creek to improve salmon habitat. The project will cross through mostly undeveloped parcels located north of the current location of the creek on parcels owned by the City, Washington State Department of Transportation (WSDOT) and private owners.

The project may also include a new pedestrian bridge for the nearby Evans Creek Trail, depending on the location of the new creek alignment. Recommendations for the new bridge will be provided at a later date, if necessary.

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FIELD EXPLORATIONS AND LABORATORY TESTING

Field Explorations

The subsurface soil and groundwater conditions at the site were evaluated by drilling 10 hand auger borings, (HA-1 through HA-6A and HA-6B through HA-9) to depths ranging from about 1 to 8 feet below the ground surface. The explorations were completed with hand tools including shovels and hand augers.

The approximate locations of the explorations completed for this project are presented on the Site Plan (Figure 2). Details of the field exploration program and logs of the explorations are presented in Appendix A.

Laboratory Testing

Soil samples were collected during drilling and taken to GeoEngineers' laboratory for further evaluation. Selected samples were tested for the determination of moisture content, fines content, grain size distribution and Atterberg Limits testing. A description of the laboratory testing and the test results are presented in Appendix B.

PREVIOUS EXPLORATIONS

In addition to the explorations we completed for this study, we reviewed the logs of five hand auger explorations and 20 test probe explorations completed previously by GeoEngineers and four borings completed by others for monitoring wells in the project vicinity. The previous explorations were advanced to depths between 3½ and 15 feet. Logs of previous explorations are presented in Appendix C.

SITE CONDITIONS

Site Geology

Geologic information for the project vicinity was obtained from the map entitled "Geologic Map of King County" (Booth et.al. 2007), published by the GeoMapNW. The project lies within the floor of the Sammamish River Valley, a broad, north-south trending valley resulting from several glacial episodes of glacial scouring in the Puget Sound region. The valley was subsequently filled with recessional glacial outwash deposits, post glacial deposits and recent alluvial deposits. Recessional outwash and alluvial deposits are mapped in the vicinity of the project sites. Recessional outwash deposits primarily include sand, gravel and cobbles with varying amounts of silt and generally overlie glacially consolidated sands and silts. Alluvial deposits typically consist of peat, organic silt, silt, sand and gravel.

Portions of the valley have been modified as a result of past and present agricultural and construction activities. The project site is located adjacent to roadway grading and commercial developments. The ground around the project site may be locally disturbed as a result of these activities.

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Sensitive Area Designations

GeoEngineers reviewed the Critical Area Maps produced by the City for the project area. The critical area designations identified in our review include Frequently Flooded Area, Aquifer Recharge Area with High Significance (Wellhead Protection Zone) and Seismic Hazard Area. The frequently flooded hazard areas are areas known to be inundated by water by a 100-year flood. Areas are classified as aquifer recharge sensitive areas because the ground surface is in direct contact with the upper sand and gravel formation (aquifer), putting the aquifer at risk of degradation of water quality from surface spills of contaminants. The City water wells are established in this upper sand and gravel aquifer. The seismic hazard is due to the presence of loose to medium dense sandy alluvium below groundwater that could liquefy if these soils were subjected to strong, earthquake-induced ground shaking.

Critical Area Ordinances (CAOs) for King County were also reviewed for the project areas. The project area lies within CAO Basin and CAO Tributary Basin delineations.

Surface Conditions

The Evans Creek Relocation project will begin near the southern end of Evan's Creek Trail on the west side of the City-owned parcel about 200 feet north of Union Hill Road. The new creek alignment will continue north onto an adjacent City-owned parcel and then trend to the northwest crossing two privately owned parcels and the Evans Creek Trail. The Creek continues towards the northwest across another City-owned parcel. The Creek then trends to the southwest across two WSDOT-owned parcels. The creek alignment rejoins the existing Evans Creek about 400 feet east of the confluence of Bear Creek and Evans Creeks. The creek alignment, as currently envisioned, is shown on the Site Plan, Figure 2.

The project alignment is currently located on predominantly undeveloped properties that are vegetated with reid canary grass, mixed deciduous trees and shrubs and a few conifers. The City has completed some stream restoration work along Evans Creek near the southern end of the new alignment. Site grades along the new alignment range from about Elevation 62 feet (North American Vertical Datum of 1988 [NAVD 88]) at the south end of the alignment to about Elevation 57 feet at the west end of the alignment.

Subsurface Conditions

The subsurface conditions in the project area were evaluated by completing 10 hand auger explorations (HA-1 through HA-6A and HA-6B through HA-9) on September 10 and 11, 2013 to depths ranging between 1 and 8 feet, and by reviewing previous exploration data from available sources. The logs of the hand auger explorations completed for this phase of the project are presented in Appendix A. The logs of the previous explorations are presented in Appendix C. The soil and groundwater conditions encountered at the project site is summarized below.

Soil conditions encountered in the hand augers indicate that the near surface soils at the site consist of a thin layer of topsoil/forest duff overlying alluvium. The alluvium is generally fine-grained consisting of interbedded layers of soft to medium stiff silt, organic silt and clay with varying amounts of sand. The majority of the hand augers were completed within the fine-grained alluvium. Coarse-grained alluvium was encountered below the fine-grained deposits in hand auger

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HA-3, HA-8 and HA-9 at depths of 7 feet, 1 foot, and 1 foot, respectively. The coarse-grained alluvium generally consists of medium dense or denser sand and gravel with variable silt and cobble content.

Data reviewed from previous borings completed near the south end of the planned creek alignment (MW056 through MW059) indicate the presence of coarse-grained alluvium consisting of medium dense or denser sand and gravel with variable silt content. This is consistent with conditions encountered in hand augers HA-8 and HA-9 completed for this study. Data reviewed from previous hand auger explorations (HA-1 through HA-5) along the Evan's Creek Trail indicate conditions similar to those encountered in the hand augers completed for this study.

Groundwater

Alluvium and outwash deposits form an extensive and prolific aquifer that extends beneath the City of Redmond. The aquifer is fed from the east by recharge and through flow generated in the Bear Creek and Evans Creek valleys. Groundwater typically flows from east to west through the downtown Redmond area and is in hydraulic continuity with the Sammamish River, the stage of which strongly controls groundwater levels in the aquifer. Groundwater is relatively shallow and fluctuates seasonally, in response to rain events as well as in response to the water level changes in the Sammamish River and in Bear Creek and Evans Creek.

Groundwater was generally encountered within ½ to 1½ feet below the ground surface. At several locations (HA-4 and HA-6A), the groundwater level was observed above the ground surface. Groundwater observed in nearby monitoring wells MW056 through MW059 installed as part of previous studies has ranged between 0.6 feet above the ground surface and 9.6 feet below the ground surface since monitoring began in February 2008. These depths correspond to about Elevations ranging from 54.3 to 57.8 feet (NAVD 1988 datum).

All projected groundwater elevations given in this report are estimates provided for general guidance only. Groundwater conditions to be encountered in excavations for construction will depend on the time of year, amount of recent and previous rainfall, stage of the Sammamish River, water level in Bear Creek and Evans Creek, and other indeterminate factors.

CONCLUSIONS AND RECOMMENDATIONS

General

The conclusions and recommendations presented below mainly address earthwork considerations and channel stability for the planned creek alignment. The project may also include a pedestrian bridge, depending on the final channel alignment. At the time this report was prepared, the need for a pedestrian bridge had not been determined. Our final report will include conclusions and recommendations for a pedestrian bridge (including seismic design, foundation support, abutment retaining walls, etc.), if necessary.

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Earthwork

General

Alluvium consisting of fine-grained organic silt, silt and clay near the surface and coarse-grained sand and gravel were observed in the explorations. We anticipate that the soils observed in the explorations can be excavated with conventional grading equipment, such as track excavators or dozers. Cobbles were occasionally encountered in alluvial soils, and the contractor should be prepared to deal with them.

Clearing and Grubbing

The existing ground surface along the project alignment is typically vegetated as discussed in the "Surface Conditions" section of this report. Vegetation types vary along the area of channel relocation. We anticipate that stripping depths will generally be 12 to 18 inches. Stripping depths will be locally greater where large trees are cleared and grubbed.

Erosion and Sedimentation Control

Potential sources or causes of erosion and sedimentation depend upon construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. The project's impact on erosion-prone areas can be reduced by implementing an erosion and sedimentation control plan. The plan should be designed in accordance with applicable City and/or county standards. The plan should incorporate basic planning principles including:

- Scheduling grading and construction to reduce soil exposure;
- Retaining existing vegetation whenever feasible;
- Revegetating or mulching denuded areas;
- Directing runoff away from denuded areas;
- Minimizing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Confining sediment to the project site;
- Inspecting and maintaining control measures frequently;
- Covering soil stockpiles; and
- Implementing proper erosion control best management practices (BMPs).

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce the potential for erosion and reduce transport of sediment to adjacent areas. Temporary erosion protection should include the construction of a silt fence around the perimeter of the work area prior to the commencement of grading activities. Permanent erosion protection should be provided by reestablishing vegetation using hydroseeding and/or landscape planting.

Until the permanent erosion protection is established and the site is stabilized, site monitoring should be performed by qualified personnel to evaluate the effectiveness of the erosion control

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measures and repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the erosion and sedimentation control plan.

Subgrade Preparation

Prior to the placement of new fill, subgrade areas should be proof-rolled to locate areas of loose, soft or pumping soils. Proof-rolling can be completed using a piece of heavy tire-mounted equipment or a loaded dump truck. If soft or pumping soils are observed, such unsuitable subgrade soils should be recompacted or overexcavated and replaced with properly compacted structural fill. The depth of overexcavation should be determined by the Geotechnical Engineer.

The Geotechnical Engineer should monitor the subgrade preparation operations to help determine the depth of removal of soft or pumping soils, and to evaluate whether subgrade disturbance or progressive deterioration is occurring. Subgrade disturbance or deterioration could occur if the subgrade is wet and cannot be dried. If the subgrade deteriorates during proof-rolling or compaction, it may become necessary to modify the proof-rolling or compaction criteria or methods.

Structural Fill

MATERIALS

Materials used to construct embankments, backfill behind or below retaining walls, or used to support structures are classified as structural fill for the purpose of this report. Structural fill material quality varies depending upon its use, as described below:

1. As a minimum, structural fill placed to construct fill embankments should meet the criteria for common borrow, WSDOT Standard Specification 9-03.14(3). Common borrow will be suitable for use as structural fill during dry weather conditions only. If structural fill is placed during wet weather, the structural fill should consist of gravel borrow, WSDOT 9-03.14(1).
2. Structural fill for bridge foundation and abutment wall elements will be provided in a subsequent report, as necessary.

ON-SITE SOILS

The near-surface soils observed in the explorations generally contain a high percentage of fines (silt) and organics and are moisture-sensitive. The on-site soils generally do not meet the criteria for common borrow. Organic soils excavated for the channel should not be reused as structural fill, but may be used as topsoil elsewhere.

FILL PLACEMENT AND COMPACTION CRITERIA

Structural fill should be mechanically compacted to a firm, non-yielding condition. Each lift should be conditioned to the proper moisture content and compacted to the specified density before placing subsequent lifts. Structural fill should be compacted to the following criteria:

1. Compaction criteria for structural fill placed below bridge foundations or other structures, or behind retaining walls will be provided in a subsequent report, as necessary.
2. Structural fill for permanent slopes should be compacted in general accordance with Method B of Section 2-03.3(14)C of the WSDOT Standard Specifications.

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3. Non-structural fill, such as fill placed in landscape areas, should be compacted in general accordance with Method A of Section 2-03.3(14)C of the WSDOT Standard Specifications. In areas intended for future development, a higher degree of compaction should be considered to reduce the settlement potential of the fill soils.

We recommend that monitoring of the placement of backfill be provided to observe that the required compaction criteria are being met, the proper materials are used for structural backfill and that the contractor is placing the material in appropriate lifts for the compaction equipment being employed.

Wet Weather Considerations

The on-site soils contain a sufficient percentage of fines (silt and clay) to be moisture-sensitive. When the moisture content of these soils is more than a few percent above the optimum moisture content, these soils become muddy and unstable, and operation of equipment on these soils is difficult. Additionally, disturbance of near-surface soils should be expected if earthwork is completed during periods of wet weather. During wet weather, we recommend that:

- The ground surface in and around the work area should be sloped so that surface water is directed away from the work area.
- The ground surface should be graded such that areas of ponded water do not develop.
- The contractor should take measures to prevent surface water from collecting in excavations and trenches.
- Measures should be implemented to remove surface water from the work area.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting. Plastic sheeting should be anchored, monitored and maintained by the contractor.
- The contractor should take necessary measures to prevent soils to be used as fill from becoming wet or unstable. These measures may include covering stockpiles with plastic sheeting, sumps with pumps, and grading. The site soils should not be left uncompacted and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent that these soils become wet or unstable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practicable.

Temporary Slopes

We recommend that temporary unsupported cut slopes higher than 4 feet be inclined no steeper than 1½H:1V (horizontal:vertical). This recommendation applies to fully dewatered conditions. Flatter slopes may be necessary if seepage is present on the face of the cut. Temporary cut slopes should encroach no closer than 5 feet laterally from roadways, pavements, structures or other improvements.

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Some sloughing and raveling of the cut slopes should be expected. Temporary covering, such as heavy plastic sheeting, should be used to protect these slopes during periods of rainfall. Surface water runoff from above cut slopes must be prevented from flowing over the slope face by using curbs, berms, drainage ditches, swales or other appropriate methods.

If temporary cut slopes experience excessive sloughing or raveling during construction, it may become necessary to modify the cut slopes to maintain safe working conditions and protect adjacent facilities or structures. Slopes experiencing excessive sloughing or raveling can be flattened or can be regraded to add intermediate slope benches, or additional dewatering can be provided if the poor slope performance is related to groundwater seepage.

Permanent Slopes

We recommend that permanent cut and fill slopes for the channel be constructed no steeper than 3H:1V. We recommend that the finished slope faces be compacted by track walking with the equipment running perpendicular to the slope contours so that the track grouser marks help provide an erosion-resistant slope texture.

To reduce erosion, newly constructed slopes should be armored with rock or other material as identified by the geomorphology protect team and/or planted and hydroseeded shortly after completion of grading. Until the vegetation is established, some sloughing and raveling of the slopes should be expected. This may require localized repairs and reseeding. Temporary covering, such as clear heavy plastic sheeting, jute fabric, loose straw, or excelsior or straw/coconut matting should be used to protect the slopes during periods of rainfall.

LIMITATIONS

We have prepared this report for the exclusive use of the City, HDR and other project team members for the Evans Creek Relocation project in Redmond, Washington. The data should be provided to prospective contractors for their bidding or estimating purposes, but our report and interpretations should not be construed as a warranty of the subsurface conditions.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix D titled “Report Limitations and Guidelines for Use” for additional information pertaining to use of this report.

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Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps

Projection: NAD 1983 UTM Zone 10N

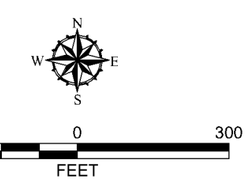
Vicinity Map

Evans Creek Relocation
Redmond, Washington

GEOENGINEERS

Figure 1

Office: Redmond Path: P:\0\0500191\GIS\050019100_F1_VicinityMap.mxd Map Revised: 11 October 2013 cbarnett



Notes

1. The locations of all features shown are approximate.
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Reference: Background image provided by the City of Redmond from Request for Letter of Interest, dated 7/2/2012.

Legend

- Hand Auger Boring by GeoEngineers, Sept 2013
- Monitoring Well completed March 4, 2003
- Hand Auger completed December 2, 2003

Site Plan

Evans Creek Relocation
City of Redmond

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Figure 2

OFFICE: RED Dwg name: W:\Redmond\Projects\0\0500191\00\CAD\050019100_F2 Rev 10-08-2013.dwg TAB: F2 User: cvanslyke Plot time: Oct-10-13 @ 1:58pm

APPENDIX A
Field Explorations

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APPENDIX A
FIELD EXPLORATIONS

General

Subsurface conditions at the sites were explored by performing 10 hand auger explorations HA-1 through HA-6A and HA-6B through HA-9. The hand augers were completed on September 10 and 11, 2013.

The locations of the explorations were estimated using a hand-held GIS device. The approximate locations of the explorations are shown on the Site Plan, Figure 2.

Borings

The borings were completed using hand auger drilling equipment and shovels. The borings were continuously monitored by a geotechnical engineer from our firm who examined and classified the soils encountered, obtained representative soil samples, observed groundwater conditions and prepared a detailed log of each exploration.

Soils encountered in the borings were visually classified in general accordance with the classification system described in Figure A-1. A key to the log symbols is also presented in Figure A-1. The logs of the hand auger borings are presented in Figures A-2 through A-11. The logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. The logs also indicate the depths at which these soils or their characteristics change, although the change may actually be gradual. If the change occurred between samples, it was interpreted. The densities noted on the hand auger logs are based on difficulty of excavation and judgment.

Observations of groundwater conditions were made during excavation. Groundwater level observations are presented on the exploration logs. These observations represent a short-term condition and may or may not be representative of the long-term groundwater conditions at the site.

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SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
PPM	Parts per million
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

DRAFT

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Date Excavated: 9/10/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 6.0

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
		X	1		OL	▼	Dark brown organic silt (soft to medium stiff, wet)		
					ML		Gray silt with organics (medium stiff to stiff, wet)		
	1	X	2 SA					55	%F = 92
	2				ML		Dark brown silt with organics (soft to medium stiff, wet)		
	3								
					SC		Gray clayey sand (medium dense, wet)		
	4								
		X	3						
	5								No recovery below 5 feet
	6						Boring completed at a depth of 6 feet		

Note: Please see Figure A-1 for explanation of symbols

DRAFT

Log of Hand Auger HA-1

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-2

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/10/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 8.0

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
		X	1		OH		Dark brown organic silt (soft to medium stiff, wet)		Groundwater encountered at ground surface
	1								
	2								
	3								
	4						Occasional wood chips		
	5								
	6								
	7	X	2		CL		Gray clay with dark brown organic silt (medium stiff to hard, moist)		
	8						Boring completed at a depth of 8 feet		

Note: Please see Figure A-1 for explanation of symbols

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Log of Hand Auger HA-2

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-3

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/10/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 7.3

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					OH		Dark brown organic silt (roots) (topsoil) (soft to medium stiff, wet)		Organic odor
	1	X	1						
	2								
	3								
	4								
	5	X	2 / AL					546	LL = 451%; PI = 238
	6								
	7				ML		Gray silt with occasional sand and gravel (soft to medium stiff, wet)		
					SP-GP		Gray sand with gravel (medium dense to dense, wet)		No recovery below 7.2 feet
							Refusal on gravel and sand at a depth of 7.3 feet		

Note: Please see Figure A-1 for explanation of symbols

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Log of Hand Auger HA-3

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-4

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/10/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					OL		Dark brown organic silt (soft to medium stiff, wet)		Groundwater at 0.5 feet above ground surface
		X	1		SC		Gray clayey fine to coarse sand (loose, wet)		
	1	X	2		OH		Dark brown organic silt (soft to medium stiff, wet)		
	2								
	3								
	4								
	5								
	6	X	3 AL					299	LL = 374%; PI = 129%
							Boring completed at a depth of 6.5 feet		No recovery below 6.5 feet

Note: Please see Figure A-1 for explanation of symbols

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Log of Hand Auger HA-4

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-5

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/10/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 4.5

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					OL		Dark brown organic silt (root fibers) (soft to medium stiff, moist to wet)		
					CL		Gray clay with trace organics (soft to medium stiff, wet)		
	1	X	1						
	2								
	3	X	2 / SA		OH		Dark brown sandy organic silt (soft to medium stiff, wet)	189	%F = 63
	4	X							

Refusal at a depth of 4.5 feet

Note: Please see Figure A-1 for explanation of symbols

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Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-5

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-6

Date Excavated: 9/11/2013 Logged By: GH

Equipment: Hand Auger Total Depth (ft) 1.5

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
		X	1		OL		Dark brown organic silt with trace gray clay (fibrous material) (soft, wet)		Groundwater 1 foot above ground surface
	1								No recovery below 1 foot depth

Boring completed at a depth of 1.5 feet

Note: Please see Figure A-1 for explanation of symbols

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Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-6A

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-7

Sheet 1 of 1

Date Excavated: 9/11/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 6.0

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					ML		Gray silt with occasional sand (medium stiff to stiff, wet)		
	1					▼			
	2								
	3	X	1 / %F					69	%F = 90
	4								
	5								
	6						Boring completed at a depth of 6 feet		

Note: Please see Figure A-1 for explanation of symbols

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Log of Hand Auger HA-6B

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-8

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/11/2013 | Logged By: GH

Equipment: Hand Auger | Total Depth (ft) 6.5

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					OL		Dark brown organic silt (wood chips and sticks) (soft to medium stiff, wet)		Groundwater at ground surface
	1								
	2		1 MC		OL		Gray organic silt (medium stiff, wet)	79	
	3								
					OH		Dark brown organic silt (soft to medium stiff, wet)		
	4								
			2						
	5								Hole caves; no samples or recovery below 5 feet
	6								
							Boring completed at a depth of 6.5 feet		

Note: Please see Figure A-1 for explanation of symbols

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Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Log of Hand Auger HA-7

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-9

Sheet 1 of 1

Date Excavated: 9/11/2013

Equipment: Hand Auger

Logged By: GH

Total Depth (ft) 1.5

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					TS		Brown topsoil with gravel (loose, moist)		Groundwater not encountered
					GP		Gray coarse gravel with occasional sand and cobbles (medium dense to dense, moist)		
	1	X	1 / SA					3	%F = 3
							Refusal at a depth of 1.5 feet		

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Note: Please see Figure A-1 for explanation of symbols

Log of Hand Auger HA-8

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-10

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

Date Excavated: 9/11/2013 Logged By: GH

Equipment: Hand Auger Total Depth (ft) 1.0

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					TS		Brown forest duff/topsoil with gravel (loose, moist)		Groundwater not encountered
		X	1		GP		Gray coarse gravel with occasional sand and cobbles (medium dense to dense, moist)		
	1						Refusal at a depth of 1 foot		

Note: Please see Figure A-1 for explanation of symbols

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Log of Hand Auger HA-9

GEOENGINEERS

Project: Evans Creek Relocation

Project Location: Redmond, Washington

Project Number: 0500-191-00

Figure A-11

Sheet 1 of 1

Redmond: Date: 10/11/13 Path:\\RED\PROJECTS\0\0500191\00\GINT\0500191\00.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_TESTPIT_1P_GEOTEC

APPENDIX B
Laboratory Testing

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APPENDIX B
LABORATORY TESTING

General

Soil samples obtained from the explorations were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate index properties of the soil samples. Representative samples were selected for laboratory testing consisting of the determination of the moisture content, fines content, grain size distribution (sieve analyses), and plasticity characteristics (Atterberg limits). The tests were performed in general accordance with test methods of the American Society for Testing and Materials (ASTM) or other applicable procedures.

Moisture Content Testing

Moisture content tests were completed in general accordance with ASTM D 2216 for representative samples obtained from the explorations. The results of these tests are presented on the exploration logs in Appendix A at the depths at which the samples were obtained.

Percent Passing U.S. No. 200 Sieve (%F)

Selected samples were "washed" through the U.S. No. 200 mesh sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to estimate the fines content for analysis purposes. The tests were conducted in accordance with ASTM D 1140, and the results are shown on the exploration logs in Appendix A at the respective sample depths.

Grain Size Analyses

Sieve analyses were performed on selected samples in general accordance with ASTM D 422. The wet sieve analysis method was used to determine the percentage of soil passing the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the Unified Soil Classification System, and are presented in Figures B-1.

Atterberg Limits Testing

Atterberg limits testing was performed on selected fine-grained soil samples. The tests were used to classify the soil as well as to evaluate index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D-4318. The results of the Atterberg limits testing are summarized in Figure B-2.

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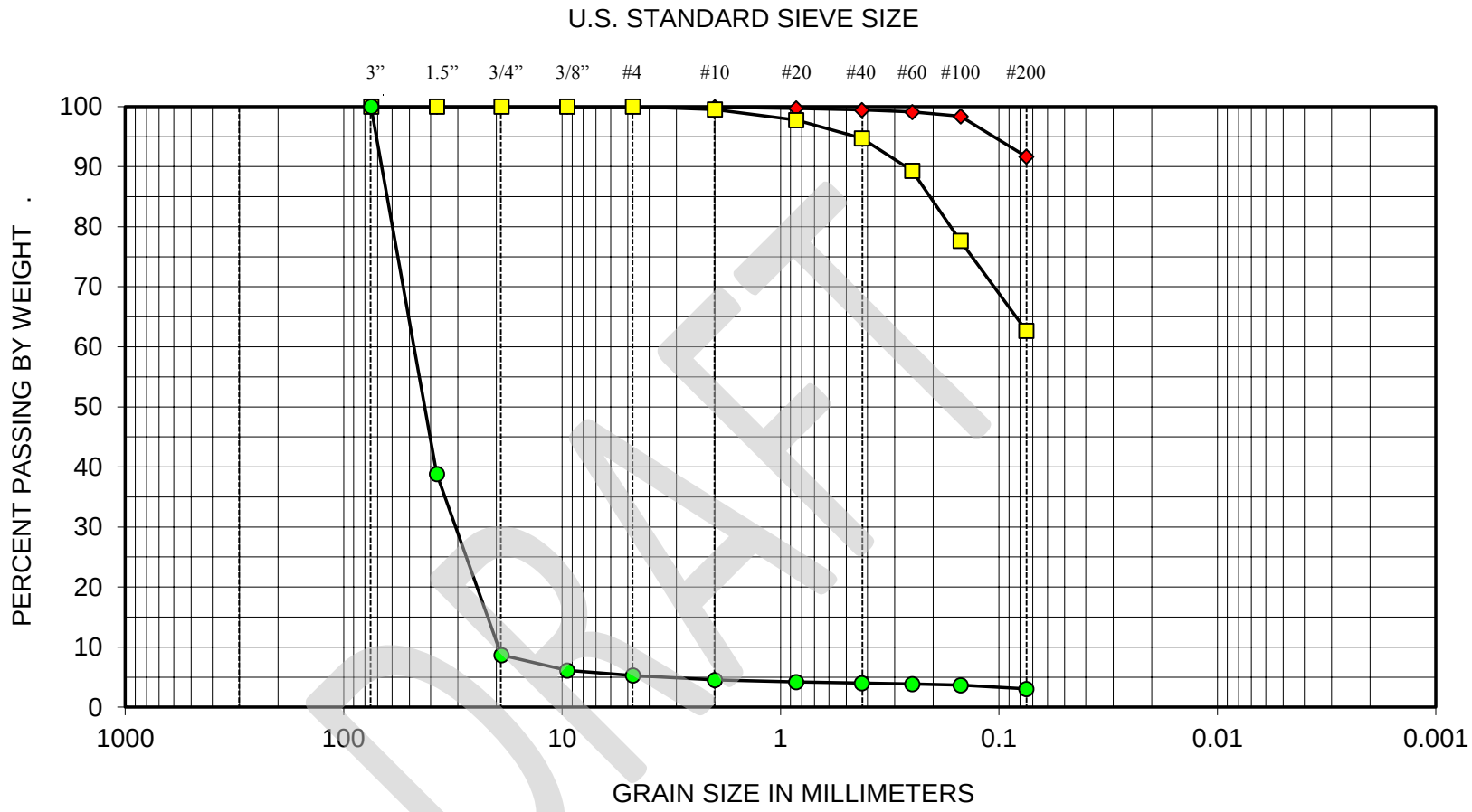

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BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	SOIL CLASSIFICATION
◆	HA-1	1	Silt (ML)
□	HA-5	3	Sandy organic silt (OL)
○	HA-8	1	Coarse gravel with occasional sand(GP)

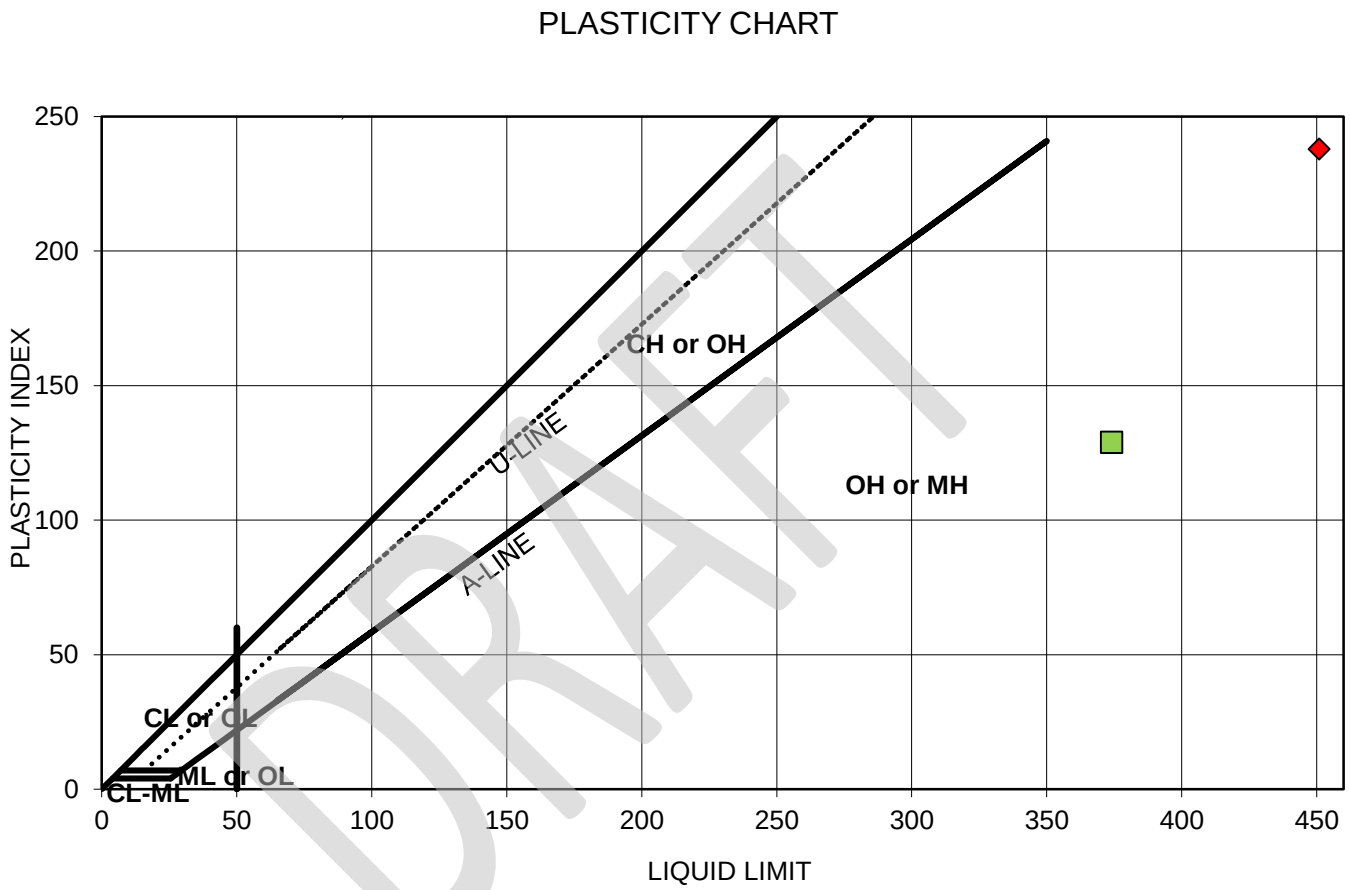
SIEVE ANALYSIS RESULTS

FIGURE B-1

GEOENGINEERS

FIGURE B-2

ATTERBERG LIMITS TEST RESULTS



SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH (ft)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SOIL DESCRIPTION
◆	HA-3	5½	546	451	238	Organic silt (OH)
■	HA-4	6	299	374	129	Organic silt (OH)

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APPENDIX C
Previous Explorations

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APPENDIX C
PREVIOUS EXPLORATIONS

This appendix presents the following exploration logs from previous studies:

- The logs of four borings with monitoring wells (MW056 through MW059) completed by Parametrix in 2003, as provided by the City of Redmond;
- The log of five hand auger borings (HA-1 through HA-5) completed by GeoEngineers, Inc. in 2003;

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER
PROJECT NAME Evan Ck Trail
LOCATION 19500 Union Hill Rd
COORDINATES
DRILLING METHOD Hollow Stem Auger
SAMPLING METHOD Split Spoon
GROUND ELEVATION @ 60ft

BORING/WELL NUMBER # MW-1
DATE COMPLETED 3-4-03
TOTAL DEPTH OF BORING ~~200.0~~ 14 16.8 btoc
INITIAL WATER LEVEL ▽ 2.5 4.13 btoc
STATIC WATER LEVEL ▼
LOGGED BY S. Matthews
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
	8-12-14	15		X		SM-SW		Silty sand w/gravel, v dk grey brown 2.5YR 3/2 NP silty gravel w/depth m-c sand + f gravel at 3' m-c sand + gravel w/silt wet		31" STU; 8" Lindr Amine
					5				5	
	7-11-11	14		X		SP-GW		Poorly graded sand and gravel, dk brown 7.5YR 3.2 NP Coarse sand + gravel wet, sub angular - subrounded Cobbles		010 stainless sch 40 PVC
					10				10	
	12-9-11			X		SW		Well graded sand, Dk Brown 10YR 3/3 na wet. f-c sand f-c gravel		
					15				15	
					20			15 bag Sand	20	
					25				25	

Continued Next Page

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Figure C-1

DRAFT

Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER
PROJECT NAME Evan Ck Trail
LOCATION 19500 Union Hill Rd
COORDINATES
DRILLING METHOD Hollow Stem Auger
SAMPLING METHOD Split Spoon
GROUND ELEVATION @ 600ft

BORING/WELL NUMBER # MW-2
DATE COMPLETED 3/4/03
TOTAL DEPTH OF BORING ~~200.0~~ 14' 16.7 Btoc
INITIAL WATER LEVEL ▽ 7.14 btoc
STATIC WATER LEVEL ▼
LOGGED BY S. Matthews
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION
								Soil grass Dk Brown silt w/cobbles & gravel
	12-17-12	6		X	5	SW		Well grade sand w/gravel 4 cft Dk brown 10YR 3/3 NP Wet f-c gravel
								Heave a little
	34-28-12	14		X	10	SP		Poorly graded sand and gravel, Dk Yellowish brown 10YR 3-4 NP Wet Coarse sand f-c gravel
	5-12-11	8		X		SW		Well graded sand w/gravel, vdk gray 10YR 3/1 NP Wet f-c gravel angular
					15			
					20			2 bags sand Bdn
					25			Continued Next Page

DEPTH (ft.) 5, 10, 15, 20, 25

WELL DIAGRAM

29"

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Figure C-2

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Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER
PROJECT NAME Evan Ck. Trail
LOCATION 19500 Union Hill Rd
COORDINATES
DRILLING METHOD Hollow Stem Auger
SAMPLING METHOD split spoon
GROUND ELEVATION @ 6004

BORING/WELL NUMBER # MW-4
DATE COMPLETED 3-4-03
TOTAL DEPTH OF BORING ~~2000~~ 15 18' btoc
INITIAL WATER LEVEL ▽ 10.16 BTOC
STATIC WATER LEVEL ▼
LOGGED BY S. Matthews
TOP OF CASING ELEVATION 2.9" Stk

50 ga

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
								Dk brown soil w/gravel to cobbles		
	15-18-24	14		X	5	GW		Gravel and Sand dk brown 10YR 3/3 NP f-c gravel m-c sand silt dry/moist rounded	5	
								@ water		
	25-20-16	12		X	10	SW		Well graded sand with silt and gravel Dk brown 7.5YR 3/2 NP wet 50% gravel rounded f-c m-c sand 30%	10	
	40-20-16			X	15	SW		30-40% gravel fine angular 30-40% m-c sand trace silt	15	
								230 Linda Returns		
					20				20	
					25				25	

Continued Next Page

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Figure C-3

Parametrix, Inc.

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER
PROJECT NAME Evergreen Trail
LOCATION 19500 Union Hill Rd
COORDINATES
DRILLING METHOD Hollow Stem Auger
SAMPLING METHOD Split Spoon
GROUND ELEVATION @ 100ft

BORING/WELL NUMBER # MW-3
DATE COMPLETED 3-4-03
TOTAL DEPTH OF BORING ~~200.0~~ 14 16.75 BTOC
INITIAL WATER LEVEL ▽ 4.35 btoc
STATIC WATER LEVEL ▼
LOGGED BY S. Matthews
TOP OF CASING ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	EXTENT	DEPTH (ft.)	U.S.C.S.	GRAPHIC LOG	GEOLOGIC DESCRIPTION	DEPTH (ft.)	WELL DIAGRAM
								Cobbles		34"
	2021-30	16		X		SM		Silty sand dk greenish grey 5GY 4/1 NP wet f-c sand		
					5				5	
	4-11-12			X		SW		Well graded sand dk greenish grey 5GY 4/1 NP wet f-c sand f-c gravel grain size increase w/depth s-a angular		
					10				10	
	8-15-19			X		SP		Poorly graded sand and gravel dk greenish grey 5GY 4/1 NP wet course sand f-c gravel angular		
					15				15	
					20				20	
								1.5 bag Sand 1 Bent		
					25				25	

Continued Next Page

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Figure C-4

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SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More Than 50% Retained on No. 200 Sieve	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is in general accordance with ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GEOENGINEERS

SOIL CLASSIFICATION SYSTEM

FIGURE 7

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Date Excavated: 12/02/03 Logged by: MET

Equipment: Hand Auger Surface Elevation (ft):

Depth feet	Sample	Sample Number	Water	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0					ML	Dark brown sandy silt (medium stiff, wet)			
	X	1							
					SP-SM	Brown fine sand with silt (medium dense, wet)			
	X	2							
					CL	Brown clay (medium stiff, moist)			
	X	3							
	X	4			SM	Gray silty fine to medium sand with gravel (dense, moist)			
						Hand auger completed at 4.5 feet on 12/02/03 Groundwater seepage observed at 0.1 feet No caving observed			

Note: See Figure 7 for explanation of symbols

The depths on the hand auger logs are based on an average of measurements across the hand auger and should be considered accurate to 0.5 foot.

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0500-129-00 GEI_GTTESTPIT_2.1.0 P:\0\0500129\00\FINALS\050012900.GPJ GEIV2.GDT 12/11/03

LOG OF HAND AUGER HA-1

GEOENGINEERS

Project: Evans Creek Trail

Project Location: Redmond, Washington

Project Number: 0500-129-00

Figure: 8

Sheet 1 of 1

Date Excavated: 12/02/03 Logged by: MET

Equipment: Hand Auger Surface Elevation (ft):

Depth feet	Sample	Sample Number	Water	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0					ML	Dark brown sandy silt (soft, wet)			
					MH	Grayish brown elastic silt (medium stiff, moist)			
	X	1							
5						Hand auger completed at 5 feet on 12/02/03 Groundwater seepage observed at 0.5 feet No caving observed			

Note: See Figure 7 for explanation of symbols
The depths on the hand auger logs are based on an average of measurements across the hand auger and should be considered accurate to 0.5 foot.

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LOG OF HAND AUGER HA-2

GEOENGINEERS

Project: Evans Creek Trail
Project Location: Redmond, Washington
Project Number: 0500-129-00

Figure: 9
Sheet 1 of 1

Date Excavated: 12/02/03 Logged by: MET

Equipment: Hand Auger Surface Elevation (ft):

Depth feet	Sample	Sample Number	Water	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0					TS	Less than 1 inch topsoil			
					MH	Grayish brown elastic silt (medium stiff, moist)			
	X	1							
						Hand auger completed at 3.5 feet on 12/02/03 Groundwater seepage observed at 1.5 feet No caving observed			

Note: See Figure 7 for explanation of symbols

The depths on the hand auger logs are based on an average of measurements across the hand auger and should be considered accurate to 0.5 foot.

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LOG OF HAND AUGER HA-3

GEOENGINEERS

Project: Evans Creek Trail

Project Location: Redmond, Washington

Project Number: 0500-129-00

Figure: 10

Sheet 1 of 1

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Date Excavated: 12/02/03 Logged by: MET

Equipment: Hand Auger Surface Elevation (ft):

Depth feet	Sample	Sample Number	Water	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0					MH	Grayish brown elastic silt (soft to medium stiff, wet)			
	X	1							
	X	2			ML	Dark brown organic silt (soft, wet)			
5									
	X	3			MH	Grayish brown elastic silt (medium stiff to stiff, moist)			
						Hand auger completed at 7.5 feet on 12/02/03 Groundwater seepage observed at 0 feet No caving observed			

Note: See Figure 7 for explanation of symbols
The depths on the hand auger logs are based on an average of measurements across the hand auger and should be considered accurate to 0.5 foot.

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LOG OF HAND AUGER HA-4

GEOENGINEERS

Project: Evans Creek Trail
Project Location: Redmond, Washington
Project Number: 0500-129-00

Figure: 11
Sheet 1 of 1

Date Excavated: 12/02/03 Logged by: MET

Equipment: Hand Auger Surface Elevation (ft):

Depth feet	Sample	Sample Number	Water	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0					DUF	Forest duff and topsoil			
					ML	Dark brown organic silt (soft, wet)			
	X	1							
5						Grades to brown			
					SP	Sand and gravel with silt (medium dense to dense, wet)			No sample recovered
						Hand auger completed at 6.5 feet on 12/02/03 Groundwater seepage observed at 0.5 feet No caving observed			

Note: See Figure 7 for explanation of symbols
The depths on the hand auger logs are based on an average of measurements across the hand auger and should be considered accurate to 0.5 foot.

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LOG OF HAND AUGER HA-5

GEOENGINEERS

Project: Evans Creek Trail
Project Location: Redmond, Washington
Project Number: 0500-129-00

Figure: 12
Sheet 1 of 1

APPENDIX D
Report Limitations and Guidelines for Use

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APPENDIX D
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of the City of Redmond, HDR Engineering, Inc. and other project team members for the Evans Creek Relocation project. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-specific Factors

This report has been prepared Evans Creek Relocation project in Redmond, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

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For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

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A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

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Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

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Appendix E - Archeological Investigation Report

DRAFT—Results of Archaeological Monitoring and Phase I Cultural Resources Inventory for the Proposed Evans Creek Relocation Project, City of Redmond, Washington

Submitted to:
HDR, Inc.

Submitted by:
Historical Research Associates, Inc.
Jennifer Gilpin, MA
Jennifer Gebhardt, BA
Serah Timm, BA
Michele Punke, PhD, RPA
Lynn Compas, MA, RPA

Seattle, Washington
November 2013

Historical Research Associates, Inc.

This report was prepared by HRA Principal Investigator Jennifer Gilpin, MA, Michele Punke, PhD, and Lynn Compas, MA, who meet the Secretary of the Interior's professional qualifications standards for archaeology, and by Jennifer Gebhardt, BA and Serah Timm, BA. This report is intended for the exclusive use of the Client and its representatives. It contains professional conclusions and recommendations concerning the potential for project-related impacts to archaeological resources based on the results of HRA's investigation. It should not be considered to constitute project clearance with regard to the treatment of cultural resources or permission to proceed with the project described in lieu of review by the appropriate reviewing or permitting agency. This report should be submitted to the appropriate state and local review agencies for their comments prior to the commencement of the project.

Executive Summary

The City of Redmond (City) is proposing to relocate approximately 3,000 linear feet (ft) of Evans Creek as part of restoration project. The proposed Evans Creek Relocation Project (Project) is located in the southeast quadrant of Section 6, Township 25 North, Range 6 East, Willamette Meridian. The City is working with HDR, Inc. (HDR), to design a possible route for the relocated creek through fields and wetlands to the north of the current creek's location. The Project will require a permit from the United States Army Corps of Engineers (USACE) and is defined as a federal undertaking; therefore, the project must satisfy the requirements of 36 CFR 800.13 of regulations implementing the National Historic Preservation Act (NHPA) of 1966, as amended.

For the purposes of this report, the Project's Area of Potential Effects (APE) is defined as the area encompassing the existing and potential Evans Creek alignments. The APE includes approximately 52 acres across 15 parcels. HDR contracted Historical Research Associates, Inc., (HRA), to conduct a Phase I cultural resources inventory of the APE. The complete Phase I inventory is comprised of archaeological monitoring, the first phase of which took place in 2013, and a surface and subsurface archaeological survey of the APE. In early summer, 2013, HRA prepared a monitoring plan and inadvertent discovery plan (MIDP) in advance of archaeological monitoring activities (Gilpin 2013).

HRA archaeologists monitored the excavation of 10 hand auger location on September 10 and 11, 2013. No cultural materials were observed. HRA conducted the Phase I inventory in September and October, 2013. No cultural resources were identified during archaeological monitoring in the APE. During surface and subsurface inventory of the APE, HRA recorded one archaeological site, the multi-component Lind Farm Complex (HRA-2045-1). The Lind Farm Complex includes both surface and subsurface components. The surface component is historic-period to modern in date, and the subsurface component includes precontact and historic-period artifacts.

HRA has not evaluated multi-component archaeological Site HRA-2045-1 for its eligibility for listing in the National Register of Historic Places. HRA recommends avoidance of ground disturbing activities within the site. HRA also recommends continued monitoring of geotechnical activities in the APE, due to the archaeological sensitivity of the APE. This recommendation also extends to excavation activities, once the realignment of Evans Creek is determined.

In the event that archaeological deposits are inadvertently discovered during construction in any portion of the APE, ground-disturbing activities should be halted immediately, and the City should be notified. The City would then contact the Department of Archaeology and Historic Preservation (DAHP) and the interested Tribes, as appropriate.

Any human remains that are discovered during construction of the Project will be treated with dignity and respect. The affected Native American Tribes are the Tulalip Tribes, Snoqualmie Indian Tribe, Muckleshoot Tribe, Snohomish Tribe, and the non-Federally recognized Duwamish Tribe.

If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity that may cause further disturbance to those remains **must** cease, and the area of the find must be secured and protected from further disturbance. In addition, the finding of human skeletal remains **must** be reported to the King County Medical Examiner (ME) **and** local law enforcement in the most expeditious manner possible. The remains should not be touched, moved, or further disturbed.

The ME will assume jurisdiction over the human skeletal remains, and make a determination of whether those remains are forensic or non-forensic. If the ME determines the remains are non-forensic, they will report that finding to the DAHP. DAHP will then take jurisdiction over those remains and report them to the appropriate cemeteries and affected tribes. The State Physical Anthropologist will make a determination of whether the remains are Indian or non-Indian, and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

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1. Introduction and Project Description

The City of Redmond (City) is proposing to relocate approximately 3,000 linear feet (ft) of Evans Creek as part of restoration project. The proposed Evans Creek Relocation Project (Project) is located in the southeast quadrant of Section 6, Township 25 North, Range 6 East, Willamette Meridian (Figure 1-1). The City is working with HDR, Inc. (HDR), to design a possible route for the relocated creek through fields and wetlands to the north of the current creek's location. The route addressed by this Project extends through parcels owned by private entities and by the City. The proposed creek relocation is located on lands adjacent to the Washington State Department of Transportation (WSDOT) mitigation project. WSDOT has already conducted cultural resources work associated with their project and it is currently under construction.

HDR contracted Historical Research Associates, Inc., (HRA), to conduct a Phase I cultural resources inventory for the Project. The complete Phase I inventory is comprised of archaeological monitoring, the first phase of which took place in 2013, and a surface and subsurface archaeological survey of the APE. In early summer, 2013, HRA prepared a monitoring plan and inadvertent discovery plan (MIDP) in advance of archaeological monitoring activities (Gilpin 2013). Consultation with the United States Army Corps of Engineers (USACE) and Department of Archaeology and Historic Preservation (DAHP) is ongoing. The second phase of archaeological monitoring will take place in 2014.

1.1 Regulatory Context and the Area of Potential Effects

1.1.1 Regulatory Context

The Project will require a permit from the USACE and is defined as a federal undertaking; therefore, the project must satisfy the requirements of 36 CFR 800.13 of regulations implementing the National Historic Preservation Act (NHPA) of 1966, as amended. These requirements concern the consideration of cultural resources when designing and implementing a federal undertaking.

This archaeological monitoring and inventory report is meant to fulfill partial compliance with applicable Federal and State laws and regulations, particularly Section 106 of the NHPA and Title 27, Revised Code of Washington (RCW), Chapter 27.44, Indian Graves and Records.

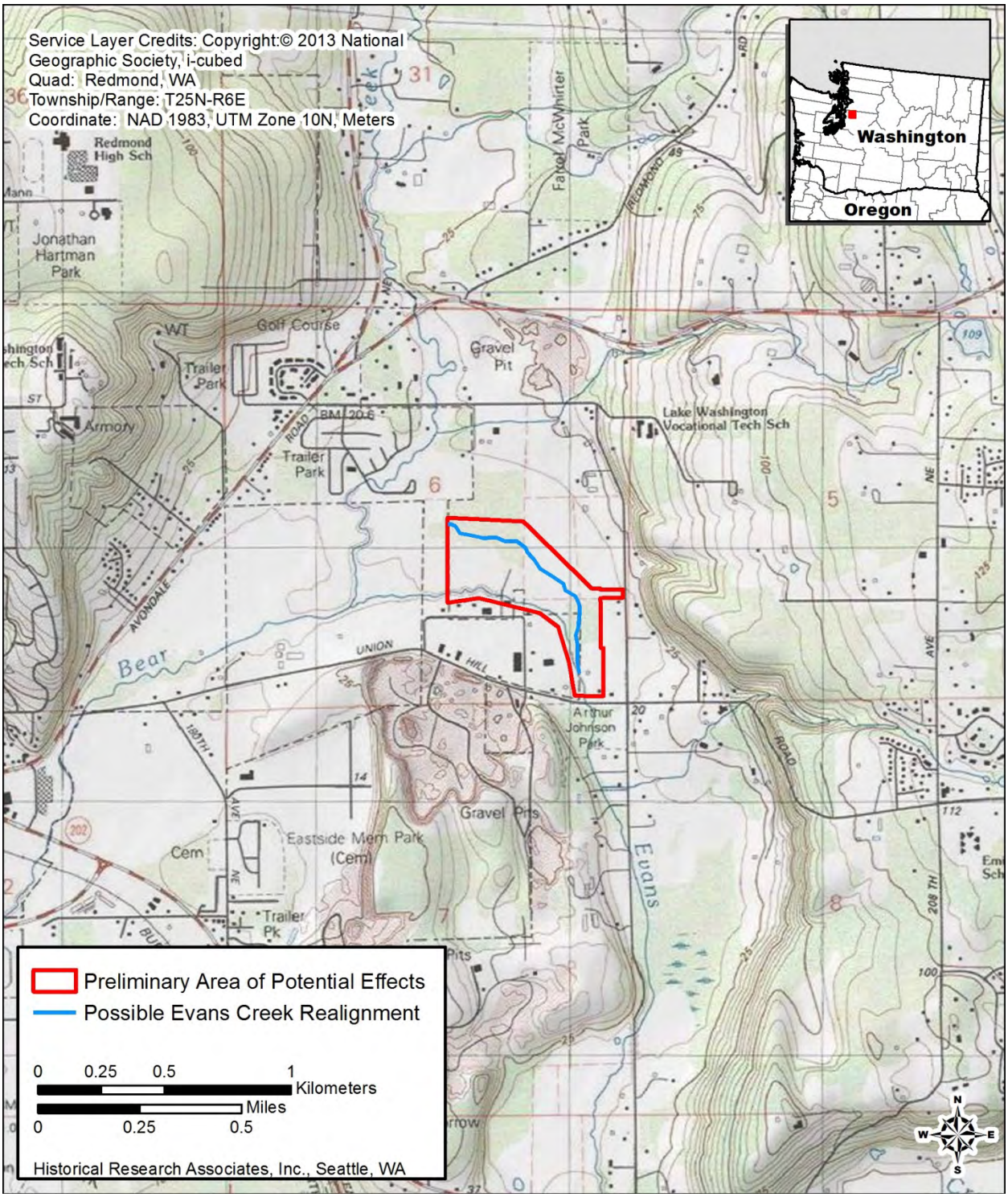

Figure 1-1. Location of the Project APE and vicinity.

1.1.2 Area of Potential Effects

The Area of Potential Effects (APE) is defined as the portion of a project that has the potential to directly or indirectly impact historic properties. Historic properties are cultural resources (including archaeological sites and buildings, structures, or objects [BSOs]) that are deemed eligible for listing in the National Register of Historic Places (NRHP).

The USACE, as lead Federal Agency, will ultimately define the APE. For the purposes of this report, however, the APE is defined as the area encompassing the existing and potential Evans Creek alignments (Figure 1-2). The APE includes approximately 52 acres across 15 parcels. The APE includes the confluence of Evans Creek with a west-flowing stream, referred to as Stream 0107 (Williams et al. 1997). There are extensive wetlands at the confluence of these drainages, and the area has been more saturated than it would normally be due to the presence of a beaver dam on Stream 0107 just upstream from Evans Creek.

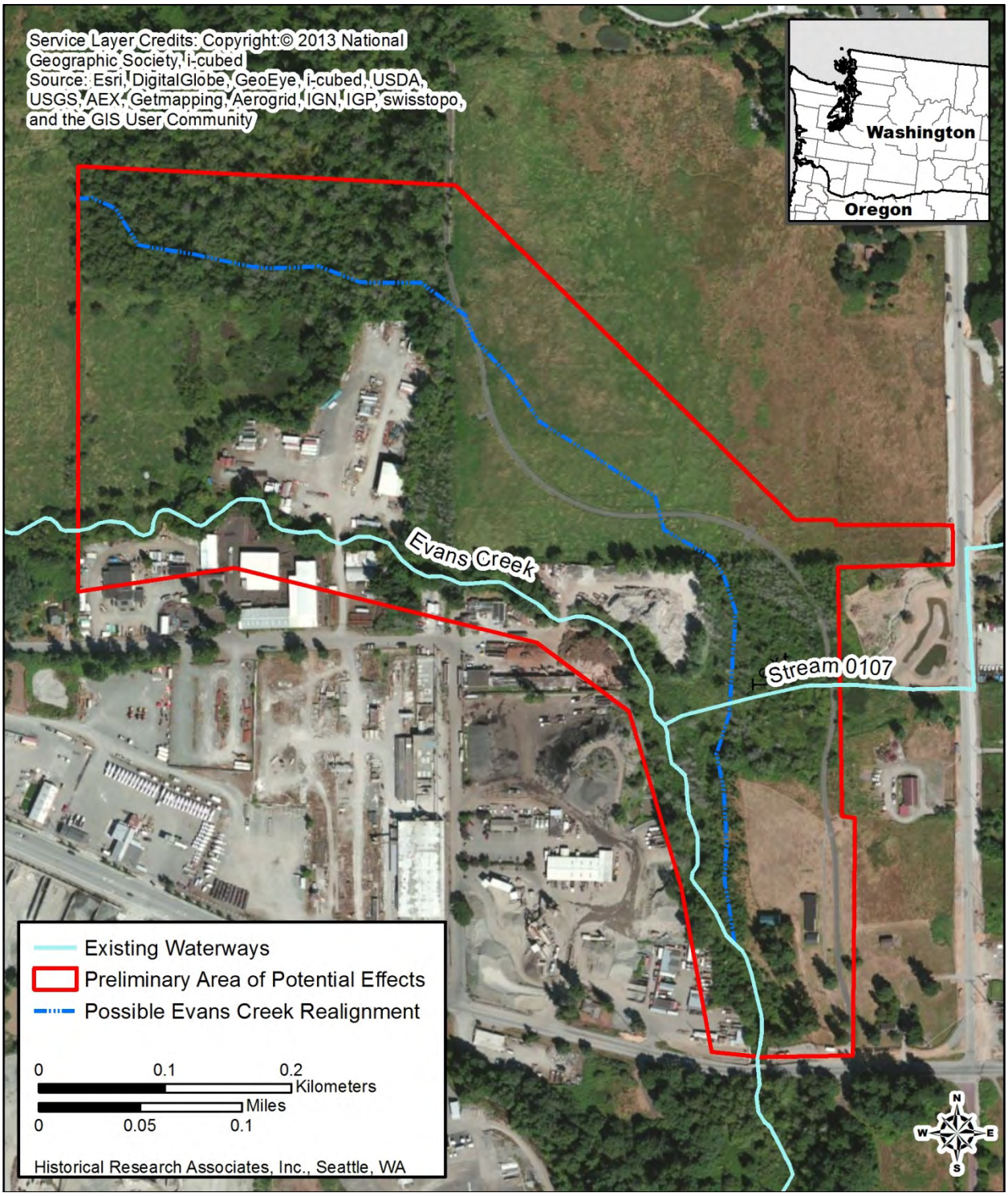

Figure 1-2. Closer view of the Project APE with aerial background.

2. Archival Research

This chapter provides a review of archival data including previous cultural resources surveys; documented archaeological sites, historic sites, structures, and objects; and historic maps. Understanding previous cultural resource surveys and known cultural resources in the vicinity of a project is important for understanding how intensively work has been conducted in the area. This archival research is necessary for developing expectations for identifying cultural resources during the fieldwork portion of this Project, which will be outlined in Section 5.

2.1 Research Methods and Materials Reviewed

In advance of archaeological monitoring and archaeological inventory, HRA archaeologist Jennifer Gilpin, MA, conducted an archival record search for documentation pertaining to an approximately 1 mile (mi) radius of the proposed APE. Ms. Gilpin searched DAHP's online database—the Washington Information System for Architectural and Archaeological Records Database (WISAARD)—for archaeological site records, cultural resource survey reports, historic register information, and cemetery records. The statewide archeological predictive model on DAHP's WISAARD was reviewed for probability estimates for archaeological resources, and to aid in developing the field strategy.

There are, at this time, no anticipated above-ground impacts associated with the Project; therefore, the search radius for above-ground BSOs was limited to parcels within the APE, for the purposes of research into past construction on and/or use of the landform. These are recorded on historic property inventory (HPI) forms, which are found on WISAARD.

2.2 Archival Research Results

The following sections are a summary of the information presented in the Project's MIDP (Gilpin 2013). Updated information has been added as necessary.

2.2.1 Previous Cultural Resources Studies

According to the records on file at the DAHP, 20 cultural resources studies have been conducted within approximately 1 mi of the APE (Table 2-1). Two of these studies have been recorded within the APE. The first focused on above-ground historic structures in the City of Redmond (Emerson and Gundy 1998). The second study followed 196th Avenue (Ave) NE, overlapping the easternmost arm of the APE by approximately 80 ft on the west side of the road; however, fieldwork was not conducted along this side of the road, as entry was denied to the properties from Perrigo

Community Park to Union Hill Road (Rd) (Demuth et al. 2008a:17). Several additional studies have been conducted adjacent to the APE, associated with road and highway improvement projects (AMEC 2007; CH2M Hill and ICF Jones & Stokes 2009; Demuth et al. 2008b; Elder and Perkins 2012; Ferris et al. 2010; Kiers 2008).

Table 2-1. Previous cultural resources studies performed within approximately 1 mi of the APE.

NADB #	Reference	Title	Distance from APE	Identified Cultural Resources (in search radius)
1339738	Robinson 1993	*A Cultural Resource Study of the 196th Avenue N.E. Corridor, King County, Washington*	~ 330 ft E	None
1339762	Robinson 1996	*A Cultural Resources Survey of a Portion of the King County Department of Transportation's Northeast Novelty Hill Road Project, King County, Washington*	~ 0.5 mi NE	None
1339825	Norman 1999a	*Re: Heritage Resource Monitoring of Construction at the Millennium Corporate Park*	~ 340 ft W	Bear and Evans Creek Site (45KI466) and the Union Hill Site (45KI467)
1339826	Norman 1999b	*Re: Archaeological Testing and Monitoring for Phase II Construction at Millennium Corporate Park*	~ 340 ft W	Two lithic flakes; additional prehistoric and historic components to the Union Hill Site (45KI467)
1340492	Emerson and Gundy 1998	*A 1998 Inventory of 165 Historic Properties Within the City of Redmond, King County, Washington*	Overlaps	
1340843	Lewarch 1997	*Review of Archaeological Data for the Millennium Corporate Park Vicinity, Redmond, Washington*	~ 340 ft W	None within current search radius
1340846	Moore et al. 1997	*Cultural Resource Survey of the Proposed Millennium Project Interim Report*	~ 340 ft W	Historic-period FMR*; no significant archaeological deposits. One potentially-historic structure (owner will document)
1340879	Norman 2002	*Archaeological Investigation for the Bear Creek Mitigation/Planting Site*	~ 700 ft NW	None
1346126	Greenawalt et al. 2005	*Perrigo Heights Archaeological Resources and Traditional Cultural Places Assessment, King County, Washington*	~ 0.6 mi NW	None

NADB #	Reference	Title	Distance from APE	Identified Cultural Resources (in search radius)
1349527	Hartmann 2007	*Cultural Resources Assessment for Union Hill Road NE between Avondale Road and 178th Place NE Project, Redmond, Washington.*	~ 0.8 mi SW	None
1350299	Gilpin and Gillespie 2007	*Cultural Resources Survey and Evaluation for the Puget Sound Energy Union Hill HP Project, City of Redmond, King County, Washington.*	~ 330 ft E	Historic-period isolated find 45KI771
1351971	AMEC 2007	*NE Novelty Hill Project: Cultural Resources Discipline Report*	Adjacent (to south and east)	Prehistoric site 45KI834
1351972	Demuth et al. 2008a	*Final Cultural Resources Section 106 Technical Report: NE Novelty Hill Road Project – Phase I*	Adjacent (to south)	Prehistoric site 45KI834
1351973	Kiers 2008	*Results of Archaeological Survey and Testing Investigations for the NE Novelty Hill Road Project, King County, Washington*	Adjacent (to south)	Prehistoric site 45KI834
1351974	Demuth et al. 2008b	*Final Cultural Resources Section 106 Technical Report: NE Novelty Hill Road Project – Phase II*	Adjacent (to south)	Prehistoric isolated finds 45KI835, 45KI836; eight BSOs
1352313	Stegner and Kelly 2008	*USPS Redmond Cultural Resources Survey, King County, Washington*	~ 0.6 mi SW	None
1353703	CH2M Hill and ICF Jones & Stokes 2009	*Appendix K: Cultural Resources Technical Memorandum – Environmental Assessment SR 520 Bridge Replacement and HOV Program, SR 520, Medina to SR 202; Eastside Transit and HOV Project.*	Adjacent (to west)	Keller Site-1 (adjacent to 45KI466)
1354785	Zuccotti and Hoffman 2010	*Cultural Resources Survey for the City of Redmond's 185th Avenue NE Extension, Redmond, Washington.*	~ 0.1 mi SW	None
1681269	Ferris et al. 2010	*NE Novelty Hill Road Project, Site 45KI834 Data Recovery Investigations Report*	~ 0.3 mi NE	Site 45KI834

NADB #	Reference	Title	Distance from APE	Identified Cultural Resources (in search radius)
1682033	Elder and Perkins 2012	*Cultural Resources Investigation at Evans Creek (Keller) Mitigation Site*	Adjacent (west end)	Site 45KI466

*FMR-Fire-Modified Rock

Please refer to the MIDP (Gilpin 2013) for details about these surveys. One observation is of interest to reiterate here, however. Although Joan Robinson did not record cultural resources during survey of the 196th Ave corridor, it was assigned a "moderate potential for unrecorded cultural resources," based on topography (i.e., the presence of nearby Evans Creek and associated wetlands) and the existence of an "Indian ceremonial ground that is supposed to have been located at 196th and Union Hill Road, just outside project boundaries" (Robinson 1993:6). The presence of several precontact to multi-component archaeological sites and isolated finds (Section 2.2.2) further heightens the sensitivity of the APE.

2.2.2 Previously Recorded Cultural Resources

Two precontact archaeological sites, two multi-component archaeological sites, three precontact isolates, and one historic-period isolate have been previously recorded within approximately 1 mi of the APE (Table 2-2). Of these, one site has been recommended eligible for the NRHP and Washington Heritage Record (WHR), and has undergone data recovery excavations (45KI834). A summary of the precontact and multi-component sites and isolates is presented below, as they are indicators of past land use and settlement patterns which influenced HRA's predictive model for this project. The historic-period isolate, 45KI771, was a surface find, likely out of context, but is representative of the dairy activities that took place in the project vicinity during the historic period (Gilpin 2007; Gilpin and Gillespie 2007).

Two archaeological sites have been recorded in the vicinity of the confluence of Bear and Evans Creeks, namely the Bear and Evans Creek Site (45KI466) and the Union Hill Site (45KI467). These sites were observed on the creek bank and comprise a mix of precontact lithic materials—such as basalt cores and edge-modified basalt flakes, red jasper flakes, and petrified wood artifacts and debitage—and historic-period debris. Precontact artifacts were observed on the surface to approximately 25 centimeters below surface (cmbs) at Site 45KI466 and to 7 cmbs at Site 45KI467. Historic-period materials, which included colorless, green, and amethyst glass shards; metal fragments; chunks of coal; and crushed rock, along with, at Site 45KI466, features including a gravel road and small log bridge, were identified from the surface to between 30 and 50 cmbs. The range of depths for both precontact and historic-period artifacts indicates a moderate degree of disturbance to the sites (Livingston et al. 2009; Norman 1999c, 1999d). According to WISAARD, neither site has been formally evaluated for eligibility for listing in the WHR or NRHP.

Table 2-2. Previously-recorded archaeological sites located within approximately 1 mi of the APE.

Resource ID	Location	Resource Type	Landform	Cultural Materials	NRHP/WHR Eligibility Status
45KI466	~ 330 ft W	Precontact lithic material; historic-period debris scatter; historic period road	Creek terrace	Prehistoric (basalt flakes; jasper flakes; petrified wood chunk and flake; basalt cores; edge-modified basalt cobbles) and historic (colorless and green glass; rusted metal fragments; coal slag; crushed rock) scatters. Also FMR* and charcoal, likely historic and associated with clearing. Historic period road and log bridge.	Not evaluated
45KI467	~ 0.3 mi SW	Precontact lithic material; historic debris scatter	Creek terrace, floodplain	Prehistoric (small lanceolate petrified wood projectile point; jasper flake fragment); FMR (likely historic); CCS** flake; basalt flake fragment. Also historic artifacts (2 fragments of amethyst glass).	Not evaluated
45KI771	~ 0.1 mi E	Historic-period isolated find	Base of outwash terrace, hillslope	Milk can observed during pedestrian survey east of APE	Not evaluated
45KI834	~ 0.3 mi NE	Precontact lithic material	Creek terrace	Leaf-shaped hafted biface; interior and cortical flakes (dunite, CCS, CVR***, quartz, obsidian); shatter; and FMR (no features)	Recommended eligible
45KI836	~ 0.2 mi NE	Precontact lithic isolated find	Creek terrace	Basalt debitage	Not evaluated
45KI837	~ 0.25 mi NE	Precontact lithic isolated find	Creek terrace	Chert flake	Not evaluated
45KI988	~ 0.2 mi NE	Precontact lithic isolated find	Creek terrace / Alluvial floodplain	Secondary basalt flake	Not evaluated
45KI1101	~ 0.2 mi NE	Precontact lithic scatter	Alluvial floodplain	Two basalt flakes	Not evaluated

*FMR-Fire-Modified Rock; **CCS-Cryptocrystalline Silicate; ***CVR-Crystalline Volcanic Rock

Archaeological site 45KI834, located approximately 0.3 mi northeast of the APE, was first recorded in 2006 during survey ahead of proposed improvements to Union Hill Rd. The precontact lithic scatter is located southeast of Stensland Creek, a tributary to Bear Creek, and it was tentatively identified as belonging to the Olcott period (see Section 4.2) due to the amount of weathering between flake scars and their location in a well-developed "B" soil horizon (Fallon 2006:3). Subsequent investigation of the site included Phase II testing and eventually data recovery excavations (Kiers 2007). During Phase II testing, artifacts were found from the surface to approximately 1 meter (m) below surface; however, they were identified in highest concentrations in the well-developed B horizon, between 40 to 60 cmbs (Kiers 2007:2; Smith 2008). The B horizon was typically described as a dark brown to dark yellowish brown silt to fine sandy loam with moderate gravel content (Kiers 2008:13–17).

During data recovery, one temporally diagnostic artifact was recovered from Site 45KI834—the leaf-shaped hafted biface base is a form that can occur from 9950 to 500 years before present (B.P.) (Blukis Onat et al. 2001). No materials suitable for radiocarbon or thermoluminescence dating techniques were observed (Ferris et al. 2010:6-3). The single obsidian flake was sourced to Obsidian Cliffs in the central Oregon Cascades. Although fire-modified rock (FMR) was observed within the site, and there were some concentrations, bioturbation (rodents burrowing) likely broke apart what may have been hearth features surrounded by lithic flaking stations. Ultimately, the small sample size and disturbed nature of deposits made affiliation with the Olcott complex uncertain, and few inter-site comparisons could be made (Ferris et al. 2010:6-4, 6-5).

The second precontact archaeological site in the search radius is 45KI1101, located in close vicinity to Site 45KI834 northeast of the APE. This archaeological site consists of only two basalt flakes observed in two adjacent shovel probes, spaced 5 m apart, at approximately 10 to 20 cmbs. One small clear glass fragment and a curved thin plastic fragment were also recovered from these probes, suggesting additional historic-period or modern disturbances (Craig and Hoffman 2010b).

Three precontact isolated finds have been recorded within approximately 0.25 mi northwest of the APE, on the Bear Creek floodplain. They include Isolate 45KI836, a piece of basalt debitage identified in a shovel probe at approximately 65 cmbs, and Isolate 45KI837, a small chert flake found approximately 45 cmbs in a second shovel probe. Isolate 45KI988, a large secondary basalt flake, was recovered from approximately 80 to 85 cmbs in a shovel probe nearby, but on a different project (Craig and Hoffman 2010a; Hoffman 2008a, 2008b).

The presence of archaeological materials within the upper 50 cm to 1 m within shovel probes placed on terraces adjacent to Evans Creek and on the nearby floodplain heightens the probability that similar artifacts may be observed within the APE.

2.2.3 Cemeteries

The closest cemeteries to the APE are located approximately 0.6 to 0.7 mi to the southwest. The Old Redmond Cemetery was started in the 1880s by the local Perrigo and Tosh families, and the Redmond Cemetery was formally established in 1904. The Cedar Lawns Memorial Park, situated adjacent to the Old Redmond Cemetery was established in 1952 (DAHP 2013b, 2013c).

2.2.4 Historically Significant Properties

One property in the search radius, the Yellowstone Road, was listed on the NRHP and WHR in 1974. This property is located approximately 330 ft east of the southeast corner of the APE (DAHP 2013a). The Old Red Brick Road (a portion of the Old Yellowstone Road) was an important transportation route through the Redmond area. The roadway itself was first established in 1901 and was the site of the first Transcontinental Automobile Race in 1909. The James Mattson Road (as it was then called) was resurfaced with brick in 1913. In 1923, the Red Brick Road was folded into the nation-wide highway system known as the Yellowstone Trail—a road system that spanned from Boston to Seattle (approximately 3,300 mi). A portion of the Red Brick Road exists under Union Hill Rd, although it is paved over. The visible portion of this historic route, now 196th Ave NE, extends 1.3 mi south from Union Hill Rd until 55th Place (Pl) NE, through the formerly-agricultural Evans Creek Valley (Rooke 2006).

Although the Project is not anticipated to present an effect to aboveground resources, WISAARD was searched to determine if BSOs have been recorded adjacent to the APE since archaeological materials may be associated with aboveground properties. Twelve additional BSOs have been recorded adjacent to or within the APE (Table 2-3). The historic contexts of these BSOs reflect the transition from agricultural to manufacturing and residential use of this portion of Redmond.

Table 2-3. Historic-period buildings, structure, or objects recorded in the immediate vicinity of the APE.

Author(s)	Date	Parcel #	Address	Year Built	Comments
Cziesla.	2007a	0625069046	8335 196th Ave NE	1951	Single family house and two outbuildings. Recommended ineligible.
Flathman	2007a	0625069122	8503 196th Ave NE	1932	Single family house in vernacular style (retains many original features). Recommended ineligible.
Flathman	2007b	0625069029	8733 196th Ave NE	1939	Single family house in vernacular style. Garage added in 1955. Recommended ineligible.

Author(s)	Date	Parcel #	Address	Year Built	Comments
Cziesla	2007b	0625069100	9215 195th Ave NE	1918	Single-family house and barn. Significantly modified since construction. Recommended ineligible.
Flathman and Harvey	2008	0625069044	8504 192nd Ave NE	1924	Originally Gilbert farm residence with multiple outbuildings. Modified into manufacturing/ industrial facility by the 1970s. Recommended ineligible.
Artifacts Consulting, Inc.	2011a	0625069129	19020 NE 84th St	1921	Professional building, remodeled in 1940.
Artifacts Consulting, Inc.	2011b	0625069018	19114 NE 84th St	1947	Manufacturing facility remodeled in same year as construction.
Bean	1985	0625069039	18844 NE 84th St	1920	Silver Shirt Legion Hall; Arthur and Rubie Johnson House. Bungalow residence recommended eligible under Criteria A and B.
Flathman and Harvey	2007	0625069034	19220 NE 80th St	1952	Ranch-style house, modified extensively into the current office building. Recommended ineligible.
Gillespie	2007	0625069050	19520 Union Hill Rd	1951	One and a half story residence with extensive modifications. Recommended ineligible.
Flathman	2007c	0625069060	19416 NE Union Hill Rd	1945	Albert Lind Farm. Barn and chicken house. Gambrel roof barn recommended eligible under Criterion C.

Author(s)	Date	Parcel #	Address	Year Built	Comments
Demuth and Flathman	2012	----	Vicinity of Union Hill Rd	1913	Evans Creek Bridge (Bridge 952a), associated with the Old Red Brick Road (Yellowstone Road). Significantly modified since construction. Determined not eligible.

The majority of the BSOs in Table 2-3 were recommended ineligible for national or state registers based on the current research. Two properties located in the APE have been recommended eligible for listing in the NRHP. The first is the Arthur and Rubie S. Johnson residence and Silver Shirt Legion Hall, which was located in the southwest portion of the APE at 18844 NE 84th Street. The Johnsons hosted meetings of the right-wing, pro-Hitler Silver Shirt Legion on their property, and, by the 1950s, were involved in the founding of a second community called East Redmond, whose government convened at the Johnsons' residence (Bean 1985).

The second is the gambrel roof barn recorded as part of the Lind Farm at 19416 NE Union Hill Rd, at the southeast end of the APE. The Lind Farm complex once contained a residence, which was removed in 2002. The two extant outbuildings (the chicken house and a second structure) are cited as more common examples of mid-twentieth century agricultural construction and were not recommended eligible for the NRHP or King County Landmarks Register (KCLR). The gambrel roof barn, however, retains characteristics of mid-twentieth century agricultural building construction and was recommended eligible for the NRHP under Criterion C (Flathman 2007c). To date, the DAHP has not concurred with this recommendation.

2.2.5 Historic Plat Map Research

HRA examined historic-period maps to identify additional cultural features and, where feasible, land ownership in the APE (Table 2-4). The 1874 General Land Office (GLO) plat for Township 25 North, Range 6 East, contains no cultural features in the APE. Evans Creek is depicted as flowing more northerly through the east half of the section (Figure 2-1). Examination of the Kroll Map Company and Metsker Map Company maps shows varying locations for Evans Creek; it is uncertain if the creek has moved that much or if the depictions are due to simple mapping error. HRA also referenced Sanborn Fire Insurance Company Maps for Redmond, Washington (available as an electronic reference at the Seattle Public Library), and determined that they did not cover the vicinity of the APE.

2.2.6 DAHP Predictive Model and Archaeological Sensitivity

DAHP's predictive model is based on statewide information, using large-scale factors. Information on geology, soils, site types, and landforms, and GLO maps were used to establish or predict

probabilities for prehistoric cultural resources throughout the state. DAHP's model uses five categories for the predictions: Low Risk, Moderately Low Risk, Moderate Risk, High Risk, and Very High Risk. The DAHP predictive model map indicates a Very High Risk in the APE. This high sensitivity is representative of the APE's location within the vicinity of multiple freshwater creeks and drainages.

Table 2-4. Historic period maps referenced for archival research.

Map Reference	Ownership	Cultural Features and Comments
General Land Office Surveyors Map (USSG 1874)	None shown	No structures depicted. Evans Creek flows northward through eastern half of APE.
Snohomish, Washington Topographic Map (USGS 1897)	None shown	One structure depicted in APE, at southeast end, west side of Evans Creek. Evans Creek appears to be in or close to current alignment.
King County Atlas (Anderson Map Company 1907)	Jas. Campbell owns SE ¼ of Section 6, T25N, R6E	No structures depicted. Evans Creek in similar alignment to present; Bear Creek intrudes into NW corner APE.
Atlas of King County, Washington (Kroll Map Company 1912)	Campbell Lumber Company owns SE ¼ of Section 6, T25N, R6E	No structures depicted. Evans Creek flows northward through eastern half of APE.
Atlas of King County, Washington (Kroll Map Company 1926)	West half APE owned by (west to east) A. Johnson, Nels Oslund, and Campbell Lumber Co. East half APE owned by (north to south) H. O. Birkeland, M. J. Kelly (et al.), A. A. Gray, and Campbell Lumber Co.	No structures depicted. Evans Creek flows northward through eastern half of APE.
Atlas of King County, Washington (Metsker 1936)	West half APE owned by (west to east) A. Johnson, Nels Oslund, and Jno. Lindgren. East half APE owned by (north to south) H. O. Birkeland, M. J. Kelly (et al.), Jno. Benson, A.A. Gray, and C. Lindstrom	No structures depicted. Evans Creek flows north of current alignment, close to proposed alignment.
Redmond, Washington 7.5-Min topographic map (USGS 1950)	None shown	Multiple structures depicted in APE, none appear along proposed stream realignment

3. Environmental Context

The environmental context presented here is largely a summary of that prepared for the MIDP (Gilpin 2013). However, additional research has been conducted into the geomorphology of the APE.

3.1 Topography and Geology

The project APE is situated in the Puget Lowlands geographic zone, in the larger Sammamish River valley at approximately 50 ft above mean sea level (amsl). The Puget Trough physiographic province stretches the entire length of Washington State from the Canadian border to the Oregon border. The landscapes within the Puget Trough are characterized as having moderate relief, rarely exceeding an elevation of 525 ft. The rolling topography surrounding the APE is primarily a result of Pleistocene glaciation (Franklin and Dyrness 1973).

During the most recent glacial episode, known as the Fraser Glaciation (circa 19,000 to 16,000 years ago), the region surrounding the APE was scoured and covered by the Puget Lobe of the Cordilleran Ice Sheet (Dethier et al. 1995; Porter and Swanson 1998). After approximately 17,000 years ago, the continental glaciers in northwestern Washington receded rapidly northward, reaching the Seattle vicinity by approximately 17,500 years ago. Glacier formation and retreat left proglacial lakes—such as nearby Lake Bretz—and deposits of gravelly to clayey till, drift, and sandy to gravelly outwash sediments over a majority of the area. The Lake Sammamish and Sammamish River trough was likely formed by subglacial erosional processes rather than recessional erosion (Booth 1994).

By 16,000 years ago, the glaciers had retreated completely, meltwaters were able to drain fully into Puget Sound (draining the proglacial lakes), and the landforms of the region responded through rapid isostatic rebound, taking the next several thousand years (until around 12,500 years ago) to achieve equilibrium with sea levels (Beechie et al. 2001; Dethier et al. 1995; Galster and Laprade 1991; Thorson 1981; Waitt and Thorson 1983). During the immediate post-glacial period, streams and rivers would have rapidly cut down through the unconsolidated glacial deposits, forming a series of terraces. Evans and Bear Creek likely formed during this time, along with associated tributaries. The APE also includes a stream entering Evans Creek at approximate River Mile (RM) 2.5. This creek is unnamed but referred to as Stream 0107 in Williams et al. 1997. A wetland complex surrounds the confluence of Stream 0107 and Evans Creek.

Mazama ash overlying peat deposts on the Sammamish River delta in Lake Washington suggest that, around 7,000 years ago, the shoreline of that lake was approximately 34 ft lower than the contemporary shoreline (Thorson 1998). The rising water levels in Lake Washington, due to the

same process in the ocean just described, would have caused the base level of the Sammamish River and its tributaries to rise, flattening their gradients and triggering the deposition of silts and development of peaty wetlands (Kopperl et al. 2010; Thorson 1998). At the nearby Bear Creek Site (45KI839), archaeologists noted weathered, probably reworked Mazama ash overlying peat deposits in what they termed Stratum V. This lens was observed by approximately 30 to 50 cm below the graded ground surface, and the overall depth was up to 1.5 m below the original ground surface. The upper levels of peat have been radiocarbon dated to between 9090 and 8730 cal B.P. (Kopperl et al. 2010:21, 33, 39).

Approximately 1,100 years ago, an earthquake occurred along the Seattle Fault, which bisects Lake Sammamish. Evidence from the West Point archaeological sites indicates that area subsided around 3 ft, and it is possible that the APE may have subsided around the same amount as it is located close to the same distance north of the fault line (Atwater and Moore 1992; Kopperl et al. 2010; Larson and Lewarch 2005; Lewarch et al. 2000; Troost and Stein 1995).

Figure 3-1 shows the surficial geology of the APE on a 1973 topographic quadrangle. The "Qoal" geological unit (south of the APE) is an early- to mid-Holocene alluvial deposit forming low terraces or "eroded base-of-slope accumulation" (Minard and Booth 1988), while the "Qyal" unit (within which the APE is situated) is a mid- to late-Holocene deposit consisting of fine grained sands, silts, and clays derived from recessional outwash deposits further upstream along Bear Creek. Archaeological sites 45KI466 and 45KI467 are located within the "Qyal" unit. Northeast of the APE, in the area where archaeological sites and isolated finds 45KI836, 45KI837, 45KI988, and 45KI1101 have been recorded, the surficial geology is mapped as "Qvry"—these are "younger recessional outwash deposits" from the drainage of Lake Bretz (Minard and Booth 1988). These sediments are older, and presumably more stable, than the Qyal unit that comprises the APE.

There is no LIDAR data for the APE, but examination of the 10-m digital elevation model (DEM) shows a small topographic high along the southern/southwestern edge of the APE. The soils data for the location suggest that the majority of the project area has served as a floodplain for Evans Creek, except for the southwestern margin of the project area which is composed of older, more gravelly alluvium (the Qoal unit, Minard and Booth 1988). The subsurface soil series mapped by the Natural Resources Conservation Service (NRCS) within the APE consist of alluvial sediments of the Everett and Puget series. Everett gravelly sandy loam sediments, present in the south and southeast portions of the APE, reflect glacial and alluvial forces behind the ancient formation of the Bear and Evans Creek floodplain. Sediments in this series are excessively drained, underlain by very gravelly sands at 18 to 36 inches and formed from glacial outwash deposits. Other areas of the APE, notably the northern portions, include poorly drained Puget silty clay loam, which forms in floodplains of recent alluvium. The Puget series in the APE has been mapped to consist of silty clay loam to 45 inches, overlying silty clay (Snyder et al. 1973; Soil Survey Staff 2013).

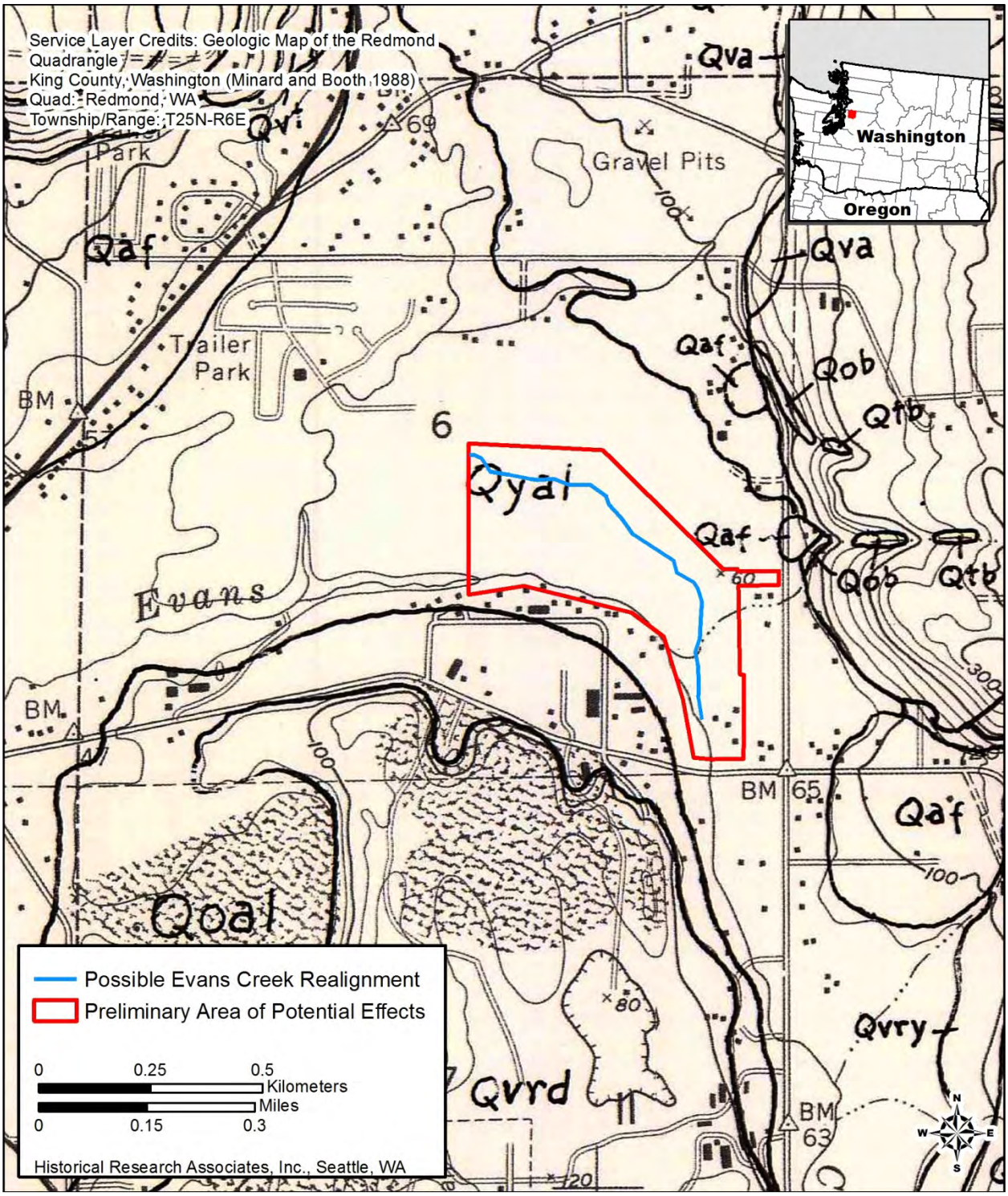

Figure 3-1. APE superimposed on georeferenced geologic map of the Redmond Quardangle (Minard and Booth 1988).

The majority of the APE may have been a wetland in the past, and there has most likely been a lot of meandering activity by the creek in the last few thousand years (although no former meander channels were indicated by the soils, DEM, or geology). It is possible that archaeological deposits are buried in the floodplain, since the location is likely aggrading over time.

3.2 Climate and Vegetation

The environment, both climatic and vegetational, of the APE has changed dramatically since the end of the Fraser Glaciation. Between approximately 13,000 and 12,000 years ago, after glacial retreat, the region developed a much cooler and drier climate which supported an ecosystem characterized by lodgepole pine (*Pinus contorta*), sedges (*Cyperaceae* sp.), sage (*Artemisia*), and a variety of grasses and herbs (Barnosky 1984; Barnosky et al. 1987; Brubaker 1991; Whitlock 1992). After 12,000 years ago, the climate warmed while continuing to dry, and Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and red alder (*Alnus rubra*) joined the developing parkland forest. This warm, dry period lasted from 12,000 to approximately 7,000 years ago, which was characterized by relatively high summer temperatures and more frequent summer droughts. The Douglas fir and western hemlock may have altered the amount of light that breached the forest canopy, reducing foliage in the understory and opening up the forest in general. Prairies were also more common due to drier climatic conditions (Barnosky et al. 1987; Brubaker 1991; Whitlock 1992).

The climate of the region had cooled and moistened to levels comparable to today's maritime regime around 6,000 years ago, producing the current Western Hemlock (*Tsuga heterophylla*) vegetation zone. Except for urbanized areas, the Western Hemlock Zone is the primary vegetative zone west of the Cascade Range. This maritime climate is generally characterized by less than 100 inches of precipitation annually, most of which falls as rain, and summer droughts typical of western Washington (Franklin and Dyrness 1973).

In the moist areas of the Western Hemlock Zone, western hemlock and western redcedar (*Thuja plicata*) dominate the overstory, along with Douglas fir (*Pseudotsuga menziesii*), madrona (*Arbutus menziesii*), and grand fir (*Abies grandis*). The typical understory in the Western Hemlock zone includes devil's club (*Oplomanax horridum*), vine maple (*Acer circinatum*), dull Oregon grape (*Mahonia nervosa*), oceanspray (*Holodiscus discolor*), rhododendron (*Rhododendron macrophyllum*), salal (*Gaultheria shallon*), and various ferns. In riparian and disturbed areas, deciduous trees such as red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), willow (*Salix* sp.), and black cottonwood (*Populus balsamifera*) are often common, with an understory including salmon berry (*Rubus spectabalis*), skunk cabbage (*Lysichiton americanus*), horsetail (*Equisetum sp.*), and water parsley (*Oenanthe sarmentosa*) (del Moral 1997; Franklin and Dyrness 1973).

GLO survey notes indicate that, historically, the vicinity of the APE consisted of gently rolling topography with 1st- to 3rd-rate soils. Bear Creek, to the west and northwest, is described as sandy and "50 links wide and 2 feet deep" (USSG 1873) with an increasingly gravelly-bottomed as it flowed

south. At the time of the GLO surveys, vegetation in the wetter areas surrounding the APE consisted of cedar "swamps" and patches of skunk cabbage (USSG 1873).

Currently, the inventoried portions of the APE contain four fairly distinct vegetational groups:

- Lind Farm Terrace: The southeast portion of the APE is a raised terrace, supporting short grasses across much of the terrace, along with native and non-native species including big-leaf maple (*Acer macrophyllum*), Douglas fir, both imported and native hazelnut (or Filbert, *Corylus* sp.), birch (*Betula*), and fruit (possibly apple, *Malus domestica*), along with understory plants such as wild rose (*Rosa* sp.) and oceanspray (*Holodiscus discolor*).
- Evans Creek/Stream 0107 Floodplain: The floodplains of these waterways include a variety of riparian vegetation, dominated by an overstory of Pacific willow (*Salix lucida*) with an understory of cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*), white water-buttercup (*Ranunculus aquatilis*), and skunk cabbage. Intrusive Himalayan blackberry was also present.
- Cleared Agricultural Field: The northeast portion of the APE consists of a cleared field, including both slightly higher and drier part covered in medium grasses, and a lower, wetter area dominated by reed canary. Ditches in the wetter portion of the cleared field contained orange jewelweed (*Impatiens capensis*).
- Upland Forest: The northwest portion of the APE has been referred to as the "upland" area. However, at the time of archaeological survey, this zone was partially saturated. This part of the APE was densely vegetated with young to mature willow, red alder, western redcedar, Oregon ash (*Fraxinus latifolia*), hardhack (*Spirea sp.*), salmonberry, vine maple (*Acer circunatum*), red-osier dogwood (*Cornus stolonifera*), currants (*Ribes sp.*), orange jewelweed, skunk cabbage, lady fern (*Athyrium filix-femina*), stinging nettle (*Urtica dioica*), and piggy-back plant (*Tolmiea menziesii*).

3.3 Fauna

The topographic and floral diversity of the region provides for varied fauna. As the glaciers were retreating in the Late Pleistocene, terrestrial mega fauna (i.e., mastodon, *Mammut americanum*), black-tailed deer (*Odocoileus hemionus*), and elk (or wapati, *Cervus elephus*) browsed on grasses, shrubs, and herbs in the newly emerging forest parkland. With fluctuating temperatures and irregular levels of precipitation affecting the number and types of trees providing canopy cover and understory vegetation, the location and abundance of terrestrial animals varied over the millennia. Historically-common animal species in the vicinity of the APE included blacktailed deer, elk, black bear (*Ursus americanus*), cougar (*Felis concolor*), bobcat (*Felis rufus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), fisher (*Mustela* sp.), marten (*Mustela* sp.), muskrat (*Ondatra zibethica*), beaver (*Castor canadensis*), bald eagle (*Haliaeetus leucocephalus*), and a variety of owls, ducks, and small song birds. Large mammals had

fairly extensive ranges and were common in upland areas. Wetland habitats in the region typically support a specialized but diverse array of fauna that includes raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), beaver, and a variety of migratory waterfowl and woodland birds.

An assortment of anadromous fish species is present in the major rivers and tributaries within the local watershed, including the Sammamish River, Bear Creek, and Evans Creek. Chinook and coho salmon (*Oncorhyncus tshawytscha* and *O. kisutch*) are the most abundant species in the Upper Sammamish River drainage, with smaller numbers of sockeye salmon (*O. nerka*) navigating the low-gradient streams (Williams et al. 1975:401). Smaller freshwater fish and invertebrate species found throughout the local drainages include suckers and chubs and freshwater clams (*Margaritafera margaritafera*) (METRO Water Quality Division 1982:14; Wydoski and Whitney 2003).

4. Cultural Context

4.1 Prehistoric Background

Contemporary archaeological research indicates that humans have occupied North America as early as 14,500 years ago, based on finds at Buttermilk Creek, Texas (Pringle 2011), and Meadowcroft Rockshelter, Pennsylvania (Adovasio et al. 1990), among others. The Pacific Northwest has produced some of the most conclusive evidence for the existence of this early human occupation in the Americas. At the Manis Site near Sequim, there is a mastodon skeleton that has been radiocarbon dated to 13,800 years ago (Waters et al. 2011). The mastodon was impaled with a bone spear point, proving the presence of human populations using technologies that were culturally related to Upper Paleolithic people of the Bering Strait area (Lawler 2011). Corroboration for these early dates is found at the rock shelter site at Paisley Cave, Oregon, where human coprolites have been radiocarbon dated to between 12,750 and 14,290 years ago (Wolman 2008).

There may have been multiple, successive migrations following coastal and inland routes (Dillehay 2000). Despite growing evidence for multiple small-scale and coastal migrations, the largest and most well-documented migration continues to be that of hunting peoples crossing the Beringia land bridge after the opening of an ice-free central corridor that was created by warming global temperatures, circa 14,700 B.P. (Fiedel 2000:56). This is often called the Clovis culture, after a distinctive type of fluted projectile point that characterizes assemblages of this period. Clovis culture is characterized by a lithic assemblage emphasizing high skill projectile point production and accompanying stone toolkits amenable to the processing of larger game. Such point types are not uncommonly found in the interior of the Pacific Northwest, including at the Marmes Rockshelter (Hicks 2004), and a sizable cache of Clovis points uncovered inadvertently at the Wenatchee Richey-Roberts site near Cooper's Ferry, Washington (Beck and Jones 2010).

Following this earliest occupation of the interior Pacific Northwest, the period from 8000 B.P. to around 5000 B.P. is known as the Early Pacific Period. This occupation is characterized by cobble-derived materials from what is known as the "Olcott" phase, including other styles of leaf-shaped projectile points, as well as stemmed points, scrapers, utilized flakes, and blade cores made of basalts or dacite (Carlson 1990; Kidd 1964; Nelson 1990). Olcott sites are usually situated inland, on raised terraces, which were more stable landforms as the earth shifted to accommodate the receding glaciers. Differences in tool assemblages and the presence of dwellings found at some Olcott sites suggest that the landscape was being used for different purposes.

Lewarch and Benson (1991) hypothesize that the initial period of limited land-use within the Southern Cascades commenced between 7000 and 6000 B.P. However, older sites do exist: for instance, the Cedar River Outlet [North] (Site 45KI25) in King County dates to approximately 8,500

years ago (Burtchard 1998). A more recently investigated site located within 2 mi of the APE, Site 45KI839 (the Bear Creek Site), includes a variety of lithic material including projectile point bases and prepared blade cores that fit well into the Late Pleistocene and Pleistocene-Holocene cultural transitions (although they are not exactly representative of Clovis or Cascade points). Radiocarbon dates received from sediments below cultural layers indicate that the site exceeds 10,000 years in age, during the oldest occupation (Kopperl et al. 2010:69).

As was mentioned above, Site 45KI834, located less than 1 mi northeast of the APE, has been tentatively identified as an Olcott-period site based on certain characteristics of the lithic assemblage and its provenience. The single temporally diagnostic artifact recovered from the site, unfortunately, is characteristic of a large date range (9950 to 500 B.P.) (Ferris et al. 2010; Kiers 2007). Closer to the center of Redmond, archaeologists have recorded a cluster of archaeological sites at the confluence of Bear Creek, the Sammamish River, and Lake Sammamish—these sites, including 45KI9, 45KI492, and 45KI493, have yielded radiocarbon dates as old as 3,000 years (Greengo 1966; Greengo and Houston 1971; Kopperl et al. 2010; Nelson 2000a, 2000b).

Over time, changes in lithic technologies and site locations suggest increased sedentism and specialization in the use of particular environments and resources across the regional landscape (Ames and Maschner 1999; Mierendorf 1986; Mierendorf et al. 1997). The Middle Pacific Period spans approximately 5000 to 2500 B.P., and numerous coastal sites from this period appear to indicate more socio-economically complex populations with a rising dependence on marine resources. Inland archaeological sites are rare in comparison to coastal settlements; work conducted in the foothills of the Cascade Mountains increasingly shows that inland regions were selectively and seasonally utilized by more nomadic populations drawn to resources less readily available along the coast (i.e., deer, elk, and huckleberry) (Burtchard 1998; Mierendorf 1986). In many archaeological and ethnographically documented cases (see Schalk 1988), this likely would have also included an increasing reliance on salmon as a bulk staple.

Nonetheless, a variety of sites with assemblages suggestive of multi-task, mixed group, and moderate-term residential base camps and hunting activities (including hunting, butchering, and lithic reduction areas) have been recorded and may represent smaller subsets of a larger and more complex social system based at lower elevations; Burtchard hypothesizes that, by around 3000 B.P., people traveled into the uplands seasonally, in a very structured manner (i.e., groups of a certain size, and/or with a particular set of skills and goals), to exploit animal and plant resources (Burtchard 1998).

The Late Pacific Period extended from approximately 3,500 years ago through the ethnographic period. Archaeological assemblages are composed of a variety of objects, including shells, art objects, and a range of hunting, fishing, woodworking, and plant processing tools made of stone, bone, and wood. Seasonal use of resources and locations within the inland region continued to characterize the Late Pacific Period, along with permanent or semi-permanent villages closer to year-round resources along the coast and shorelines of larger drainages and lakes. These sites also extend

into the ethnographic period as components of large, permanent residences and seasonal base camps (Ames and Maschner 1999; Dampf 2006). Locally, shell midden site 45KI22 in the upper Bear Creek drainage (approximately 5 mi north of the APE) is representative of a precontact camp, and it contains a local, readily-available resource (i.e., freshwater clams) within organic sediments (Murphy et al. 2001:5).

4.2 Ethnographic Background

The project area was occupied and utilized by a number of Native American groups, including the Sammamish, Duwamish, Suquamish, Snoqualmie (Snuqualmie), Snohomish, and Skykomish Indians (Haeberlin and Gunther 1930; Spier 1936; Swanton 1952). The peoples now referred to as the Duwamish ethnographically consisted of a number of bands whose traditional territory stretched from the Duwamish River at Elliott Bay, to Lake Union and Lake Washington, and east to the project area. The Sammamish people, who occupied much of the area along the river and lake that currently bears their name, have been grouped with the Duwamish, although they may have been a separate group with Duwamish affiliations (Ballard 1951:2:404–405; Haeberlin and Gunther 1930:8; Smith 1940:17; Spier 1936:34, 42; Swanton 1952).

The Sammamish and other nearby groups such as the Duwamish are considered members of the Puget Sound Coast Salish culture. Peoples moving through the project area spoke various dialects of the Coast Salish Lushootseed language. Characteristic of the groups within the Coast Salish culture were seasonal settlement patterns, economies based on salmon as a staple, and a stratified society (Miss and Campbell 1991:22).

Coast Salish groups oriented settlement and subsistence systems toward saltwater, riverine, and inland environments in their territories (Haeberlin and Gunther 1930). Over the winter, Coast Salish groups including the Sammamish inhabited permanent villages, usually located close to a major source of water (i.e., the sea or lakeshore). Winter villages consisted of one or more cedar plank longhouses in which as many as eight families resided (Haeberlin and Gunther 1930; Suttles and Lane 1990). The closest documented winter village to the APE was likely *šəqusalʔtxʷ*, meaning "a high place with a house on it." This village site was located on "a creek entering the [Sammamish] river from the east below Redmond," possibly meaning Bear Creek (Hilbert et al. 2001:114; Waterman ca. 1920). The winter was spent not only repairing and constructing tools needed in the upcoming harvesting season, but in ritual storytelling and communal gatherings and travel between villages. Families subsisted largely on processed and stored foods from the previous seasons, although hunting and fishing activities certainly took place.

During the spring, summer, and fall, the Coast Salish used temporary pole and reed mat structures that were easily transported to traditional hunting, gathering, and fishing locations. Family groups moved to various environmental zones seasonally to harvest abundant resources, process them for storage, and then transport the supplies to the permanent village. Resources included roots, berries,

and other plant products. Salmon and shellfish harvested from local lakes, rivers, and creeks were staple resources. Groups established fishing stations, at which salmonid runs were available at various times throughout much of the year (Campbell 1981; Haeberlin and Gunther 1930). Inland groups, including the Sammamish, hunted land mammals in addition to collecting marine and riverine resources. Some men in these groups specialized in the pursuit of deer, elk, bear, or beaver. Waterfowl and other birds were also important parts of the Coast Salish diet, and were either trapped in nets or hunted. From prehistory through historic and modern times, the Redmond area had a prominent role in cross-country travel. Native Americans used the Evans Creek Valley as a transportation route from Lake Sammamish to the Snoqualmie River (Murphy et al. 2001).

T. T. Waterman recorded a number of ethnographic place-names within the vicinity of the APE, close to Lake Sammamish between one and two miles southwest (Figure 4-1). The name for the Redmond vicinity was *x̌ʼuq̓ʷ*, or "crowded in, poked in" (also "stuff into, plug in, plug up"). *Tubaʔl* ("used to be wide") was the name for a "creek entering the [Sammamish] river below Redmond" and may refer to the outlet of Bear Creek into the Sammamish River. The junction of the Sammamish River and Lake Sammamish bears two distinct ethnographic names. The place at the head of the Sammamish River, where it drains from the lake, was known as *šəqid* or *cʼəpqid*. Respectively, these names mean "above head" and the "head of deep water hole in river"; the latter name refers to the Lushootseed name for the Sammamish Slough (*cʼəp,* recorded by Waterman as *Tsap*). In Lake Sammamish, the place where it drains into the river is known as *łapucid*, meaning "hard to find" or "throw something over the mouth of it." This location is extremely marshy and swamp-like, making the distinction between river and lake difficult (Hilbert et al. 2001:112–114). A steep hill at the northeastern end of Lake Sammamish was known as *pukʷab*, "a heap or knoll" or "pile." Waterman notes that Evans Creek runs at the base of this hill (Hilbert et al. 2001:115–117). Another place-name in the vicinity of the APE is the "Avondale Fishing Camp," which was a seasonal fishing location located approximately 0.8 mi northeast, on Bear Creek (Hebner 1966:52–53, in Greenawalt et al. 2005:11).

The Euroamerican influence was felt long before most Native groups met incoming settlers to the Pacific Northwest. Many populations in the vicinity of the project area were decimated by at least one smallpox epidemic, only one of several European diseases that traveled long distances without the aid of direct Native American/Euroamerican contact (Newcombe 1923; Suttles and Lane 1990). In 1855, under the Treaty of Point Elliott, the Native Americans living in the vicinity of the project area (including the Sammamish and Snoqualmie tribes) were assigned to the Tulalip or Port Madison Reservations. However, few people relocated to these relatively distant locations, choosing to stay in their traditional lands (Ruby and Brown 1992). Some Native Americans who remained in the Redmond area continued to follow their traditional way of life, while others worked with and for the incoming settlers, clearing land and practicing agriculture. Early accounts place Native Americans arriving in large numbers during the hop-picking season (Way 1989:4, 5).

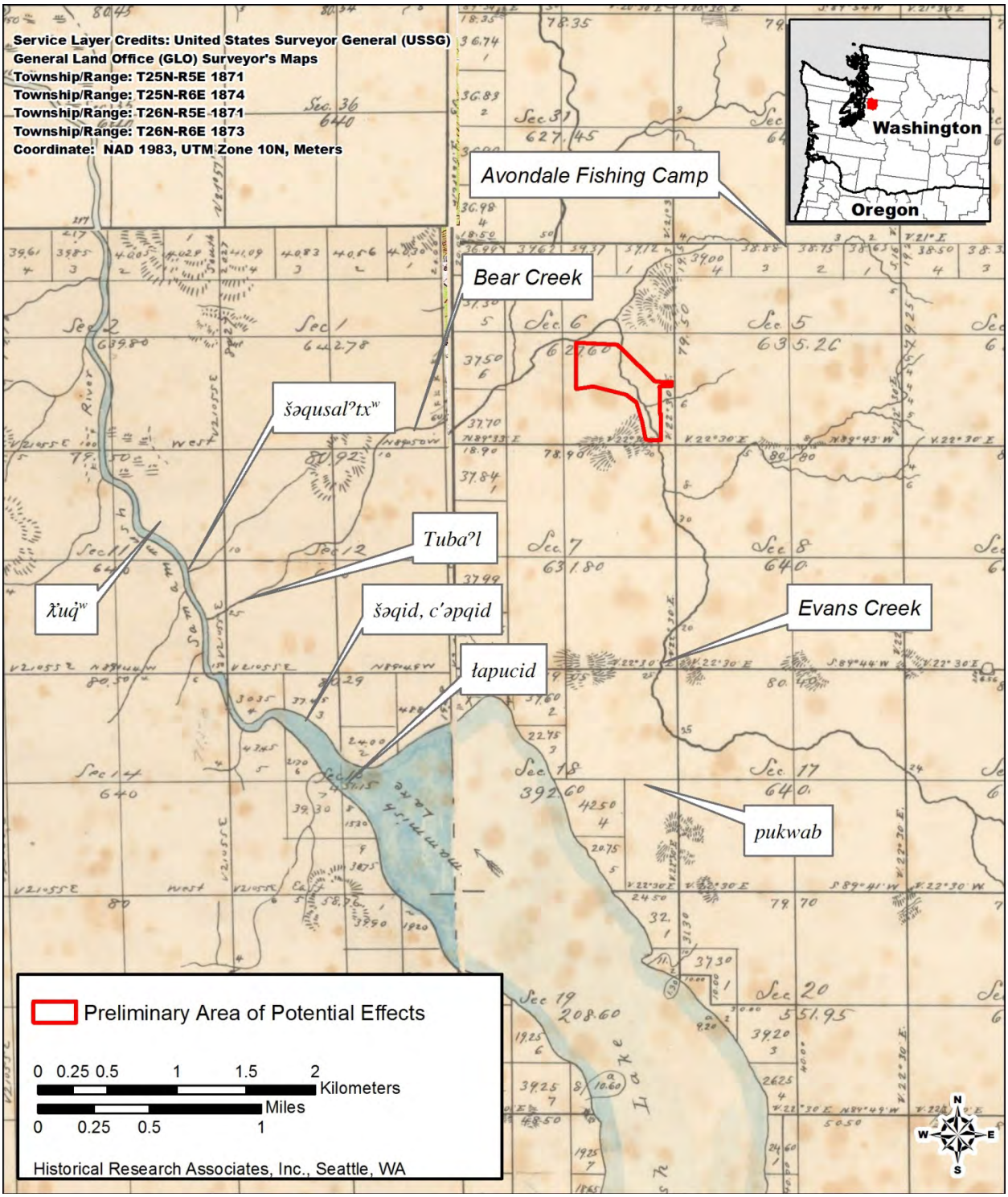

Figure 4-1. Project APE and ethnographic place names in the vicinity.

4.3 Historic Background

The first Euroamerican settlers arrived in the Project area in the mid- to late 1800s. The GLO first surveyed the Township in 1874 (Figure 2-1). The Warren Wentworth Perrigo and Luke M. McRedmond families were the first permanent Euroamerican settlers in the Redmond area, and they took up residence on rich bottom lands east of the Sammamish River in the early 1870s (Bagley 1929:847; McConaghey 1993:30). Perrigo ran a successful trading operation from his farmhouse with both neighboring Native Americans and Euroamericans. Additional settlers soon arrived, and in 1875, a log schoolhouse was constructed for the local children. By 1876, 25 land claims in the vicinity were made and occupied by claimants (McConaghey 1993:30). Of the 50 residents of what is presently Redmond in the 1880 census, 14 were "Indians" and the remaining 36 members of three local Euroamerican families (Perrigo, Tosh, and Perry) (Malowney 2002:11). The town of Redmond itself was platted in either 1887 or 1891, and incorporated on December 31, 1912 (Bagley 1929; McConaghey 1993). By 1909, Redmond was reported to have two mills, "three general stores, three hotels, two livery stables, two blacksmith shops, a grocery, shoe store, restaurant, two churches and four saloons" (McConaghey 1993:216).

Historically, Perrigo used the established trails along Evans Creek to transport his trade goods from (now) Redmond to the Snoqualmie Valley (Way 1989). By the early 1900s, the Yellowstone Trail was established, linking Seattle to Boston. A portion of this early highway is still visible as the Old Red Brick Road (or Old Yellowstone Road; 196th Ave NE, south of Union Hill Rd to 55th Pl NE). The town's depot also served as an important hub for the Northern Pacific Railroad (Malowney 2002; Way 1989).

On logged-over parcels and swamp lands reclaimed with the straightening of Squak (Sammamish) Slough, farming soon flourished in Redmond's renowned rich soils. The Evans Creek Valley, located southeast of the APE, was known by its early Scandinavian settlers as "Happy Valley." Lumbering, dairying, and poultry-raising were the principal industries, with the Avondale and Happy valleys supporting the farm industries outside town limits. A variety of logging and lumber operations and their associated lumber camps were in full operation in the area from the early 1880s through the 1920s, by which time the logging industry was waning due to declining areas of uncut timber (Bagley 1929:850; Way 1989).

The Happy Valley Grange, founded in 1909, played a vital role in the social, educational, and political life of Redmond's farmers. Eventually the Grange became one of the largest grange organizations in Washington during the Progressive Era, a short period of populist sentiment and reform in the Pacific Northwest (Bagley 1929:850; Schwantes 1996:349–350). In the 1930s and 1940s, Redmond's farming and dairy industries expanded. The dairy industry peaked in 1948, when 25 dairy farms operated between Redmond and Bothell (Way 1989:115).

According to Bureau of Land Management (BLM) records, Obidiah Evans first claimed the southeast quadrant of Section 6 in 1889 (WAOAA 064994, BLM 2013). By 1907, the quadrant was

owned by Jas. Campbell, whose logging company cleared the land (Flathman 2007c). In the succeeding decades, the lands encompassing the APE were converted into smaller parcels, many of which were associated with farms—an example is the Lind Farm, the chicken house and barn from which are still extant—but also industrial facilities (see Section 2.2.5; Flathman 2007c).

Albert Lind first owned the property at the far southeast corner of the APE in 1941. A bungalow residence had been constructed on the property in 1933, perhaps by the owners from 1929 (Otto Sundholm and G. Leathers). Lind continued to develop the farm with the currently existing gambrel roof barn and chicken house (both constructed in the 1945) and the third shed-roof outbuilding (uncertain construction date). According to aerial photographs dating to the 1960s through the present day, the small bridge crossing Evans Creek appeared sometime in the later 1960s (NETR Online 2013). Sometime in the early 1970s, the property was sold to the Barrett family (Flathman 2007c).

5. Expectations for Hunter-fisher-gatherer, Ethnographic Period, Historic Indian, and Historic Euroamerican Cultural Resources

HRA developed probabilities for prehistoric and ethnographic Native American and historic Euroamerican archaeological resources in the project APE prior to fieldwork. Probability is based on review of environmental, geological, ethnographic, and historical archival data and review of previously recorded archaeological sites in the vicinity of the Project.

The project APE has been historically disturbed by logging and farming practices, and some more recent developments such as industrial facilities. Based on archival research, including the number of archaeological sites and isolated finds recorded in the near vicinity, HRA determined that the APE has a moderate to high probability for precontact archaeological resources. Local access to freshwater sources heightens the likelihood that archaeological remains associated with temporary or seasonal fishing and processing camps, as well as hunting and tool repair/manufacturing debris, could exist within remnant creek terraces and on the floodplains of Evans Creek and Stream 0107, particularly close their confluence. These materials may be found within the upper meter of sediments, as was the case with several of the surrounding resources (e.g., 45KI466, 45KI834, 45KI1101), but they might also be more deeply buried, as was the case at the Bear Creek Site (45KI839) closer to the Sammamish River.

There is also a moderate probability for historic Native American and/or historic Euroamerican archaeological resources in this area. Historic-period farmsteads, notably the Lind Farm, are located within the APE, and archaeological materials could include deposits of structural materials (i.e., window glass, brick fragments, nails, and milled wood) from local farm buildings or other structures, household items (i.e., metal or glass storage vessels, ceramics), or the remains of farming and dairying implements (i.e., machinery, metal or glass storage vessels). It is likely that these materials would be found closer to the surface.

6. Field Strategy and Methods

6.1 Archaeological Monitoring

HRA observed GeoEngineers staff environmental engineers Grace Harper and Ian Rork as they excavated 10 auger probes over two days. These auger probes were placed along the potential new alignment of Evans Creek and are the first proposed phase of geotechnical investigation for the Project (the next phase will include geotechnical boring utilized a drill rig).

Augering was performed by Rork, using a telescoping 3-inch hand-turned auger that extended to 9 ft in length. A shovel was utilized to clear obstructions (e.g., rocks) from close the ground surface. As sediments were pulled up from the probe, Harper recorded the consistency and inclusions on a standardized form. Samples were collected from the major sedimentary changes, for instance, when topsoil gave way to a silty peat, or when sands were encountered. HRA noted the consistency as well, and examined the sediments with a trowel and by manually squeezing and pulling apart the soil peds to look for cultural materials. Many of the sediments were too clayey to efficiently screen through ¼-inch mesh.

The first five probe locations were mapped during monitoring using a handheld Trimble GPS instrument. The last five auger locations were provided to HRA after monitoring was complete by GeoEngineers, as the GPS unit was being utilized for archaeological survey. Photographs were taken of the geotechnical auger probe location and sometimes the sediments themselves. HRA recorded the subject of photographs and the direction of view in a field notebook. All shovel probe forms, fieldwork notes, and photographs are on file at HRA's Seattle office.

6.2 Archaeological Inventory

The Project is in early planning stages, and although project proponents have indicated a possible course for the realigned Evans Creek, it has not been finalized. During project planning meetings with HDR and the City, HRA was informed that there was a zone in which the creek would be most likely realigned. As a result, HRA formulated a grid system to investigate an area surrounding the potential stream alignment and zone to give project planners leeway in locating the watercourse.

Background research into the soils within the APE did not indicate any definite former channels of Evans Creek, the vicinity of which subsurface investigation might investigate. It is likely that Evans Creek—as well as Bear Creek—has meandered across its floodplain over the past several thousand years, and that former channels may be encountered, buried more deeply within the finer floodplain sediments. There was therefore no particular location within the APE where HRA planned to target shovel probes.

As noted earlier, prior to entering the field, HRA created a grid using ArcMap, oriented north-south and east-west, covering the most probable zone for the creek realignment. The intent was that, field conditions allowing, transects would be walked along the grid lines and that a shovel and/or auger probe would be excavated at the majority of the crossing points indicated on the grid, spaced at 20-m intervals. The columns were numbered A through DD, and shovel probes were located along the rows, numbered as the probes were placed and recorded with a handheld GPS instrument.

Shovel probes were dug along the north-south transect lines, as feasible, given water saturation and surface vegetation. If the water levels exceeded a few inches above the ground surface—which occurred in the Stream 0107 wetland area—no shovel probe was attempted. Similarly, if vegetation was too dense (e.g., thick, tall Himalayan blackberries along transect D), a shovel probe location was skipped. Reasons for skipping a probe location were noted in the field director's notebook.

During transects, archaeologists attempted to look for surface features, as vegetation across the entire APE was dense and ground visibility was poor to nonexistent. In areas within the APE where the surface was not saturated, a round-nosed shovel was used to excavate the upper levels of each probe. HRA archaeologists attempted to excavate as deeply as feasible, initially with a shovel, based on archival research. Artifacts within the several sites and isolated finds recorded in the vicinity of the APE were all observed within the upper 85 cmbs. Shovel probes, on average, measured 30 to 40 cm in diameter.

Below approximately 80 cmbs in shovel probes located in drier locations, archaeologists switched to using a 4-inch hand-turned auger to continue excavation. In wet, saturated zones, once the vegetation cap and root zone was cleared with a shovel, archaeologists generally utilized the 4-inch auger to excavate the entire probe. Sediments in these probes liquefied easily, simply slumping into the probe. It was discovered that, in many instances, utilizing the auger at shallower depths was a more efficient means of deeper excavation, although the volume was not as great as the typical shovel probe.

Shovel/auger probes were excavated as deeply as feasible. They were halted upon reaching an obstruction (e.g., a gravel layer, impassible root, rock); upon reaching a depth at which the auger was essentially stuck, or would not continue further, due to suction or density of sediments; or upon the depth of the auger. Four augers were utilized during fieldwork, and the shortest auger was capable of reaching depths of 130 to 150 cmbs.

As feasible, HRA pressed sediments removed from shovel and auger probes through ¼-inch hardware mesh on standing shaker or hand-held box screens. Sediments containing higher percentages of clay were not screened, but archaeologists worked through the clay with their hands to ensure that artifacts were not present.

During excavation, archaeologists took note of sediment color and texture, as well as any inclusions (i.e., woody debris, gravels, charcoal), and at which depth these changes were encountered. These observations were recorded on standardized shovel probe forms. HRA also noted the presence or

absence of cultural materials within the probes. When cultural materials were observed, the archaeologist noted the depth and sedimentary context, as well as the time period of the find (i.e., precontact or historic-period), its material type, and basic measurements. This information would then be compiled into a State of Washington Site Inventory Form.

Positive shovel probes were noted, and as soon as the surrounding probes in the survey grid were known to be positive or negative, a series of radial shovel probes were dug at 5-m intervals in cardinal directions surrounding the positive probe. If one of those radials was positive, additional radial probes were excavated at 5-m intervals. In the case of the Lind Farm multi-component scatter (see Section 7.2.1.1), radials were eventually halted when negative shovel probe transects were encountered to the west, and other surface features of the overall site (e.g., trees and driveways) were encountered.

Overview photographs of the different portions of the APE were taken, as well as photographs showing sediments removed from shovel and/or auger probes, and cultural materials encountered during survey. HRA recorded the subject of photographs and the direction of view in a field notebook. All shovel probe forms, fieldwork notes, and photographs are held on file at HRA's Seattle office.

7. Archaeological and Architectural Inventory Results

7.1 Archaeological Monitoring

No cultural materials were observed during archaeological monitoring of the 10 hand auger (HA) locations. HRA archaeologists Jennifer Gilpin, MA, and Serah Timm, BA, monitored on September 10 and 11, 2013, respectively. Gilpin observed HAs 1 through 5, excavated in the upland forest and cleared agricultural field of the northern and northeast portions of the APE (Figure 7-1). Timm observed HA6 through HA9, excavated in the Stream 0107 wetlands and along the slightly raised Evans Creek terrace. Nine initial locations were mapped. Geoengineers was unable to obtain a good sediment profile from HA6, however, due to its position in the completely saturated wetland close to Stream 0107. Therefore, hand auger probe HA6A was attempted, and the results recorded, in the original position, and Geoengineers excavated HA6B in less deeply saturated waters northeast of the original probe.

The sediments observed in HA1 through HA7 were largely fine-grained, consisting of fine sandy silts overlying peaty silts and silty peats, over increasingly clayey silts. The sediments are consistent with long-term wetlands in the area. Several hand auger probes were excavated within areas of standing water (Figure 7-2). Hand auger probes in these areas extended between 4 and 9 ft below surface (ftbs).

HA8 and HA9 were excavated on the slightly raised Evans Creek terrace close to the cleared field of the Lind Farm. GeoEngineers staff encountered cobbles at fairly shallow depths and were therefore unable to obtain sediment samples deeper than 1.5 ftbs (Figure 7-3).

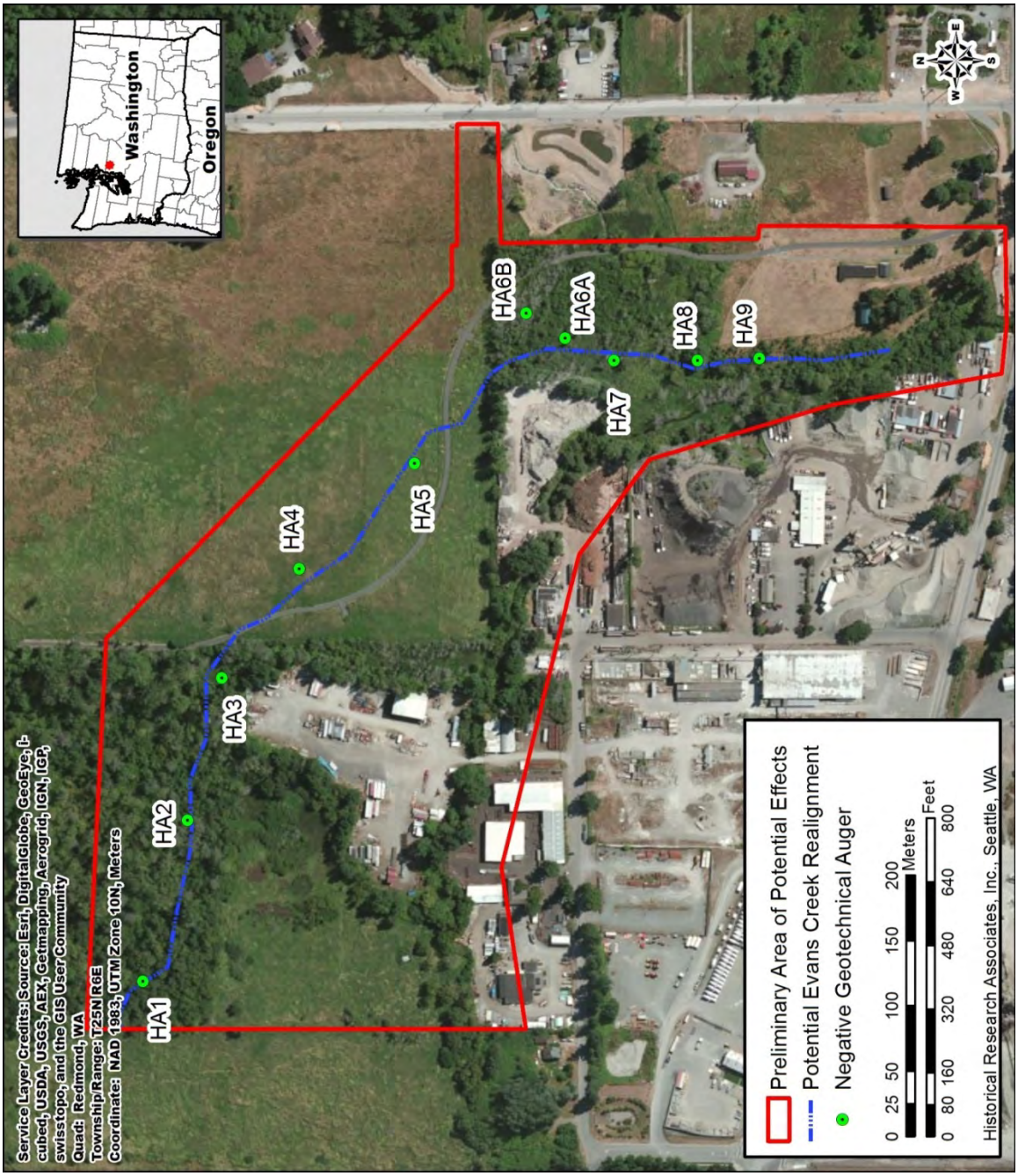

Figure 7-1. Locations of monitoring geotechnical hand augers (HA) in the APE.

Figure 7-2. View of HA6A in standing water (view to north).

Figure 7-3. Increasing gravels in HA8 at 1.5 ftbs.

7.2 Archaeological Inventory

As mentioned in Section 3.2, HRA identified four distinct ecosystems during survey of the APE. Although the sediments observed within the shovel probes were often similar, the four survey areas will be discussed separately for efficiency's sake. HRA archaeologists Jennifer Gilpin, MA, Joey Baumgartner, BA, Justin Butler, BA, Adam Fruge, BA, Jennifer Gebhardt, BA, and Serah Timm, BA, conducted archaeological inventory on September 11–13, 16–19, 23, and October 14, 2013.

7.2.1 Lind Farm Terrace

The Lind Farm terrace is located at the southeast end of the APE, which consists of a topographically higher terrace above the immediate Evans Creek floodplain and primary terrace (Figure 7-4). Existing BSOs in this portion of the APE include a gambrel-roof barn (recommended eligible for the NRHP, Flathman 2007c), a chicken house, and a third outhouse. HRA also noted a small concrete and wood bridge crossing Evans Creek southwest of the barn (Figure 7-5). The Lind Farm terrace is largely cleared of vegetation, save short grasses across much of the field, and older, cultivated evergreen, deciduous, and crop trees close to the Lind Farm buildings (these trees are recorded as part of the Lind Farm Site, Section 7.2.1.1). There is a buffer zone of taller vegetation along the western and northern edges of the Lind Farm terrace, including wild rose, hawthorne, and additional evergreen bushes and trees, and dense, tall thickets of Himalayan blackberry.

Figure 7-4. View across cleared field on Lind Farm terrace, looking south towards the barn and outbuildings.

Figure 7-5. Overview of concrete and wood bridge across Evans Creek (view to northwest).

HRA encountered increasingly gravelly sandy silts to silty sands in shovel probes excavated on the Lind Farm terrace, and most shovel probes in this area were halted due to gravel or rock layers (Figure 7-6). Appendix A of this report contains the shovel probe results table. Gravels typically appear by 60 cmbs, and they are subrounded to subangular basalt and granitic pebbles to cobble-sized rocks. Although historic-period to modern artifacts were anticipated due to the presence of active farm buildings, most probes were negative for cultural resources (Figure 7-6).

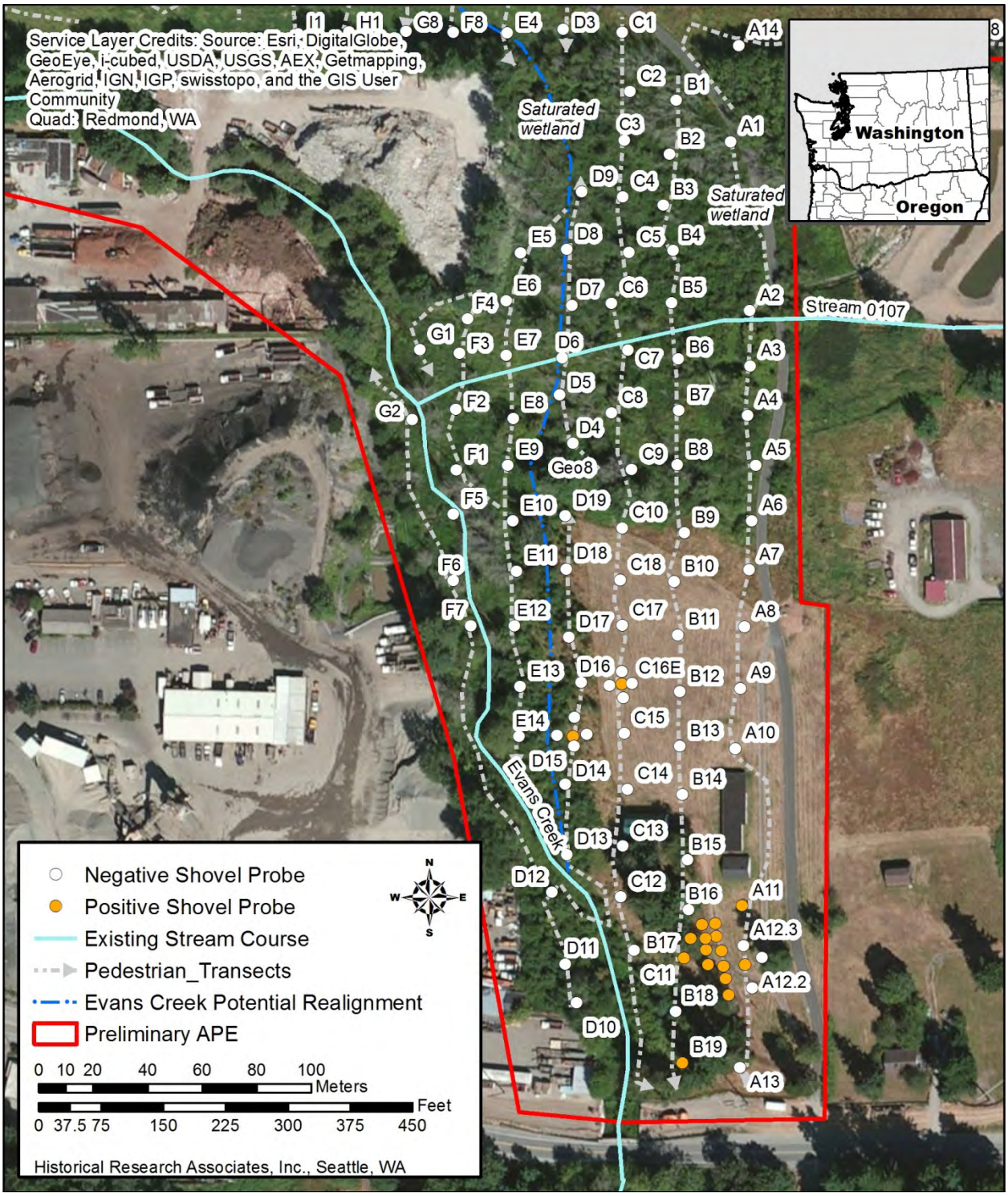

Figure 7-6. Shovel probes and pedestrian transects conducted in the southeast portion of the APE, on the Lind Farm Terrace and the Evans Creek/Stream 0107 Floodplain.

7.2.1.1 Lind Farm Complex (Site HRA-2045-1)

Fifteen shovel probes excavated on the Lind Farm terrace were positive for precontact and/or historic-period cultural materials. The Lind Farm Complex Site (HRA-2045-1) was recorded to encompass these artifacts, as well as the existing BSOs and planted vegetation (above-ground features). The historic period above-ground features in the Lind Farm Site include graveled and paved driveways connecting NE Union Hill Rd and the buildings (Figure 7-7); two fruit trees close to the former location of the farmhouse (razed in 2002); two rows of Turkish hazelnut (or filbert) trees located on the east bank of Evans Creek (Figure 7-8); and a scatter of larger oak, birch, and evergreen trees surrounding the buildings. A modern concrete and wood bridge crossing Evans Creek is also located within the site boundary.

The site is divided, for management reasons, into two loci. Locus A consists of twelve positive shovel probes in the southeast corner of the APE (SPA12 and SPA12.4–SPA12.12), along with all of the above-ground features. Locus B contains two positive shovel probes (SPC16 and SPD15) and no above-ground features: it is located approximately 30 m northwest of Locus A at the edge of the grassy field. Appendix B contains the State of Washington Archaeological Site Inventory Form prepared for the Lind Farm Complex.

Figure 7-7. Overview of the Lind Farm Complex, Locus A, with fruit tree in foreground, driveway visible in right of frame, and established trees and outbuildings in background (view to northwest).

Figure 7-8. Hazelnut grove southwest of the barn, on the east bank of Evans Creek (view south).

Five shovel probes in Locus A and one probe in Locus B contained precontact lithic material. The precontact component of the site includes one CCS tertiary flake (0-10 cmbs in SPA12); one CCS tertiary flake fragment (0-30 cmbs in SPC16); one basalt secondary flake (0-20 cmbs in SPA12.8); and two pieces of CCS shatter (0-26 cmbs in SPA12.5 and 0-68 cmbs in SPA12.12) (Figures 7-9–7-11). Scattered FMR was observed in SPC16 and in SPB17; however, no oxidized earth or root burns were observed in association with these rocks, and their origin is uncertain.

All shovel probes in the Lind Farm Complex, with the exception of SPC16, contained historic-period artifacts, and some materials that are not time diagnostic. The observed historic-period materials include a single clear glass patent medicine bottle lip and neck, dating to after 1904 (Figure 7-12). Archaeologists also observed a small fragment of milk glass in SPA12.14 between 0 and 30 cmbs (Figure 7-13). Milk glass was used in a variety of bottle and container types—primarily cosmetic and toiletry bottles or ointment jars, but also ink, bitters, liquor, and fruit or food jars—from the 1870s to the middle 1900s (Lindsey 2013).

Non-temporally diagnostic artifacts include brick fragments, shards of clear flat and vessel glass, wire nails and nail fragments, and pieces of avian and small mammal bone (Figure 7-14–7-15).

Figure 7-9. Red CCS flake from SPA12.

Figure 7-10. Basalt flake from SPA12.8.

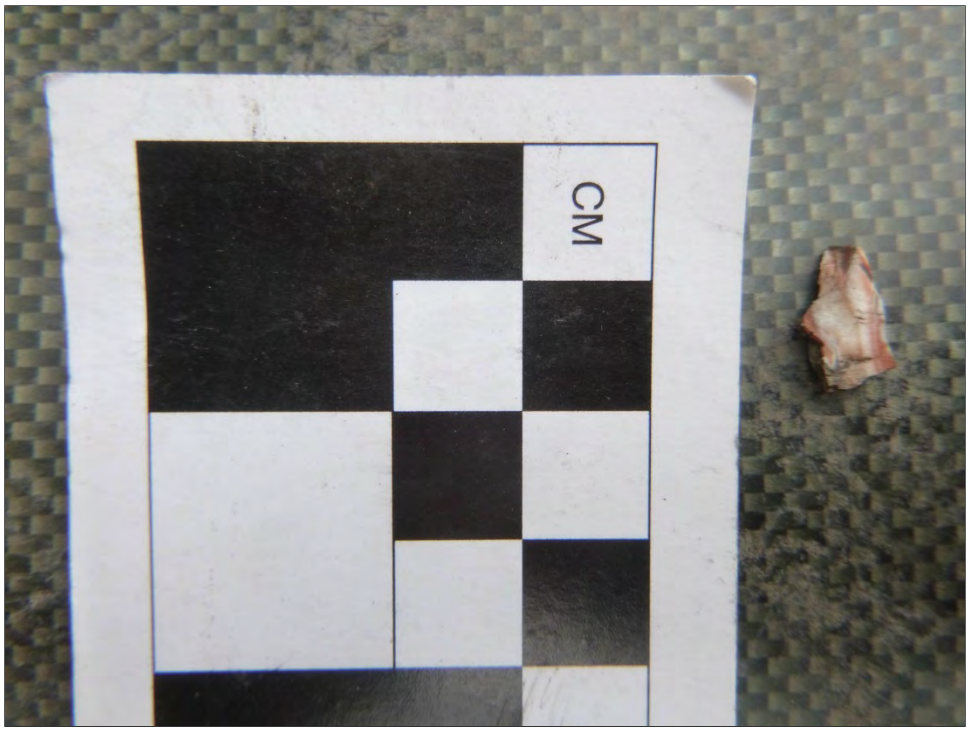

Figure 7-11. CCS shatter fragment from SPA12.5.

Figure 7-12. Clear glass patent medicine bottle lip and neck fragment, from SPA12.12.

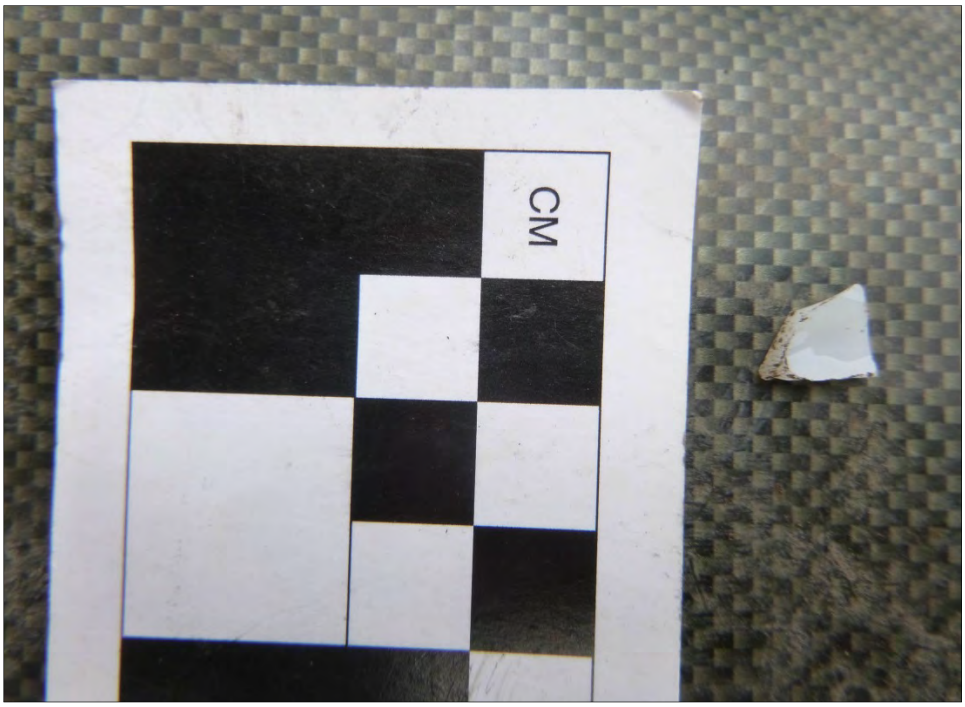

Figure 7-13. Milk glass fragment from SPA12.14.

Figure 7-14. Overview of nondiagnostic historic-period and more recent (e.g., the swatch of plastic) artifactsfrom SPA12.4, including clear glass, wire, brick, and black plastic fragments.

Figure 7-15. Overview of nondiagnostic historic-period artifacts from SPA12.9, including brick and slag fragments and a wire nail.

Artifacts of all time periods were mostly observed in the upper 30 to 50 cm of soil, which consisted of sandy loam with some gravel content. Below this, sediments grew increasingly silty, pale yellow in color, with gravel content increasing to roughly 60 to 70 percent by termination of these probes. SPA12 contained a metal pipe or container approximate 25 cmbs (Figure 7-16). It appears, therefore, that these artifacts were mixed in the topsoil, although some have traveled downwards, through bioturbation or potentially historic-period disturbances, into the lower, more gravelly soil horizon.

Figure 7-16. Probe A12, showing metal pipe or tank buried 25 cmbs (north to top of frame).

7.2.2 Evans Creek/Stream 0107 Floodplain

The Evans Creek floodplain is located west and northwest of the Lind Farm terrace, and this merges into the Stream 0107 wetland system. Stream 0107 flows from east to west, and it is situated north of the Lind Farm terrace. At the time of survey, a family of beavers had partially dammed Stream 0107, flooding large portions of its confluence with Evans Creek. Prior to archaeological survey, the City notched the beaver dam, which brought water levels down to a manageable level in most portions of this wetland complex. The beavers did not reappear to repair the dam during HRA's survey of the APE. There remained some areas along and north of Stream 0107 that contained standing water deeper than a few feet, and these areas were not transected nor probed (Figure 7-6).

Archaeologists utilized augers to probe within the floodplain, relying on shovels in a few instances to excavate the upper 10 to 40 cm when the location was dry enough (Figure 7-17). HRA observed

fine-grained sediments within probes in the Stream 0107 floodplain, along with a few appearances of lenses of gray medium to coarse-grained sands closer to the current Evans Creek channel and Lind Farm terrace. At approximately 70 to 90 cmbs, above the transition into increasingly silty peats, archaeologists sometimes noted a yellowish or orange-brown lens that appeared oxidized (Appendix A). Although its identification is tentative, this lens may be reworked Mazama ash, similar to what was noted at the Bear Creek site (Kopperl et al. 2010). Shovel probes in this location generally terminated between 100 and 200 cmbs due to liquefaction of sediments or too great of suction pulling on the auger. No probes were positive for cultural materials.

Figure 7-17. Overview of SPF1 excavation, east of the Evans Creek channel and south of Stream 0107 (view to north).

7.2.3 Cleared Agricultural Field

Due to dense grasses—both short field grasses and the taller reed canary-grass—ground visibility was very poor in the cleared fields in the northeast portion of the APE. HRA continued shovel/auger probes in the field, slightly adjusting shovel probes that were located directly on the raised Evans Creek Trail boardwalk (Figure 7-18) or within the pockets of standing water that were present in this portion of the APE. The water was present in ditches and agricultural drainages that empty towards Evans Creek. HRA excavated shovel/auger probes within the survey grid

approximately 60 m to either side of the potential new Evans Creek channel location, and along one proposed access route into the APE (Figure 7-19).

Shovel probes in the cleared field portion of the APE largely contained the "typical" wetland sediment profile for this area, consisting of layers of dark brown fine sandy silts and silts overlying increasingly grayish-brown clayey silts. By approximately 70 to 90 cmbs, as seen in the wetland shovel/auger probes, archaeologists often noted a brief (less than 10 cm thick) layer of slightly oxidized yellowish to orange brown fine sands to very silty—or ashy—sediments. This usually directly overlay increasingly peaty silts to peats, of varying fibrousness. Once again, the identification of this layer is tentative at this time, but the oxidized and ashy sediments may be Mazama ash, as such sediments were observed overlying peat deposits at the nearby Bear Creek Site (45KI839, Kopperl et al. 2010). By 150 cmbs, in general, the peats gave way to grayish-brown or bluish-gray clayey silts to silty clays. Figure 7-20 shows the progression of sediments from SPI5. Shovel probes at the northern end of the APE within the cleared fields encountered increasing gravels between 100 and 140 cmbs; this may be the location of an older stream channel. No shovel/auger probes contained cultural materials.

Figure 7-18. Overview of survey and shovel/auger probing transects in northeast part of the APE. Note raised Evans Creek Trail boardwalk to left in frame. The Upland Forest is present to left in frame (view to north).

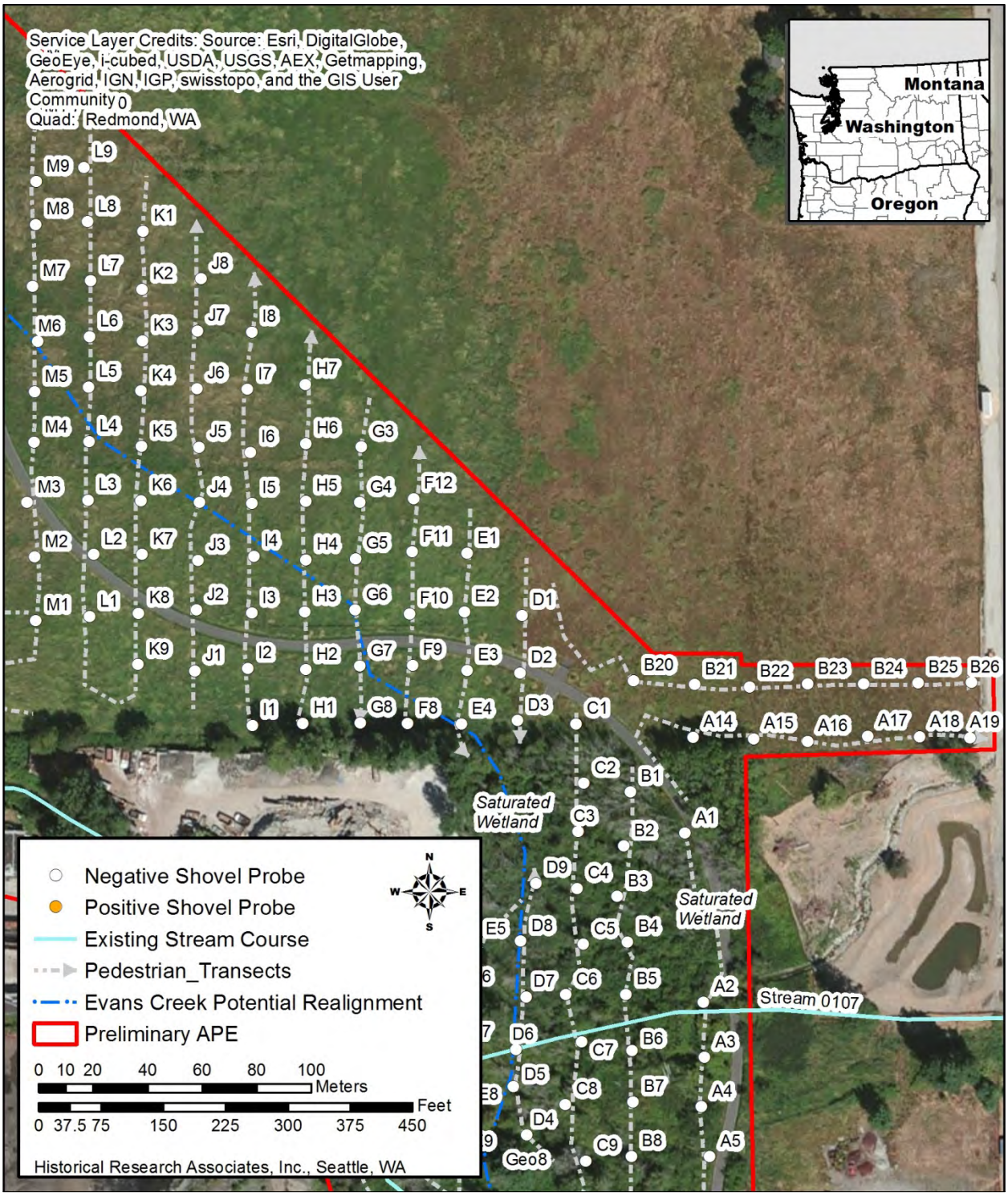

Figure 7-19. Shovel probes and pedestrian transects conducted in the northeast portion of the APE, in cleared fields.

Figure 7-20. Overview of sediments from the auger probe column at SPI5, which extended to 260 cmbs. The oxidized sediments observed above the peat are circled in white.

7.2.4 Upland Forest

Shovel/auger probes in the upland forest were conducted in dense undergrowth, although HRA utilized surveyors' pathways whenever feasible to make the fieldwork more efficient (Figure 7-21). The upland forest is situated north of industrial lands within the APE. These lands have been filled at least 4 to 6 ft above the natural ground surface with cobbly and gravelly sand fill to form a raised terrace. Debris associated with these industrial facilities was observed along the boundary of the forested zone with the filled industrial terrace. The upland forest was swampy in portions of the APE, containing standing water. However, no shovel/auger probes were skipped due to deeper standing water (as in the Evans Creek/Stream 0107 Floodplain area). HRA continued to probe along north-south oriented transects, following the surveyor's paths and cutting new ones through the younger alder and willow growth, when necessary, with a machete.

Figure 7-21. Overview of R transect from southernmost point (R6, view to north).

At the western end of the upland forest, HRA encountered the existing reroute for Evans Creek, created as part of a wetland mitigation project by the Washington State Department of Transportation (Figure 7-22; WSDOT 2012). HRA narrowed the area that was shovel probed as the proposed stream connection point was reached (Figure 7-23). No cultural materials were seen in the shovel/auger probes excavated in the upland forest. The observed sediments were essentially the same as what was observed in the cleared fields, except that larger roots were observed more deeply in the forested zone.

HRA noted a second cleared field south of the upland forest, and east of the WSDOT parcel. Beyond a quick walk into the field to observe the vegetation along the south boundary of the upland forest, HRA did not survey this area because, at this time, it is uncertain that project activities will impact that area.

Figure 7-22. Overview of existing Evans Creek reroute on WSDOT parcel to west of the APE (view to southwest).

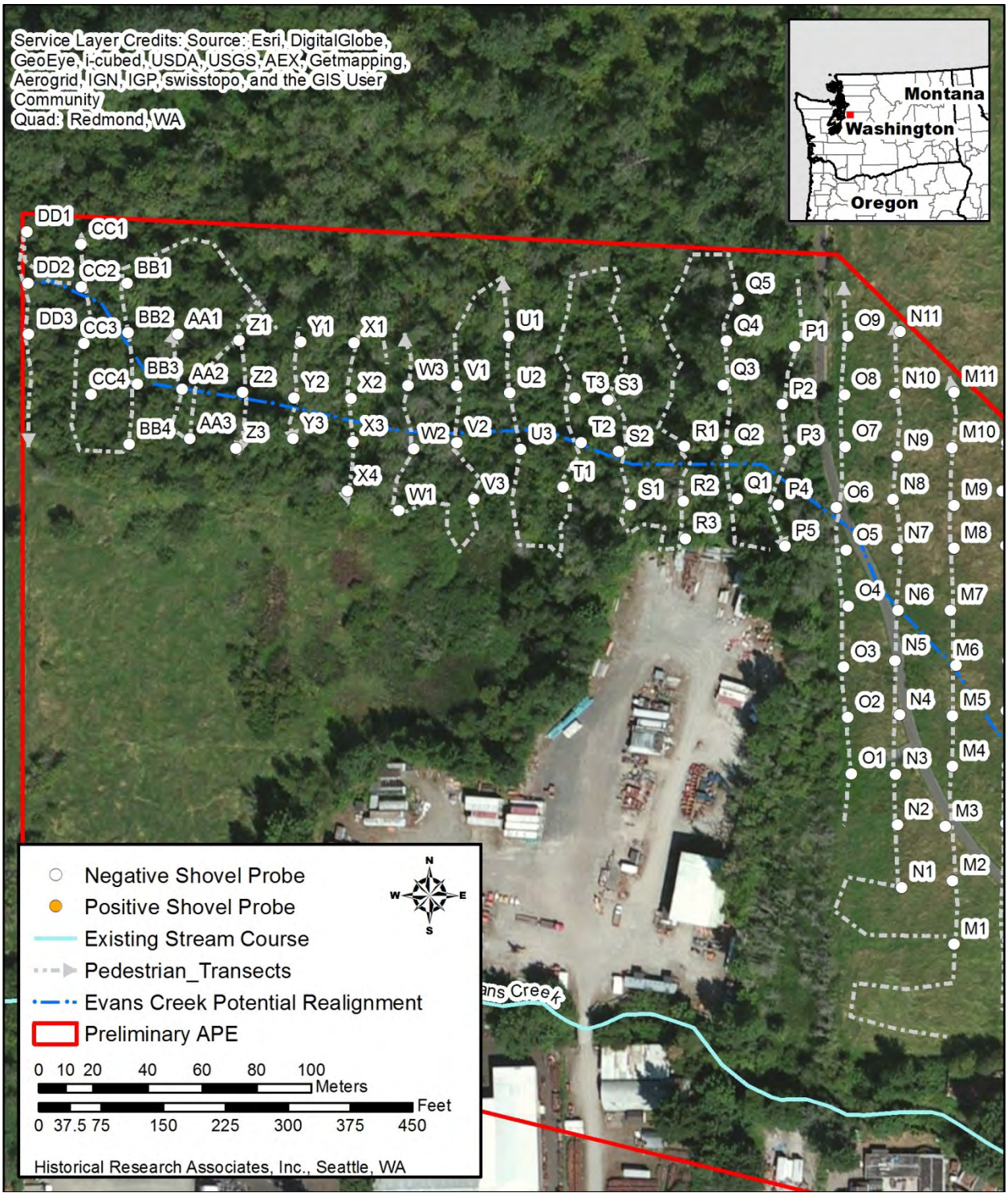

Figure 7-23. Shovel probes and pedestrian transects conducted in the northwest portion of the APE, in the upland forest.

8. Summary and Recommendations

8.1 Archaeological and Architectural Resources

No cultural resources were identified during archaeological monitoring in the APE. HRA recorded one archaeological site, the multi-component Lind Farm Complex (HRA-2045-1) during inventory of the proposed Evans Creek APE. The Lind Farm Complex includes both surface and subsurface components. The above-ground BSOs associated with the Lind Farm Site—a gambrel-roof barn, chicken house, and third outbuilding—were recorded in 2005 and 2007 (Flathman 2007c; Melton 2005). Flathman recommended that the barn is eligible for listing in the NRHP (Flathman 2007); however, the DAHP has not concurred with this recommendation.

There is also a small concrete bridge, crossing Evans Creek, recorded by HRA that is a part of the overall Lind Farm Complex. As part of the Project, the City wishes to remove the bridge to improve the flow of Evans Creek. At this time, it is uncertain that the reroute of Evans Creek would extend that far to the south. The bridge appears too recent to be recorded as part of the archaeological site, and it is therefore considered a non-contributing element to the overall archaeological site.

Subsurface components to the Lind Farm Complex include precontact lithic artifacts and historic period glass, brick, and metal fragments in both Loci. HRA has not evaluated Site HRA-2045-1 for its eligibility for listing in the NRHP. HRA recommends avoidance of ground disturbing activities within Loci A and B. The areas of the Lind Farm that will be protected will be delineated through installation of orange hazard fencing.

HRA recommends continued monitoring of geotechnical activities in the APE, due to the archaeological sensitivity of the APE. Archaeological monitoring will also help to obtain additional information on the characteristics of subsurface sediments and the transitions between depositional units, which will provide further information on the likelihood of encountering archaeological resources. The transition from silty to clayey slackwater deposits in the upper 60 to 100 cmbs, overlying increasingly peat-rich silts, is particularly of interest. Archaeologists often noted a yellow to orange-brown, ashy and oxidized layer overlying the peat in the northeast and northwest portions of the APE. Based on observations at the Bear Creek Site (45KI839), where a similar oxidized layer was described overlying the peat, and which has been described as reworked Mazama ash dating to over 7,000 years ago, the sediments observed at Evans Creek may represent a once-exposed surface that has been subsequently buried, through seasonal flooding, subsidence due to the 1000 A.D. Seattle Fault earthquake, or a combination of these activities. Such buried surfaces are often the location of cultural materials.

HRA recommends archaeological monitoring of excavation activities, once the realignment of Evans Creek is decided upon. Even though archaeological materials were not observed in the majority of the APE, the sensitivity of the area remains high.

8.2 Accidental Discovery of Archaeological Resources

In the event that archaeological deposits are inadvertently discovered during construction in any portion of the APE, ground-disturbing activities should be halted immediately, and the City should be notified. The City would then contact DAHP and the interested Tribes, as appropriate.

8.3 Discovery of Human Remains

Any human remains that are discovered during construction of the Project will be treated with dignity and respect. The affected Native American Tribes are the Tulalip Tribes, Snoqualmie Indian Tribe, Muckleshoot Tribe, Snohomish Tribe, and the non-Federally recognized Duwamish Tribe.

If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity that may cause further disturbance to those remains **must** cease, and the area of the find must be secured and protected from further disturbance. In addition, the finding of human skeletal remains **must** be reported to the King County Medical Examiner (ME) **and** local law enforcement in the most expeditious manner possible. The remains should not be touched, moved, or further disturbed.

The ME will assume jurisdiction over the human skeletal remains, and make a determination of whether those remains are forensic or non-forensic. If the ME determines the remains are non-forensic, they will report that finding to the DAHP. DAHP will then take jurisdiction over those remains and report them to the appropriate cemeteries and affected tribes. The State Physical Anthropologist will make a determination of whether the remains are Indian or non-Indian, and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

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Appendix A: Shovel Probe Table

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
A1	20 m N of A2	5280960	569004	200 cmbs Auger at surface	0-110 cmbs: Mottled dark brown and olive grey, organic loamy clay. Groundwater at 30 cmbs.	None.	Maximum extent of auger.
					110-170 cmbs: Compact, bluish grey, loamy clay. Few sand inclusions.		
					170-200 cmbs: Dark brown, saturated, organic loam with bluish grey, compact clay inclusions.		
A2	20 m S of A12	5280898	569011	200 cmbs Auger at surface	0-70 cmbs: Mottled dark brown and olive grey, organic silty loam. Groundwater at 25 cmbs.	None.	Maximum extent of auger.
					70-110 cmbs: Gradual transition between brown silty loam and grey clay.		
					110-170 cmbs: Grey, coarse sandy clay.		
					170-200 cmbs: Dark brown, saturated, silty peat.		
A3	20 m S of A2	5280878	569011	170 cmbs Auger at surface	0-45 cmbs: Dark brown, saturated, organic silty loam. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
					45-100 cmbs: Mottled dark greyish brown, saturated clayey loam.		
					100-140 cmbs: Dark grey sandy, clayey loam with sand inclusions.		
					140-170 cmbs: Dark brown, friable, organic clayey loam. Clay content increases with depth.		
A4	20 m S of A3	5280860	569010	190 cmbs Auger at surface	0-50 cmbs: Dark brown, saturated, organic silty loam. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					50-70 cmbs: Greyish brown, silty clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					70-90 cmbs: Grey, compact clay.		
					90-110 cmbs: Intermittent lenses of grey, compact clay and grey, coarse sand.		
					110-140 cmbs: Grey, compact, fine sandy clay.		
					140-160 cmbs: Brown, silty peat.		
					160-190 cmbs: Blue gleyed clay.		
A5	20 m S of A4	5280842	569013	200 cmbs Auger at surface	0-50 cmbs: Dark brown, organic silty loam. Groundwater at 25 cmbs.	None.	Practical refusal with auger.
					50-80 cmbs: Light greyish brown, clayey loam.		
					80-130 cmbs: Mottled olive brown and grey, compact, loamy clay with organics.		
					130-180 cmbs: Dark grey to bluish grey, sandy, clayey loam with intermittent sand lenses. <1% coarse granules and pea gravels.		
					180-200 cmbs: Bluish grey, compact clay with yellow mottles/streaking.		
A6	20 m S of A5	5280821	569012	180 cmbs Auger at surface	0-45 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					45-65 cmbs: Greyish brown, silty clay.		
					65-80 cmbs: Grey, sandy clay.		
					80-110 cmbs: Grey clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					110-180 cmbs: Grey, sandy clay with intermittent compact clay and coarse sand lenses.		
A7	20 m S of A6	5280803	569011	48 cmbs	0-48 cmbs: Dark brown, loose, dry, gravelly, silty loam. >30% poorly sorted gravels.	None.	Gravel barrier.
					At 45-48 cmbs, slight yellowish brown color gradations.		
A8	20 m S of A7	5280782	569009	51 cmbs	0-11 cmbs: Dark brown, silty loam with 15% gravels.	None.	Gravel barrier.
					11-47 cmbs: Brown gravelly loam. 40-60% poorly sorted subround gravels and cobbles.		
					47-51 cmbs: Yellowish brown, gravelly coarse sand. 40-60% poorly sorted subround gravels and cobbles.		
A9	20 m S of A8	5280760	569008	37 cmbs	0-13 cmbs: Dark brown sandy silty with 15% poorly sorted gravels and 35% cobbles.	0-20 cmbs: colorless glass fragment.	Boulder obstruction.
					13-37 cmbs: Dark reddish brown sandy silt with 15% gravels and 35% cobbles.		
A10	20 m S of A9	5280738	569006	37 cmbs	0-17 cmbs: Brown, dry, compact, silty loam. 15% poorly sorted gravels and cobbles. Charcoal flecks throughout.	None.	Boulder obstruction.
					17-23 cmbs: Dark yellowish brown, dry, compact, slightly sandy silt. 15% gravels and cobbles.		
					23-37 cmbs: Brown, dry, compact, silty loam with 20% gravels and cobbles.		
A11	10 m S of old chicken coop	5280680	569008	60 cmbs	0-20 cmbs: Dark brown, silty loam with 35% poorly sorted gravels and cobbles.	0-20 cmbs: wire-cut nail.	Cobble obstruction.
					20-60 cmbs: Dark reddish brown, sandy silt with 35% gravels and cobbles. Charcoal at 31 cmbs and 58 cmbs.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
A12	20 m N of A13	5280659	569009	59 cmbs	0-14 cmbs: Brown, dry, compact, silty loam. 15% poorly sorted gravels and cobbles. Charcoal flecks throughout.	0-10 cmbs: 1 red jasper flake, 1 copper unknown object.	Large metal tank obstruction.
					14-59 cmbs: Strong brown, dry, compact, silty medium to coarse sand. 35% poorly sorted gravels and cobbles.	10-50 cmbs: 2 copper pipe fragments, 1 white cloth fragment, 1 brick fragment, other modern trash: plastic and foil fragments.	
A12.1	5 m E of A12	5280661	569016	60 cmbs	0-12 cmbs: Dark brown, silty loam. Disturbed with inclusions of asphalt and concrete.	None.	Cobble obstruction.
					12-14 cmbs: Carbonized earth, charcoal and ash. Can be seen in profile.		
					14-60 cmbs: Light brown to olive brown, gravelly loam. 40-60% gravels and cobbles.		
A12.2	5 m S of A12	5280650	569012	65 cmbs	0-20 cmbs: Dark brown, gravelly, sandy silt. Many organics and 20% poorly sorted gravels and cobbles.	None.	Collapsing sidewalls.
					20-40 cmbs: Dark yellowish brown to strong brown, gravelly, sandy silt. 50% gravels and cobbles.		
					40-65 cmbs: Mottled olive brown and yellowish grey, coarse sand and gravels.		
A12.3	5 m N of A12	5280666	569009	63 cmbs	0-25 cmbs: Dark brown, sandy silt with 25% poorly sorted gravels and cobbles.	None.	Gravel barrier.
					25-58 cmbs: Dark yellowish brown, fine to medium sandy silt. 35% gravels and cobbles.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					58-63 cmbs: Light yellowish brown, silty, sandy gravels. >50% gravels and cobbles.		
A12.4	5 m W of A12	5280658	569001	20 cmbs	0-20 cmbs: Dark brown, fine sandy silt with 30% poorly sorted gravels and cobbles.	0-20 cmbs: 2 curved colorless glass fragments, 1 brick fragment, 1 black plastic fragment.	2 rubber coated wire obstructions
A12.5	5 m W of A12.3	5280664	569001	47 cmbs	0-26 cmbs: Dark brown, sandy silt with 30% poorly sorted gravels and cobbles.	0-26 cmbs: 1 wire-cut nail, 1 terra cotta fragment, 2 CCS shatter.	Cobble obstruction.
					26-47 cmbs: Yellowish brown, sandy silt with 45% gravels and cobbles with charcoal flecks throughout.		
A12.6	5 m W of A12.4	5280659	568996	80 cmbs	0-30 cmbs: Dark brown, fine sandy silt with few pea gravels.	0-20 cmbs: 2 brick fragments.	Cobble obstruction.
					30-70 cmbs: Dark yellowish brown, fine sandy silt with 60-70% gravels and cobbles.		
					70-80 cmbs: Pale yellowish brown silt with 70% gravels and cobbles.		
A12.7	5 m S of A12.4	5280654	569002	60 cmbs	0-30 cmbs: Dark brown, silty loam with 35% poorly sorted gravels and cobbles.	0-30 cmbs: 3 wire-cut nail fragments, 1 wire tack nail, 1 small decomposing mammal bone, modern trash: plastic and foil fragments.	Gravel barrier.
					30-58 cmbs: Light brown to brown, gravelly loam.		
					58-60 cmbs: Coarse sand and poorly sorted gravels.		
A12.8	5 m N of A12.5	5280669	568999	53 cmbs	0-20 cmbs: Dark brown, silty loam with 20% poorly sorted gravels and cobbles.	0-20 cmbs: 1 saw-cut wood fragment, 5	Cobble obstruction.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					20-53 cmbs: Dark reddish brown, sandy silt with 45% gravels and cobbles.	pieces of terra cotta, 14 colorless glass fragments, 1 head of wire-cut nail, 1 basalt flake.	
A12.9	5 m W of A12.5	5280664	568995	20 cmbs	0-20 cmbs: Dark brown, silty loam with 15% poorly sorted gravels and 5% cobbles.	0-20 cmbs: wire-cut nail, 1 brick fragment, 1 ceramic fragment, 1 piece of slag/carbonized trash.	Root obstruction.
A12.10	5 m S of A12.7	5280648	569003	40 cmbs	0-36 cmbs: Dark brown, silty loam with 10% poorly sorted gravels and cobbles.	0-30 cmbs: 2 wire-cut nail fragments, 1 colorless glass fragment, 2 ceramic fragments, 1 pink flagging fragment.	Cobble obstruction.
					36-40 cmbs: Strong brown, slightly sandy silt. 40% large gravels and cobbles.		
A12.11	5 m N of A12.8	5280674	568998	85 cmbs	0-25 cmbs: Dark brown, organic, gravelly, sandy silt.	0-25 cmbs: 3 machine-cut wire nails.	Gravel barrier.
					25-70 cmbs: Dark yellowish brown, gravelly, fine to medium sandy silt. 35% gravels and 10% cobbles.		
					70-85 cmbs: Olive grey, coarse sandy gravels.		
A12.12	5 m W of A12.8	5280668	568995	68 cmbs	0-20 cmbs: Greyish brown, gravelly loam.	0-68 cmbs: 2 nail fragments, 2 colorless glass (pane) fragments, 1 colorless glass (bottle) fragment, 1 CCS flake shatter.	Cobble obstruction.
					34-68 cmbs: Light brown, gravelly loam. 30-50% gravels and cobbles.		
A12.13	5 m W of A12.12	5280668	568989	47 cmbs	0-13 cmbs: Dark brown, silty loam with 20% poorly sorted gravels and cobbles.	0-13 cmbs: 1 terra cotta fragment, 1	Cobble obstruction.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					13-47 cmbs: Dark reddish brown, sandy silt with 45% gravels and cobbles.	colorless glass fragment, 1 plastic fragment.	
A12.14	5 m W of A12.11	5280673	568994	60 cmbs	0-14 cmbs: Dark brown, silty loam with 10% poorly sorted gravels and cobbles.	0-20 cmbs: wire-cut nail.	Cobble obstruction.
					14-60 cmbs: Yellowish brown, sandy silt with 35% gravels and cobbles.	0-30 cmbs: 8 brick fragments, 1 white (milk) glass fragment.	
A13	20 m S of A12	5280621	569008	70 cmbs	0-32 cmbs: Dark brown, dry, moderately loose, gravelly, sandy silt. <10% gravels and cobbles.	None.	Gravel barrier.
					32-66 cmbs: Dark yellowish brown grading to strong brown, extremely compact, gravelly, sandy silt. >35% pea gravels, 10-20% small to large, round to subround cobbles.		
					66-70 cmbs: Yellowish brown to olive grey sandy gravel. >50% gravels and cobbles.		
A14	NE portion of APE ~ 3 m of wetland fence. ~10 m E of walkway. Located in a cleared field	5280995	569007	170 cmbs Auger at 80 cmbs	0-36 cmbs: Dark brown silts with clay content. Rootlets near surface with few to no gravels.	None.	Practical refusal with auger.
					36-60 cmbs: Grey clayish silts with oxidation stains that is compact with few organics.		
					60-70 cmbs: Similar matrix, but with fine sandy silts.		
					70-110 cmbs: Darker grey clayish silts to silty clay, still having strong brown oxidations stains. Few to no peas size gravels.		
					110-150 cmbs: Dark greyish brown to dark brown peaty silts, with organics including charcoal and some pale grey ash inclusions.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					150-160 cmbs: Abrupt transition to gleyed gravels with silt matrix.		
					160-170 cmbs: Dark grey clayish silts, smooth with a few gravels and preserved organics. Suction due to water at half auger.		
A15	20 m E of A14	5280995	569029	110 cmbs Auger at 80 cmbs	0-30 cmbs: Dark brown silts with clay content and rootlets near the surface, having few to no gravels. Several roots were 1 cm in diameter.	None.	Root obstruction.
					30-40 cmbs: Slightly sandy silts, grey with oxidation stains and ~2 % gravels.		
					40-80 cmbs: Transition to a compact grey sandy silts to silty sand with ~40% subround pea gravels, few rootlets and oxidation stains. Some possible peat inclusions.		
					80-110 cmbs: Transition to very dry clayey silts, dark gray with oxidation staining. Some possible peaty inclusions. May be disturbed, appears patchy. Halt.		
A16	20 m E of A15	5280994	569049	180 cmbs Auger at 80 cmbs	0-30 cmbs: Dark brown silts with clay content and rootlets near the surface, having few to no gravels.	None.	Practical refusal with auger.
					30-100 cmbs: Grey fine sandy silts with oxidation stains, few rootlets and few subround pea gravels. Moderately compact, with compaction increasing with depth.		
					100-150 cmbs: Transition to clayish silts, darker grey-brown with some gleyed blue-grey clay inclusions and lenses. Also contains some peatly silt lenses.		
					150-180 cmbs: Transition to increasing peaty silts, still much darker grey clayish silts with oxidation stains.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
A17	20 m E of A16	5280996	569071	150 cmbs Auger at 80 cmbs	0-36 cmbs: Dark brown silts with clay content. Rootlets near surface with few subround gravels.	None.	Practical refusal with auger.
					36-80 cmbs: Grey silty coarse sand with ~20% pea gravels and some rootlets.		
					80-110 cmbs: Grey to greyish brown clayish silts with some peat like lenses and few to no pea gravels.		
					110-140 cmbs: Increasing peaty silts, dark greyish brown to dark brown that is very dry and compact.		
					140-150 cmbs: Greyish brown clayish loam that is very hard and compact.		
A18	20 m E of A17	5280995	569090	150 cmbs Auger at 75 cmbs	0-36 cmbs: Dark brown silts with many subround peas gravels and small cobbles.	None.	Practical refusal with auger.
					36-80 cmbs: Grey increasingly gravely silty sands. Moist to wet by base of level. Rootlets were common with ~20% angular pea gravels and ~15% subround pea gravels. Appears to be fill.		
					80-150 cmbs: Grayish-brown to dark brown peaty silts, clayey silts. Layers of deposition, al very fine with few gravels. Very compacted and dry.		
A19	20 m E of A18	5280995	569109	85 cmbs	0-30 cmbs: Dark brown silty loam with many small subround cobbles and subround pea gravels. Cobble and gravels increase past 20 cmbs.	None.	Compactness and cobble obstructions.
					30-85 cmbs: Greyish brown sandy silt with ~60% subround small cobbles and subround pea gravels that is poorly sorted and very compact. Appears to be disturbed.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B1	20 m N of B2	5280975	568984	200 cmbs Auger at 30 cm	0-30 cmbs: Dark brown, saturated, organic silty loam. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					30-175 cmbs: Greyish brown, saturated, compact, silty clay.		
					175-200 cmbs: Bluish grey, compact clay with dark brown organic inclusions.		
B2	20 m N of B3	5280956	568982	125 cmbs Auger at surface	0-25 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					25-50 cmbs: Grey, slightly silty clay with few organic inclusions.		
					50-80 cmbs: Grey, compact clay.		
					80-125 cmbs: Grey clay, increasing organic peat inclusions.		
B3	20 m N of B4	5280937	568979	135 cmbs Auger at surface	0-50 cmbs: Dark brown, organic silty loam. 20 cm of water above ground surface.	None.	Practical refusal with auger.
					50-120 cmbs: Light greyish brown, saturated, compact silty loam.		
					120-135 cmbs: Dark grey, compact, organic, silty, loamy peat.		
B4	20 m N of B5	5280920	568983	102 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam. Groundwater at surface.	None.	No retention of matrix in auger.
					30-102 cmbs: Grey to bluish grey, silty, gleyed clay with few organics. Sandy clay inclusions.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B5	20 m N of B6	5280901	568983	176 cmbs Auger at surface	0-50 cmbs: Dark brown, organic silty loam. 20 cm of water above ground surface.	None.	Practical refusal with auger.
					50-125 cmbs: Greyish brown, compact, saturated, silty loam. Organics become finer.		
					125-160 cmbs: Dark brown, organic, peat loam.		
					160-176 cmbs: Grey, extremely compact, slightly oxidized, loamy clay with few organics.		
B6	20 m S of B5	5280881	568985	143 cmbs Auger at surface	0-50 cmbs: Dark brown, saturated, organic silty loam. Standing water at surface.	None.	No retention of matrix in auger.
					50-80 cmbs: Greyish brown, slightly organic, silty clay.		
					80-143 cmbs: Intermittent lenses of dark grey silty clay and dark brown, silty peat.		
B7	20 m S of B6	5280862	568985	195 cmbs Auger at surface	0-50 cmbs: Dark brown, organic silty loam. Standing water at surface.	None.	Practical refusal with auger.
					50-100 cmbs: Greyish brown, compact, semi-friable, silty, clayey loam.		
					100-160 cmbs: Dark brown to dark reddish brown, silty, loamy peat.		
					160-195 cmbs: Dark grey, extremely dense, medium to coarse sandy clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B8	20 m S of B7	5280842	568985	200 cmbs Auger at surface	0-35 cmbs: Dark brown, organic silty loam. Standing water at surface.	None.	Practical refusal with auger.
					35-75 cmbs: Light greyish brown, silty clay.		
					75-120 cmbs: Dark brown to dark reddish brown, organic clay loam (peat).		
					120-180 cmbs: Bluish grey, compact, loamy clay with coarse sandy inclusions. <1% pea gravels.		
					180-200 cmbs: Bluish grey, extremely compact, firm clay with diminising sandy inclusions.		
B9	20 m S of B8	5280817	568987	53 cmbs	0-53 cmbs: Brown, compact, dry, gravelly silty loam. Many poorly sorted gravels and cobbles.	None.	Cobble obstruction.
B10	20 m S of B9	5280799	568983	61 cmbs	0-18 cmbs: Dark brown, dry, compact, gravelly silt. 10-15% poorly sorted gravels and cobbles.	None.	Cobble obstruction.
					18-38 cmbs: Strong brown, dry, compact, gravelly, sandy silt. 40% gravels and cobbles. Woody debris and associated charcoal present.		
					38-61 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sandy gravel. 60% patinated gravels and cobbles.		
B11	20 m S of B10	5280779	568985	60 cmbs	0-16 cmbs: Dark brown, dry, compact, gravelly silt. 10-15% poorly sorted gravels and cobbles. Charcoal flecks and pieces.	None.	Cobble obstruction.
					16-39 cmbs: Strong brown, dry, compact, gravelly, sandy silt. 40% gravels and cobbles.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					39-60 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sandy gravel. 60% patinated gravels and cobbles.		
B12	20 m S of B11	5280759	568985	78 cmbs	0-11 cmbs: dark brown sandy silt with 30% round to subround large cobbles and 15% gravels.	None.	Cobble obstruction.
					11-55 cmbs: Dark reddish-brown sandy silt with same amount cobbles and gravels and flecks of charcoal throughout.		
					55-78 cmbs: Light yellowish-brown silty sand with 40% gravels and 5% small cobbles. Terminated due to collapsing sidewalls.		
B13	20 m S of B12	5280739	568985	68 cmbs	0-40 cmbs: Dark brown, dry, compact, gravelly silt. 10% poorly sorted gravels and cobbles.	None.	Cobble obstruction.
					40-68 cmbs: Strong brown grading to yellowish brown, dry, compact, gravelly, sandy silt. 50% gravels and 10% cobbles.		
B14	20 m S of B13	5280721	568986	72 cmbs	0-30 cmbs: Very dark brown, gravelly, sandy silt. 10% gravels and small to medium cobbles.	None.	Compact gravel barrier.
					30-45 cmbs: Dark yellowish brown, compact, cobbly, sandy silt. >50% poorly sorted gravels.		
					45-65 cmbs: Reddish brown to yellowish brown, gravelly, cobbly, sandy silt. All gravels patinated.		
					65-72 cmbs: Light yellowish brown, loose, gravelly, silty sand. Patinated gravels.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B15	20 m S of B14	5280697	568988	63 cmbs	0-25 cmbs: Dark brown loose and dry sandy silt with large cobbles to small boulders below surface. Active roots systems. Gravels unsorted and increasing in size and percentage with depth.	None.	Collapsing sidewalls.
					25-62 cmbs: Dark yellowish-brown losse and gravelly silts. Over 30% pea gravels and 10% medium to large rounded cobbles not well sorted. Gravels make up over 50 % of matrix by volume.		
					62-63 cmbs: Cobble barrier with oxidized reddish brown to yellowish-brown sediments.		
B16	20 m N of B17	5280679	568989	68 cmbs	0-8 cmbs: Very dark brown, silty loam with few poorly sorted, round gravels and cobbles.	None.	Gravel obstructions.
					8-68 cmbs: Brownish yellow to light brown, gravelly, loamy, silty sand. Sand increases with depth.		
B17	20 m N of B16	5280661	568987	60 cmbs	0-10 cmbs: Dark brown, silty loam.	0-50 cmbs: 1 large FCR cobble, 1 colorless glass fragment, 1 wire-cut nail, 1 burned bone fragment.	Compact gravel barrier.
					10-60 cmbs: Greyish brown, sandy loam with 20% round to subround, small to large gravels and small cobbles. Common roots		
B18	20 m N of B19	5280642	568984	62 cmbs	0-62 cmbs: Greyish brown, compact, sandy silt with 10-20% round to subround, small to large gravels.	None.	Compact gravel barrier.
B19	20 m S of B18	5280623	568986	45 cmbs	0-45 cmbs: Light greyish brown, very compact, sandy, gravelly clay with mottled blue clay inclusions.	0-40 cmbs: several small pieces of coal, 1 colorless glass bottle base fragment.	Compact gravel barrier.
B20	~40m E of C1	5281016	568985	164 cmbs Auger at	0-25 cmbs: Dark brown sandy silt with no gravels and many rootlets.	None.	Exceeded vertical APE.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				83 cmbs	25-42 cmbs: Grey clayish silthy with reddish brown oxidation stains and no gravel or roots.		
					42-68 cmbs: Blueish grey coarse sand with ~5% subround to round pea gravels.		
					68-130 cmbs: Blueish grey silty clay with no gravels.		
					130-145 cmbs: Blueish grey coarse sand and water table at 130 cmbs.		
					145-164 cmbs: Blueish grey silt with reddish brown oxidation stains.		
B21	~20 m E of B20	5281015	569008	136 cmbs Auger at 82 cmbs	0-22 cmbs: Dark brown silt with no gravels and many rootlets.	None.	Practical refusal with auger.
					22-115 cmbs: Greyish brown silt with oxidation stains that is dry and moderately compact, having no gravels.		
					115-136 cmbs: Dark brown silt with many organics (peaty).		
B22	~20 m E of B21	5281014	569028	113 cmbs Auger at 76 cmbs	0-22 cmbs: Dark brown silt with no gravels and many rootlets.	None.	Practical refusal with auger.
					22-95 cmbs: grey find sandy silt with reddish brown oxidation stains that is dry and moderately compact, having no gravels. Sand content increases slightly with depth.		
					95-113 cmbs: Dark brown silt with many organics and no gravels.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B23	~20 m E of B22	5281015	569049	143 cmbs Auger at 76 cmbs	0-17 cmbs: Dark brown silt with no gravels and many rootlets.	None.	Practical refusal with auger.
					17-105 cmbs: Grey fine sandy silt with reddish brown oxidation stains that is dry and moderately compact, having no gravels.		
					105-110 cmbs: Grey medium coarse sand.		
					110-143 cmbs: Dark brown silt with many organics that is dry and moderately compact, having no gravels.		
B24	~20 m E of B23	5281015	569070	126 cmbs Auger at 71 cmbs	0-17 cmbs: Dark brown silt with no gravels and many rootlets.	None.	Practical refusal with auger.
					17-115 cmbs: Light yellowish brown sandy silt with ~5% round to subround pea gravels and ~1% subround large small cobbles.		
					115-126 cmbs: Dark brown silt with many organics (peaty) that is dry and moderately compact, having no gravels.		
B25	~20 m E of B24	5281015	569090	107 cmbs Auger at 75 cmbs	0-26 cmbs: Dark bronwn silt with ~10% subround and subangular pea gravels and ~5% subangular small cobbles.	None.	Practical refusal with auger.
					26-85 cmbs: Dark yellowish brown sandy silt with ~5% subround and subangular pea gravels and <5% subangular small cobbles that is dry and moderately compact. Sand content increases with depth.		
					85-107 cmbs: Dark brown silt with few organics that is dry and moderately compact.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B26	~20 m E of B25	5281015	569109	61 cmbs	0-22 cmbs: Dark brown silt with ~15% subround and subangular gravels and ~5% subangular small cobbles that is moist and moderately compact.	None.	Compactness and cobble obstructions.
					22-61 cmbs: Grey coarse sand with ~35% pea gravels and ~15% small subangular cobbles that is very compact. Appears to be fill and the location supports that.		
C1	20 m N of C2	5281000	568964	193 cmbs Auger at 80 cmbs	0-25 cmbs: Dark brown, organic silty clay. Groundwater at 58 cmbs.	None.	Practical refusal with auger.
					25-193 cmbs: Dark bluish grey, gleyed clay with organic lenses.		
C2	20 m S of C1	5280979	568967	190 cmbs Auger at surface	0-170 cmbs: Light yellowish brown, sandy clay with lenses of medium to coarse sand and organics throughout.	None.	Practical refusal with auger.
					170-190 cmbs: Light bluish grey, gleyed clay with organic lenses.		
C3	20 m S of C2	5280961	568965	76 cmbs Auger at surface	0-65 cmbs: Dark yellowish brown, sandy clay with lenses of medium to coarse sand and organics throughout. Standing water above surface.	None.	Practical refusal with auger.
					65-76 cmbs: Light yellowish brown, compact, moist, silty clay.		
C4	20 m S of C3	5280940	568965	160 cmbs Auger at surface	0-112 cmbs: Dark yellowish brown, sandy clay with lenses of medium to coarse sand and organics throughout. Standing water above surface.	None.	Practical refusal with auger.
					112-160 cmbs: Dark grey clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
C5	20 m S of C4	5280920	568967	23 cmbs Auger at surface	0-23 cmbs: Dense grass and reed rootmat; unable to penetrate with auger. (5 attempts)	None.	Unable to penetrate rootmat with auger.
C6	20 m S of C5	5280901	568960	63 cmbs Auger at surface	0-63 cmbs: Dark brown, saturated, organic silty clay with grey gleyed clay mottles. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
C7	20 m S of C6	5280884	568966	77 cmbs Auger at surface	0-50 cmbs: Dark greyish blue, gleyed clay. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					50-55 cmbs: Dark grey silt with charcoal flecks.		
					55-77 cmbs: Dark greyish blue, gleyed clay.		
C8	20 m S of C7	5280861	568960	170 cmbs Auger at surface	0-80 cmbs: Dark bluish grey, organic coarse sand. Groundwater at surface.	None.	Practical refusal with auger.
					80-105 cmbs: Dark bluish grey, gleyed clay.		
					105-150 cmbs: Dark bluish grey, coarse sand.		
					150-170 cmbs: Dark bluish grey, gleyed clay.		
C9	20 m S of C8	5280840	568968	75 cmbs Auger at surface	0-50 cmbs: Dark bluish grey, organic coarse sand. Groundwater at surface.	None.	Gravel barrier.
					50-75 cmbs: Dark bluish grey, coarse sand with 20% subround to subangular gravels.		
C10	20 m S of C9	5280819	568964	60 cmbs	0-20 cmbs: Dark brown, silty loam with 35% poorly sorted gravels.	None.	Root obstruction.
					20-60 cmbs: Dark reddish brown, silty loam with 25% gravels and 5% cobbles.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
C11	20 m S of C10	5280664	568969	64 cmbs	0-64 cmbs: Dark yellowish brown, compact, sandy silt with 25% poorly sorted gravels and cobbles.	None.	Cobble and root obstructions.
C12	20 m S of C13	5280684	568964	51 cmbs	0-51 cmbs: Dark yellowish brown, compact, sandy silt with 25% poorly sorted gravels and cobbles.	None.	Boulder obstruction.
C13	20 m S of C14	5280702	568965	57 cmbs	0-57 cmbs: Dark yellowish brown, compact, sandy silt with 15% poorly sorted gravels and cobbles.	None.	Boulder obstruction.
C14	20 m S of C15	5280723	568966	59 cmbs	0-59 cmbs: Dark yellowish brown, compact, sandy silt with 15% poorly sorted gravels and cobbles.	None.	Boulder obstruction.
C15	20 m S of C16	5280743	568965	87 cmbs	0-15 cmbs: Dark yellowish brown, compact, sandy silt with 15% poorly sorted gravels and cobbles.	None.	Gravel barrier.
					15-80 cmbs: Reddish brown sandy silt. Charcoal flecks throughout. 35% gravels and cobbles.		
					80-87 cmbs: Light yellowish brown, compact, silty sand with 35% subround to round gravels and small cobbles.		
C16	20 m S of C15	5280762	568964	67 cmbs	0-14 cmbs: Dark brown, dry, compact, gravelly silt. 50% poorly sorted gravels and cobbles. Charcoal flecks throughout.	0-30 cmbs: 1 CCS flake shatter.	Gravel barrier.
					14-36 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60-70% gravels. Few charcoal flecks throughout.	0-48 cmbs: 5 pieces of FMR.	
					36-48 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sand. 70% small, round gravels. Dark charcoal stain in N wall at 32-40 cmbs.		
					48-67 cmbs: Light brown to tan silty gravel. 70% small to large gravels and medium cobbles.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
C16N	5 m N of C16	5280766	568964	63 cmbs	0-11 cmbs: Dark brown, sandy silt with 35% gravels.	None.	Cobble obstruction.
					11-52 cmbs: Reddish brown sandy silt. Charcoal flecks throughout. 35% gravels and cobbles.		
					52-63 cmbs: Light brown to tan sandy gravel. 70% small to large gravels and medium cobbles.		
C16E	5 m E of C16	5280762	568968	70 cmbs	0-15 cmbs: Dark brown, dry, compact, gravelly, silty loam. 15% gravels	None.	Gravel barrier.
					15-70 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60-70% gravels.	None.	
C16S	5 m S of C16	5280756	568965	66 cmbs	0-20 cmbs: Dark brown, sandy silt with 35% gravels.	None.	Cobble obstruction.
					20-56 cmbs: Reddish brown sandy silt. Charcoal flecks throughout. 35% gravels and cobbles.		
					56-66 cmbs: Light brown to tan sandy gravel. 70% small to large gravels and medium cobbles.		
C16W	5 m W of C16	5280761	568960	69 cmbs	0-15 cmbs: Dark brown, gravelly silt. 20% poorly sorted gravels and cobbles. Charcoal flecks throughout.	None.	Gravel barrier.
					15-46 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60% gravels. Few charcoal flecks throughout.		
					46-69 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sand. 70% small, round gravels.		
C17	20 m N of C16	5280783	568964	43 cmbs	0-15 cmbs: Dark brown, dry, compact, gravelly silt. 50% poorly sorted gravels and cobbles. Charcoal flecks throughout.	None.	Gravel barrier.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					15-43 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60% gravels and 20% gravels. Few charcoal flecks throughout.		
C18	20 m S of C10	5280800	568964	72 cmbs	0-16 cmbs: Dark brown, dry, compact, gravelly silt. 50% poorly sorted gravels and cobbles. Charcoal flecks throughout.	None.	Sidewalls caving.
					16-55 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60-70% gravels. Few charcoal flecks throughout.		
					55-72 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sand. 70% small, round gravels.		
D1	20 m N of D2	5281040	568944	194 cmbs Auger at 75 cmbs	0-32 cmbs: Light grey, sandy clay.	None.	Practical refusal with auger.
					32-160 cmbs: Mottled dark grey and brown clay. Organics and charcoal present throughout.		
					160-174 cmbs: Grey, saturated, coarse sand.		
					174-194 cmbs: Dark grey clay.		
D2	20 m N of D3	5281019	568944	180 cmbs Auger at 85 cmbs	0-28 cmbs: Dark brown silty loam, topsoil, moderately moist with many roots.	None.	Practical refusal with auger.
					28-80 cmbs: Grey, clayey silts with strong brown oxidation stains. Moist to wet, some water in probe.		
					80-85 cmbs: Thin lens pale tan silts - possibly ashy? Immed bleeds into silty peats/peaty silts.		
					85-150 cmbs: Trend to increasingly peaty silts, dark greyish brown to dark brown. Increasingly fibrous peats.		
					150-180 cmbs: Below peats, grey to bluish grey clayey silts.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
D3	5 m N of wetland boundary	5281001	568943	150 cmbs Auger at 78 cmbs	0-20 cmbs: Dark brown silty loam, wet by 15 cmbs. Many roots.	None.	Practical refusal with auger.
					20-90 cmbs: Brownish grey to brown, clayey silts with strong brown oxidation stains. Moist to wet, some water in probe but goes down with digging. Some sandy lenses.		
					90-95 cmbs: Thin lens pale tan silts - possibly ashy? Immed bleeds into silty peats/peaty silts.		
					95-150 cmbs: Trend to increasingly peaty silts, dark greyish brown to dark brown. Increasingly fibrous peats then back to silty. Auger stuck at base.		
D4	20 m S of D5	5280850	568946	55 cmbs Auger at surface	0-40 cmbs: Dark brown, organic silty loam. Groundwater at 12 cmbs.	None.	Gravel barrier.
					40-55 cmbs: Mottled dark brown and bluish grey, silty loam with 5% subround gravels.		
D5	20 m S of D6	5280867	568941	88 cmbs Auger at surface	0-55 cmbs: Dark bluish grey, sandy clay. Groundwater at 5 cmbs.	None.	Practical refusal with auger.
					55-88 cmbs: Bluish grey, silty clay.		
D6	20 m S of D7	5280881	568942	80 cmbs Auger at surface	0-80 cmbs: Dark greyish brown, sandy silt with lenses of fine sand and organics throughout. Groundwater at surface.	None.	No retention of matrix in auger.
D7	20 m S of D8	5280900	568946	135 cmbs Auger at surface	0-65 cmbs: Bluish grey, gleyed clay. Water 5 cm above ground surface.	None.	No retention of matrix in auger.
					65-135 cmbs: Dark brown, silty, organic peat.		
D8	20 m S of D9	5280921	568944	95 cmbs Auger at	0-12 cmbs: Dark brown, silty organics. Groundwater at surface.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				surface	12-48 cmbs: Bluish grey, gleyed silty clay.		
					48-58 cmbs: Reddish brown, organic sandy silt.		
					58-95 cmbs: Very dark reddish brown silty peat.		
D9	20 m N of D8	5280942	568950	95 cmbs Auger at surface	0-7 cmbs: Dark brown, silty organics. Water 10 cm above ground surface.	None.	Practical refusal with auger.
					7-80 cmbs: Bluish grey, gleyed silty clay.		
					80-85 cmbs: Light reddish brown, clayey silt.		
					85-95 cmbs: Very dark reddish brown silty peat.		
D10	20 m S of D11	5280645	568948	85 cmbs	0-25 cmbs: Dark brown, moist, organic, fine to medium sandy loam with many organics and few gravels.	None.	Cobble obstructions.
					25-65 cmbs: Dark grey, moist, loamy, medium sand. Oxidation mottling from 25-45 cmbs. Gravels and cobbles increase with depth.		
					65-85 cmbs: Gravelly, loamy, medium to coarse sand. 35% pea size gravels and 10% medium to large cobbles, which increase with depth, along with saturation. Groundwater at 80 cmbs.		
D11	20 m S of D12	5280659	568943	88 cmbs	0-50 cmbs: Dark brown, moist, organic, fine to medium sandy loam with many organics and few gravels.	None.	Gravel barrier.
					50-75 cmbs: Dark grey, moist, loamy, medium sand. <10% pea size gravels and coarse granules. Oxidation staining near 50 cmbs.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					75-88 cmbs: Gravelly, loamy, medium to coarse sand. 35% pea size gravels and 10% medium to large cobbles, which increase with depth.		
D12	20 m S of D13	5280685	568938	90 cmbs	0-35 cmbs: Dark brown, compact, organic, sandy loam. Charcoal flecks throughout.	None.	Practical refusal with auger.
					35-70 cmbs: Olive brown to grey, loamy, fine to medium sand. <10% gravels.		
					70-90 cmbs: Grey, moist, loamy, medium to coarse sand with medium to large gravels and small cobbles.		
D13	20 m S of D14	5280699	568944	78 cmbs	0-8 cmbs: Brown, sandy silt.	None.	Compact clay barrier.
					8-40 cmbs: Silty, well sorted gravels.		
					40-75 cmbs: Clayey, organic silt.		
					75-78 cmbs: Mottled bluish grey, gleyed clay with few gravels.		
D14	20 m S of D15	5280725	568943	83 cmbs	0-35 cmbs: Dark brown, compact, organic, sandy loam with <10% round gravels.	None.	No retention of matrix in auger.
					35-72 cmbs: Olive brown to grey, loamy, fine to medium sand with gravels. Heavy oxidation at 35 cmbs.		
					72-83 cmbs: Grey, moist, loamy, medium to coarse sand with gravels. Groundwater at 75 cmbs.		
D15	20 m S of	5280742	568946	40 cmbs	0-8 cmbs: Dark brown silt with many roots.		Cobble

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
	D16				8-20 cmbs: Very dark greyish brown silty loam with few gravels and cobbles.	17-30 cmbs: rusted nail fragment.	obstructions.
					20-40 cmbs: Grey gravelly, micaceous sand.		
D15N	5 m N of D15	5280749	568947	58 cmbs	0-20 cmbs: Brown to greyish brown, loose, gravelly, sandy silt.	None.	Cobble obstructions.
					20-58 cmbs: Very dark yellowish brown to strong brown, gravelly, sandy silt. 35% gravels and 20% cobbles.		
D15E	5 m N of D15	5280743	568951	54 cmbs	0-28 cmbs: Dark greyish brown, silty loam. Many and organics. 15% poorly sorted gravels and cobbles.	None.	Gravel barrier.
					28-54 cmbs: Borwnish grey, sandy silt. 30% poorly sorted gravels and cobbles, which increase with depth.		
D15S	5 m S of D15	5280739	568947	50 cmbs	0-20 cmbs: Dark brown, silty sand to sandy silt with 15% gravels.	None.	Cobble obstructions.
					20-40 cmbs: Dark greyish brown, gravelly, silty, very fine sand. 40% pea to large gravels and cobbles.		
					40-50 cmbs: Light yellowish brown, compact silt with 60% patiated gravels.		
D15W	5 m W of D15	5280743	568940	60 cmbs	0-24 cmbs: Light brown, silty loam with few gravels.	None.	Cobble obstructions.
					24-60 cmbs: Grey, gravelly loam. Gravel and cobbles increase with depth to 70%.		
D16	20 m S of D17	5280762	568949	60 cmbs	0-20 cmbs: Brown to greyish brown, loose, gravelly, sandy silt.	None.	Cobble obstructions.
					20-54 cmbs: Dark yellowish brown, loose, dry, sandy silt. >50% round to subround gravels and cobbles.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					54-60 cmbs: Dark grey, silty, gravelly, medium to coarse sand.		
D17	20 m S of D16	5280779	568945	54 cmbs	0-50 cmbs: greyish brown gravelly loam with much higher sand content than seen previously. Less silty content as well. Gravels ~10-25% poorly sorted with fewer cobbles than previous probes. Coarse sand content, trending large in grain size.	None.	Gravel barrier.
					50-54 cmbs: Slight color change - lighter tone with sparse silt content in sandy to gravelly loam. Coarse outwash gravels (poorly sorted).		
D18	20 m S of D19	5280804	568944	63 cmbs	0-15 cmbs: Brown, silty loam with 20% poorly sorted gravels.	None.	Gravel barrier.
					15-55 cmbs: Yellowish brown, unconsolidated gravelly loam. with 30% gravels and 5% cobbles.		
					55-63 cmbs: Yellowish grey, compact, gravelly, loamy, medium to coarse sand.		
D19	20 m N of D18	5280823	568943	50 cmbs	0-47 cmbs: Dark brown, gravelly, silty loam with 20-30% poorly sorted gravels and cobbles.	None.	Root obstruction.
					47-50 cmbs: Light brown to yellowish brown, gravelly silt. Large root present		
E1	20 m N of E2	5281063	568924	206 cmbs Auger at 73 cmbs	0-35 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					35-73 cmbs: Mottled dark grey and greyish brown, silty loam.		
					73-110 cmbs: Mottled dark grey, silty, clayey loam with organic peat inclusions.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					110-206 cmbs: Olive grey to bluish grey, extremely compact clay with medium to coarse sand lenses. Groundwater at 110 cmbs.		
E2	20 m S of E1	5281041	568923	135 cmbs Auger at 60 cmbs	0-25 cmbs: Grey, compact, silty loam.	None.	Maximum extent of auger.
					25-100 cmbs: Mottled grey clay.		
					100-135 cmbs: Grey to very dark brown, clayey, silty loam. Dark brown organic inclusions. Groundwater at 115 cmbs.		
E3	20 m N of E4	5281020	568924	250 cmbs Auger at 80 cmbs	0-19 cmbs: Dark greyish brown, organic silty, clayey loam. Groundwater at 17 cmbs.	None.	Practical refusal with auger.
					19-90 cmbs: Mottled grey and yellowish brown, compact, silty clay with charcoal flecks.		
					90-115 cmbs: Dark grey, compact, organic clayey silt. Charcoal flecks throughout.		
					115-215 cmbs: Brownish grey to dark grey, compact, organic silty clay.		
					215-250 cmbs: Bluish grey, compact, gleyed clay. Blue gleyed sand at 225-235 cmbs.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
E4	20 m S of E3	5281000	568922	200 cmbs Auger at 70 cmbs	0-20 cmbs: Dark brown, saturated, organic silt.	None.	Practical refusal with auger.
					20-40 cmbs: Grey, very moist, clayey silts with strong brown oxidation stains.		
					40-55 cmbs: Silty, medium to coarse sand lens with few pea gravels and heavy oxidation stains and charcoal throughout.		
					55-85 cmbs: Grey, very moist, organic, clayey silt. Coarse organics and oxidation at 75-85.		
					85-150 cmbs: Light brown, organic, peaty silt. Greyish brown silty inclusions at 100-150 cmbs. Heavy oxidation at 120 cmbs. Groundwater at 120 cmbs.		
					150-185 cmbs: Greyish blue, gleyed, clayey silt.		
					185-200 cmbs: Gleyed clayey silt transitions to fine sands.		
E5	20 m N of E6	5280920	568927	174 cmbs Auger at surface	0-25 cmbs: Very dark brown, saturated, loose, organic, silty loam. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					25-48 cmbs: Grey, moist, compact, silty clay.		
					48-62 cmbs: Grey, moist, sandy clay. Grey saturated, silty medium sand lens at 60-62 cmbs.		
					62-72 cmbs: Grey to reddish brown, silty transition to peaty silt.		
					72-174 cmbs: Dark reddish brown, silty, organic peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
E6	20 m S of E5	5280902	568922	130 cmbs Auger at surface	0-30 cmbs: Very dark brown, saturated, loose, organic, silty loam. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
					30-62 cmbs: Grey, moist, compact, silty clay with grey sand lenses throughout.		
					62-72 cmbs: Grey to reddish brown, silty transition to peaty silt.		
					72-130 cmbs: Dark reddish brown, silty, organic peat.		
E7	20 m S of E6	5280882	568922	106 cmbs Auger at surface	0-52 cmbs: Very dark brown, saturated, loose, organic, silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					52-60 cmbs: Brownish grey, saturated, loose, silty, coarse sand.		
					60-75 cmbs: Grey, moist, compact, silty clay with grey, silty sand lenses throughout.		
					75-90 cmbs: Grey to reddish brown, silty transition to peaty silt.		
					90-106 cmbs: Dark reddish brown, silty, organic peat.		
E8	20 m S of E7	5280859	568924	47 cmbs	0-47 cmbs: Very dark brown, saturated, loose, organic, silty loam. At 30 cmbs: common small to large, round gravels and small cobbles, which increase with depth to many.	5 cmbs: barbed wire across diameter of probe	Gravel barrier.
E9	20 m S of E8	5280842	568922	40 cmbs	0-40 cmbs: Very dark brown, saturated, loose, organic, silty loam. At 20 cmbs: common small to large, round gravels and small cobbles, which increase with depth to many.	None.	Gravel barrier.
E10	20 m S of E9	5280821	568924	31 cmbs	0-28 cmbs: Very dark brown, very moist, loose, weak, silty loam. 10% small to medium round to subangular gravels at 20 cmbs, which increase with depth.	None.	Gravel barrier.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					28-31 cmbs: Dark brownish grey, moist, compact, silty, sandy gravel. 40-45% gravels.		
E11	20 m S of E10	5280803	568926	50 cmbs	0-15 cmbs: Very moist, organic silts. Many reeds and roots.	None.	Gravel barrier.
					15-20 cmbs: Mottled grey and strong brown, silty clay.		
					20-50 cmbs: Cobbly, gravelly silt.		
E12	20 m S of E11	5280783	568925	70 cmbs	0-8 cmbs: Very moist, organic silts. Many reeds and roots.	None.	Cobble obstruction.
					8-20 cmbs: Dark brown, organic silt. Few small gravels.		
					20-45 cmbs: Mottled grey and strong brown, clayey silt transitioning to silty clay. <5% pea gravels.		
					45-60 cmbs: Dark greyish brown silt with 5 cm lens of light yellowish brown silt.		
					60-70 cmbs: Gravelly silt. 50-70% small to medium, round to subround gravels and cobbles.		
E13	20 m S of E12	5280761	568927	60 cmbs	0-24 cmbs: Duff and moss overlying dark brown, silty loam with few to no gravels. Clay content increases with depth.	None.	Gravel barrier.
					24-44 cmbs: Mottled grey and strong brown, clayey silt transitioning to silty clay. Oxidation staining from 24-30 cmbs. <5% pea gravels.		
					44-60 cmbs: Dark grey, clayey silts with few organics. 40-60% pea size to medium gravels and small cobbles.		
E14	20 m S of E13	5280742	568927	90 cmbs	0-20 cmbs: Dark brown, fine sandy loam with many roots and coarse organics.	None.	Gravel barrier.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					20-90 cmbs: Grey, moist, silty medium to coarse sand. Pea to small, subround gravels increase in size and quantity with depth.		
F1	20 m S of F2	5280840	568904	153 cmbs Auger at 40 cmbs	0-40 cmbs: Brown, organic, silty loam.	None.	Gravel obstruction.
					40-50 cmbs: Brown, saturated, sandy, silty loam.		
					50-153 cmbs: Grey, sandy loam. Sand content increases and becomes coarser with depth. 10-15% gravel. 2 silty peat laminates present.		
F2	20 m N of F1	5280862	568903	137 cmbs Auger at 50 cmbs	0-50 cmbs: Brown, saturated, organic, silty loam. Water at 10 cmbs.	None.	Gravel and cobble obstructions.
					50-137 cmbs: Grey, silty, medium to coarse sand. <10% pea gravels at 110-135 cmbs.		
F3	20 m N of F2	5280883	568905	108 cmbs Auger at surface	0-70 cmbs: Brown, saturated, sandy, silty loam.	None.	Cobble obstruction.
					70-108 cmbs: Greyish blue, silty, coarse to granular size sand with small pea gravels.		
F4	20 m N of F3	5280895	568908	222 cmbs Auger at 45 cmbs	0-25 cmbs: Very dark brown, organic silty loam. Groundwater at 25 cmbs.	None.	Practical refusal with auger.
					25-45 cmbs: Grey, saturated, compact, clayey silt with silty sand inclusions.		
					45-80 cmbs: Dark reddish brown, organic, peaty silt.		
					80-95 cmbs: Grey, saturated, compact, clayey silty with sandy lenses. Few small, round gravels.		
					95-160 cmbs: Dark reddish brown, organic, silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					160-222 cmbs: Grey, clayey, coarse sandy silt with lenses of small, angular gravels and blue gleyed clay.		
F5	20 m S of F1	5280824	568902	130 cmbs Auger at 50 cmbs	0-30 cmbs: Dark brown, very moist, weak silt with many organics.	None.	In fill.
					30-80 cmbs: Grey, silty, medium to coarse sand with few gravels and coarse organics.		
					80-100 cmbs: Dark brown to greyish brown, clayey silt transitioning to silty clay. Few organics and charcoal flecks throughout.		
					100-130 cmbs: Transition back to gravelly gray sands, increasing amounts of gravel (pea to pebble, subrounded). Infill starts so halt.		
F6	20 m S of F5	5280799	568902	60 cmbs Auger at 50 cmbs	0-20 cmbs: Dark brown, very moist, weak silt with many organics.	None.	In fill. No retention in auger.
					20-30 cmbs: Greyish brown to grey, slightly clayey silts with few gravels and organics.		
					30-50 cmbs: Grey, gravelly, clayey silt.		
					50-60 cmbs: Grey, coarse sandy gravel.		
F7	20 m S of F6	5280783	568909	100 cmbs Auger at 40 cmbs	0-25 cmbs: Dark brown, very moist, weak silt with many organics.	None.	Root obstruction.
					25-40 cmbs: Mottled grey and brown, medium sandy clay with few gravels and coarse organics.		
					40-100 cmbs: Grey, silty, coarse sand. 5-30% subround pea gravels. Common organics		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
F8	20 m S of F9	5281000	568902	120 cmbs Auger at 50 cmbs	0-25 cmbs: Dark brown silt.	None.	No retention fo matrix in auger.
					25-80 cmbs: Brown to greyish brown silt transitioning to clayey silt. Strong brown oxidation staining throughout. Groundwater at 75 cmbs.		
					80-85 cmbs: Light yellowish brown silt with many organics.		
					85-120 cmbs: Dark brown, organic peaty silt. Silt content increases with depth.		
F9	20 m W of E3	5281022	568904	165 cmbs Auger at 55 cmbs	0-18 cmbs: Dark greyish brown, organic silty, clayey loam. Groundwater at 18 cmbs.	None.	Practical refusal with auger.
					18-33 cmbs: Mottled grey and yellowish brown, compact, silty clay with charcoal flecks.		
					33-100 cmbs: Dark grey, compact, silty clay. Charcoal flecks throughout.		
					100-165 cmbs: Dark greyish brown, organic, clayey silt.		
F10	20 m W of E2	5281041	568903	135 cmbs Auger at 45 cmbs	0-25 cmbs: Very dark brown, silty loam. Roots throughout.	None.	Maximum extent of auger.
					25-110 cmbs: Mottled grey clay with oxidized inclusions and few carbonized roots. Groundwater at 45 cmbs.		
					110-135 cmbs: Grey silt transitioning to brown, organic, peaty silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
F11	20 m N of F10	5281063	568904	200 cmbs Auger at 70 cmbs	0-30 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					30-70 cmbs: Mottled dark grey and greyish brown, silty loam.		
					70-130 cmbs: Dark reddish brown, saturated, compact, silty, organic clayey loam.		
					130-200 cmbs: Dark bluish grey, clayey loam with intermittent organic peat lenses and oxidation staining between 130-180 cmbs.		
F12	20 m N of F11	5281083	568905	118 cmbs Auger at 50 cmbs	0-35 cmbs: Dark brown, organic silty loam. Groundwater at 35 cmbs.	None.	Practical refusal with auger.
					35-50 cmbs: Dark grey, extremely compact, clayey loam.		
					50-110 cmbs: Dark greyish brown, extremely compact, organic clayey loam.		
					110-118 cmbs: Dark greyish blue, extremely compact, loamy clay.		
G1	20 m N of G2	5280884	568890	120 cmbs Auger at surface	0-35 cmbs: Dark greyish brown,saturated, loose, silty loam. Groundwater at 20 cmbs.	None.	Sidewalls collapsing.
					35-120 cmbs: Grey, silty, medium to coarse sand with very coarse sand and organic, sandy silt lenses throughout.		
G2	20 m S of G1	5280858	568887	110 cmbs Auger at 30 cmbs	0-40 cmbs: Dark brown, very moist, weak silt with many organics.	None.	Practical refusal with auger.
					40-80 cmbs: Grey, silty, medium to coarse sand with few gravels and coarse organics.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					80-110 cmbs: Dark brown to greyish brown, clayey silt transitioning to silty clay. Few organics and charcoal flecks throughout.		
G3	20 m N of G4	5281102	568886	137 cmbs Auger at 40 cmbs	0-21 cmbs: Dark brown, organic, sandy silt. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					21-85 cmbs: Mottled light grey and reddish brown clay.		
					85-120 cmbs: Dark brown, organic peaty silt.		
					120-137 cmbs: Dark brown silt.		
G4	20 m N of G5	5281081	568885	257 cmbs Auger at 48 cmbs	0-16 cmbs: Dark brown, organic, sandy silt. Groundwater at 48 cmbs.	None.	Practical refusal with auger.
					16-80 cmbs: Mottled light grey and reddish brown clay.		
					80-110 cmbs: Dark reddish brown, organic peaty silt.		
					110-257 cmbs: Mottled bluish grey and reddish brown, gleyed clay with few organics.		
G5	20 m N of G6	5281061	568883	178 cmbs Auger at surface	0-13 cmbs: Dark brown, organic, sandy silt. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					13-105 cmbs: Mottled grey and reddish brown caly.		
					105-135 cmbs: Dark brown, organic peaty silt.		
					135-178 cmbs: Dark grey clay.		
G6	20 m S of G5	5281042	568883	173 cmbs Auger at	0-90 cmbs: Mottled dark grey and brown clay. Organics and charcoal throughout. Groundwater at 30 cmbs.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				40 cmbs	90-120 cmbs: Dark brown, organic, peaty silt.		
					120-160 cmbs: Dark grey clay. Organics and charcoal present throughout.		
					160-173 cmbs: Light bluish grey, gleyed clay.		
G7	20 m N of G8	5281021	568885	166 cmbs Auger at surface	0-16 cmbs: Dark brown, organic, sandy silt. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					16-80 cmbs: Mottled grey and reddish brown caly.		
					80-140 cmbs: Dark brown, organic peaty silt.		
					140-166 cmbs: Light bluish grey, gleyed clay.		
G8	20 m S of G7	5281001	568885	169 cmbs Auger at 40 cmbs	0-80 cmbs: Dark brownish grey, silty clay with few organics and charcoal flecks.	None.	Practical refusal with auger.
					80-90 cmbs: Reddish brown, organic silt with charcoal flecks.		
					90-169 cmbs: Dark brown, organic, peaty silt. Organics decrease with depth.		
H1	20 m S of H2	5281000	568864	200 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam. Groundwater at 25 cmbs.	None.	Practical refusal with auger.
					30-120 cmbs: Mottled grey clay.		
					120-180 cmbs: Dark brown silt transitioning to silty peat.		
					180-200 cmbs: Bluish grey, gleyed clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
H2	20 m S of H3	5281020	568865	200 cmbs Auger at surface	0-30 cmbs: Greyish brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.
					30-80 cmbs: Mottled grey clay.		
					80-160 cmbs: Dark brown silt transitioning to silty peat.		
					160-200 cmbs: Bluish grey, gleyed clay.		
H3	20 m W of G6	5281041	568865	135 cmbs Auger at surface	0-35 cmbs: Dark brown, silty loam. Groundwater at surface.	None.	Maximum extent of auger.
					35-78 cmbs: Mottled grey clay.		
					78-85 cmbs: Light grey clayey loam.		
					85-105 cmbs: Mottled grey clay with few silt lenses throughout.		
					105-135 cmbs: Greyish brown to brown silt with silty peat laminates throughout.		
H4	20 m S of H5	5281060	568865	200 cmbs Auger at surface	0-10 cmbs: Greyish brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.
					10-70 cmbs: Mottled grey clay.		
					70-150 cmbs: Dark brown silt transitioning to silty peat.		
					150-200 cmbs: Bluish grey, gleyed clay.		
H5	20 m S of H6	5281082	568865	200 cmbs Auger at surface	0-20 cmbs: Light greyish brown, organic silt. Groundwater at surface.	None.	Practical refusal with auger.
					20-60 cmbs: Mottled grey clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					60-140 cmbs: Dark brown silt transitioning to silty peat.		
					140-200 cmbs: Bluish grey, gleyed clay.		
H6	20 m S of H7	5281103	568865	200 cmbs Auger at surface	0-15 cmbs: Light brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.
					15-50 cmbs: Mottled grey clay.		
					50-70 cmbs: Greyish brown silt.		
					70-150 cmbs: Dark brown silt transitioning to silty peat. Very dark brown peat at 200 cmbs.		
					150-200 cmbs: Bluish grey, gleyed clay.		
H7	20 m N of H6	5281125	568865	200 cmbs Auger at surface	0-25 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					25-60 cmbs: Grey clay.		
					60-160 cmbs: Dark brown silt transitioning to silty peat.		
					160-200 cmbs: Bluish grey, gleyed clay.		
I1	20 m S of I2	5281000	568846	202 cmbs Auger at surface	0-16 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 50 cmbs.	None.	Practical refusal with auger.
					16-46 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					46-155 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					155-170 cmbs: Very dark grey, silty clay with heavy charcoal stain.		
					170-202 cmbs: Bluish grey, gleyed clay.		
I2	20 m S of I3	5281021	568844	190 cmbs Auger at 40 cmbs	0-19 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 8 cmbs.	None.	Practical refusal with auger.
					19-40 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					40-180 cmbs: Very dark grey, silty clay with heavy charcoal stain at 175-180 cmbs.		
					180-190 cmbs: Bluish grey, gleyed clay.		
I3	20 m S of I4	5281041	568845	205 cmbs Auger at 15 cmbs	0-15 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 5 cmbs.	None.	Practical refusal with auger.
					15-30 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					30-50 cmbs: Brownish grey, silty, fine sand.		
					50-140 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		
					140-205 cmbs: Bluish grey, gleyed clay.		
I4	20 m S of I5	5281062	568846	150 cmbs Auger at 25 cmbs	0-25 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					25-50 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					50-148 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		
					148-150 cmbs: Bluish grey, gleyed clay.		
I5	20 m S of I6	5281081	568845	260 cmbs Auger at surface	0-20 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 14 cmbs.	None.	Practical refusal with auger.
					20-60 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					60-70 cmbs: Light yellowish to reddish brown, very fine sandy silt.		
					70-160 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		
					160-175 cmbs: Very dark grey, silty clay with heavy charcoal stain.		
					175-260 cmbs: Bluish grey, gleyed clay. Greyish blue, gleyed, silty very fine sand at 230-240 cmbs.		
I6	20 m S of I7	5281100	568845	206 cmbs Auger at 50 cmbs	0-16 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 50 cmbs.	None.	Practical refusal with auger.
					16-46 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					46-155 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		
					155-170 cmbs: Very dark grey, silty clay with heavy charcoal stain.		
					170-206 cmbs: Bluish grey, gleyed clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
I7	20 m S of I8	5281123	568844	136 cmbs Auger at 45 cmbs	0-28 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					28-55 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					55-65 cmbs: Light yellowish to reddish brown, very fine sandy silt.		
					65-136 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat. Dark charcaol stain at 130-132 cmbs.		
I8	20 m N of I7	5281144	568845	175 cmbs Auger at 46 cmbs	0-37 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					37-55 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.Light yellowish to reddish brown, very fine sandy silt inclusions.		
					55-120 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		
					120-135 cmbs: Very dark grey, silty clay with heavy charcoal stain.		
					135-175 cmbs: Bluish grey, gleyed clay.		
J1	20 m S of J2	5281020	568824	150 cmbs Auger at 20 cmbs	0-20 cmbs: Dark brown, saturated, clayey loam. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					20-80 cmbs: Dark grey, medium sand.		
					80-100 cmbs: Brown, peaty silt with grey sandy loam inclusions.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					100-150 cmbs: Grey, sandy clay.		
J2	20 m S of J3	5281042	568825	190 cmbs Auger at 10 cmbs	0-70 cmbs: Dark brown, slightly sandy silt. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					70-100 cmbs: Brown, peaty silt.		
					100-120 cmbs: Greyish brown, silty clay.		
					120-170 cmbs: Mottled grey and reddish brown clay with peat inclusions.		
					170-190 cmbs: Greyish blue, gleyed clay.		
J3	20 m S of J4	5281060	568826	200 cmbs Auger at 10 cmbs	0-120 cmbs: Mottled grey and reddish brown (oxidation), clay. Groundwater 20 cmbs	None.	Practical refusal with auger.
					120-150 cmbs: Brownish grey clayey, loamy peat.		
					150-170 cmbs: Brownish grey, silty clay.		
					170-200 cmbs: Bluish grey, gleyed clay.		
J4	20 m S of J5	5281081	568826	200 cmbs Auger at surface	0-120 cmbs: Mottled grey and reddish brown (oxidation), clay. Groundwater 20 cmbs	None.	Practical refusal with auger.
					120-150 cmbs: Brownish grey clayey, loamy peat.		
					150-170 cmbs: Brownish grey, clayey silt.		
					170-200 cmbs: Bluish grey, gleyed clay.		
J5	20 m S of J6	5281102	568826	170 cmbs Auger at	0-70 cmbs: Dark brown, saturated, clayey loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				10 cmbs	70-80 cmbs: Yellowish brown, silty, fine sand with few charcoal flecks.		
					80-130 cmbs: Brown clayey, loamy peat.		
					130-150 cmbs: Brown, silty clay.		
					150-170 cmbs: Bluish grey, gleyed clay.		
J6	20 m S of J7	5281123	568825	140 cmbs Auger at 50 cmbs	0-30 cmbs: Dark brown, organic loamy silt.	None.	Practical refusal with auger.
					30-80 cmbs: Grey, silty clay. Groundwater at 50 cmbs.		
					80-140 cmbs: Dark brown, organic peaty silt.		
J7	20 m S of J8	5281144	568825	145 cmbs Auger at 55 cmbs	0-70 cmbs: Dark brown, organic, loamy, clayey silt.	None.	Practical refusal with auger.
					70-140 cmbs: Dark brown, organic peaty silt with yellowish brown, silty sand inclusions.		
J8	20 m N of J7	5281163	568827	160 cmbs Auger at 70 cmbs	0-50 cmbs: Dark brown, organic loamy silt.	None.	Practical refusal with auger.
					50-90 cmbs: Grey, silty clay with yellowish brown sand inclusions.		
					90-140 cmbs: Brown clayey, loamy peat.		
					140-160 cmbs: Bluish grey, gleyed clay.		
K1	20 m N of K2	5281181	568805	152 cmbs Auger at surface	0-27 cmbs: Very dark brown, organic silty loam. Groundwater at 10 cmbs. Buried woody debris at 27 cmbs.	None.	Woody obstruction.
					27-55 cmbs: Grey clay.		
					55-140 cmbs: Brown peaty silt transitioning to peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					140-152 cmbs: Dark bluish grey, gleyed silty clay with coarse woody debris.		
K2	20 m N of K3	5281159	568805	200 cmbs Auger at surface	0-25 cmbs: Very dark brown, organic silty loam. Groundwater at 5 cmbs.	None.	Practical refusal with auger.
					25-140 cmbs: Brown peaty silt transitioning to peat. Coarse, fully carbonized material at 100 cmbs.		
					140-150 cmbs: Light brown, fine interface between peaty silt and gleyed clay.		
					150-200 cmbs: Bluish grey, gleyed clay.		
K3	20 m N of K4	5281141	568805	200 cmbs Auger at surface	0-20 cmbs: Very dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					20-45 cmbs: Grey clayey loam.		
					45-165 cmbs: Brown peaty silt transitioning to peat.		
					165-200 cmbs: Dark bluish grey, gleyed silty clay with coarse woody debris.		
K4	20 m N of K5	5281122	568805	200 cmbs Auger at surface	0-15 cmbs: Very dark brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.
					15-55 cmbs: Slightly mottled, grey clay.		
					55-145 cmbs: Brown peaty silt transitioning to peat.		
					140-200 cmbs: Dark bluish grey, gleyed silty clay.		
K5	20 m N of K6	5281102	568805	200 cmbs Auger at	0-15 cmbs: Very dark brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				surface	15-60 cmbs: Grey clay with organic and carbonized debris present.		
					60-155 cmbs: Brown peaty silt transitioning to peat. Light yellowish brown silt lens at 153-155 cmbs.		
					155-200 cmbs: Dark bluish grey, gleyed silty clay.		
K6	20 m N of K7	5281082	568805	150 cmbs Auger at 45 cmbs	0-50 cmbs: Greyish brown, silty clay with organics and charcoal throughout. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					50-55 cmbs: Medium to coarse sand.		
					55-65 cmbs: Yellowish brown, silt.		
					65-150 cmbs: Dark brown silt with many organics (though decrease suddenly around 140 cmbs).		
K7	20 m N of K8	5281062	568805	87 cmbs Auger at surface	0-25 cmbs: Greyish brown, silty clay.	None.	No retention fo matrix in auger.
					25-70 cmbs: Bluish grey, coarse sand.		
					70-87 cmbs: Brown, organic silt.		
K8	20 m N of K9	5281041	568804	197 cmbs Auger at 35 cmbs	0-50 cmbs: Greyish brown, silty clay. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					50-75 cmbs: Grey to brown, coarse sand.		
					75-95 cmbs: Mottled grey and reddish brown clay.		
					95-145 cmbs: Light yellowish brown silt with charcoal flecks.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					145-180 cmbs: Dark brown, organic silt. Organics decrease with depth.		
					180-197 cmbs: Light bluish grey, gleyed clay.		
K9	20 m S of K8	5281022	568804	165 cmbs Auger at 50 cmbs	0-60 cmbs: Greyish brown, silty clay. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					60-80 cmbs: Grey to brown, coarse sand.		
					80-140 cmbs: Dark brown, organic silt with lenses of silt and sand throughout.		
					140-165 cmbs: Light bluish grey, gleyed clay.		
L1	20 m S of L2	5281040	568786	280 cmbs Auger at 60 cmbs	0-20 cmbs: Dark brown, organic silt. Groundwater at 100 cmbs.	None.	Practical refusal with auger.
					20-50 cmbs: Mottled grey and strong brown, very fine sandy silt.		
					50-95 cmbs: Grey, clayey, sandy silt with oxidation stains and organics throughout.		
					95-100 cmbs: Light brown silt (possible ash?) lens.		
					100-180 cmbs: Dark brown silty peat and peaty silt.		
					180-280 cmbs: Bluish grey, clayey, gleyed silts with preserved organics.		
L2	20 m N of L1	5281062	568787	190 cmbs Auger at	0-20 cmbs: Dark brown, organic silt. Groundwater at 20 cmbs.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				50 cmbs	20-70 cmbs: Mottled grey and strong brown, very fine sandy silt.		
					70-90 cmbs: Grey, silty, medium to coarse sand.		
					90-190 cmbs: Dark brown, peaty silt and silty peat. Greyish brown find sandy silt inclusions at 100-110 cmbs.		
L3	20 m N of L2	5281082	568785	134 cmbs Auger at 58 cmbs	0-45 cmbs: Greyish brown, silty clay. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					45-70 cmbs: Grey to brown, coarse sand.		
					70-75 cmbs: Light yellowish brown silt with charcoal flecks.		
					75-95 cmbs: Dark reddish brown silt.		
					95-134 cmbs: Dark brown silt.		
L4	20 m N of L3	5281104	568786	142 cmbs Auger at 40 cmbs	0-60 cmbs: Greyish brown, silty clay with organics and charcoal throughout. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					60-70 cmbs: Light yellowish brown transitioning to grey silt.		
					70-120 cmbs: Dark brown, organic silt. Organics decrease with depth.		
					120-142 cmbs: Light bluish grey, gleyed clay.		
L5	20 m N of L4	5281124	568785	137 cmbs Auger at 45 cmbs	0-40 cmbs: Greyish brown, silty clay with organics and charcoal flecks throughout. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					40-50 cmbs: Light yellowish brown silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					50-137 cmbs: Dark brown, organic silt. Organics decrease with depth.		
L6	20 m N of L5	5281142	568786	156 cmbs Auger at 20 cmbs	0-35 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					35-55 cmbs: Grey, compact, clayey silt. Charcoal flecks throughout.		
					55-60 cmbs: Yellowish brown, very fine sandy silt.		
					60-65 cmbs: Brownish grey, clayey, peaty silt.		
					65-156 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		
L7	20 m N of L6	5281163	568786	125 cmbs Auger at 20 cmbs	0-30 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 12 cmbs.	None.	Practical refusal with auger.
					30-45 cmbs: Grey, compact, clayey silt. Charcoal flecks throughout.		
					45-50 cmbs: Yellowish brown, very fine sandy silt.		
					50-55 cmbs: Brownish grey, clayey, peaty silt.		
					55-125 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
L8	20 m N of L7	5281184	568785	120 cmbs Auger at 26 cmbs	0-26 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 8 cmbs.	None.	Practical refusal with auger.
					26-50 cmbs: Grey, compact, clayey silt.		
					50-70 cmbs: Yellowish brown, very fine sandy silt.		
					70-80 cmbs: Brownish grey, clayey, peaty silt.		
					80-120 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		
L9	20 m N of L8	5281204	568784	129 cmbs Auger at 20 cmbs	0-16 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					16-30 cmbs: Mottled light grey transitioning to greyish brown, silty clay. Few charcoal flecks throughout.		
					30-129 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat. Light yellowish to reddish brown, very fine sandy silt inclusion at 45-50 cmbs.		
L10	20 m N of L9	5281222	568785	114 cmbs Auger at 40 cmbs	0-19 cmbs: Dark greyish brown, organic, clayey silt. Charcoal flecks throughout. Groundwater at 16 cmbs.	None.	Woody obstruction.
					19-40 cmbs: Mottled light grey transitioning to greyish brown, silty clay.		
					40-114 cmbs: Intermittent beds of grey clay and very dark brown peaty silt and silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
M1	20 m S of M2	5281038	568766	150 cmbs Auger at 47 cmbs	0-90 cmbs: Dark bluish grey, gleyed sand with many organics. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					90-95 cmbs: Yellowish brown silt.		
					95-105 cmbs: Dark brown silt.		
					105-150 cmbs: Dark brown, clayey, organic silt.		
M2	20 m N of M1	5281061	568766	182 cmbs Auger at 45 cmbs	0-100 cmbs: Dark greyish brown, silty clay with many organics. Groundwater at 30 cmbs.	None.	Practical refusal with auger.
					100-182 cmbs: Dark brown, organic silt.		
M3	20 m N of M2	5281081	568763	198 cmbs Auger at surface	0-30 cmbs: Greyish brown, clayey loam.	None.	Practical refusal with auger.
					30-45 cmbs: Bluish grey, coarse sand. Groundwater at 35 cmbs.		
					45-100 cmbs: Yellowish brown, silty loam.		
					100-170 cmbs: Dark brown, organic silt. Organics increase with depth.		
					170-198 cmbs: Dark bluish grey, gleyed clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
M4	20 m N of M3	5281103	568766	126 cmbs Auger at surface	0-20 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 8 cmbs.	None.	Practical refusal with auger.
					20-55 cmbs: Grey, compact, clayey silt.		
					55-60 cmbs: Yellowish brown, very fine sandy silt.		
					60-75 cmbs: Brownish grey, clayey, peaty silt.		
					75-110 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		
					110-126 cmbs: Brown, compact, silty clay with many organics.		
M5	20 m N of M4	5281122	568766	93 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					30-45 cmbs: Greyish brown silt.		
					45-50 cmbs: Grey, medium to fine sand.		
					140-175 cmbs: Dark greyish blue, gleyed clay.		
M6	20 m N of M5	5281140	568767	175 cmbs Auger at surface	0-20 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					20-50 cmbs: Greyish brown silt.		
					50-140 cmbs: Light greyish brown to dark brown silt transitioning to peaty silt and peat.		
					140-175 cmbs: Dark greyish blue, gleyed clay.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
M7	20 m N of M6	5281161	568765	190 cmbs Auger at surface	0-20 cmbs: Dark brown, organic silty loam. Groundwater at surface.	None.	Practical refusal with auger.
					20-35 cmbs: Grey silty clay.		
					35-140 cmbs: Light greyish brown to dark brown silt transitioning to peaty silt and peat.		
					140-190 cmbs: Greyish blue, gleyed clay.		
M8	20 m N of M7	5281183	568766	140 cmbs Auger at 40 cmbs	0-20 cmbs: Very dark brown, silty loam with many organics. Groundwater at 40 cmbs.	None.	Practical refusal with auger.
					30-50 cmbs: Grey silty clay.		
					50-140 cmbs: Light greyish brown to dark brown silt transitioning to peaty silt and peat.		
M9	20 m N of M8	5281199	568766	145 cmbs Auger at 30 cmbs	0-30 cmbs: Very dark brown, silty loam with many organics.	None.	Gravel obstruction.
					30-55 cmbs: Grey silty clay.		
					55-145 cmbs: Brown peaty silt transitioning to peat.		
M10	20 m N of M9	5281220	568765	110 cmbs Auger at 45 cmbs	0-35 cmbs: Very dark brown, organic, silty loam. Groundwater at 10 cmbs.	None.	Gravel barrier.
					35-50 cmbs: Grey clay.		
					50-107 cmbs: Light greyish brown to dark brown silt transitioning to peaty silt and peat.		
					107-110 cmbs: Bluish grey, sandy, gleyey clay with round gravels.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
M11	20 m N of M10	5281240	568766	120 cmbs Auger at 45 cmbs	0-30 cmbs: Very dark brown, organic, silty loam. Groundwater at 45 cmbs.	None.	Gravel barrier.
					30-55 cmbs: Grey clayey loam with light grey clay laminates.		
					55-120 cmbs: Dark brown, organic, peaty silt transitioning to silty peat.		
N1	20 m E of M2	5281059	568747	155 cmbs Auger at 20 cmbs	0-20 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					20-105 cmbs: Grey clay with light reddish brown (oxidation) mottling.		
					105-155 cmbs: Strong brown, clayey, silty peat.		
N2	20 m N of N1	5281082	568745	155 cmbs Auger at 20 cmbs	0-30 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	Practical refusal with auger.
					30-100 cmbs: Grey clay with light reddish brown (oxidation) mottling.		
					100-105 cmbs: Yellowish brown, sandy silt.		
					105-155 cmbs: Strong brown, clayey, silty peat.		
N3	20 m N of N2	5281100	568745	170 cmbs Auger at 20 cmbs	0-20 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					20-30 cmbs: Grey, coarse sand.		
					30-95 cmbs: Grey clay with few organics and charcoal flecks.		
					95-170 cmbs: Strong brown, clayey, silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
N4	20 m N of N3	5281122	568746	160 cmbs Auger at 10 cmbs	0-20 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					20-90 cmbs: Grey clay with few organics and charcoal flecks.		
					90-160 cmbs: Strong brown, clayey, silty peat.		
N5	20 m N of N4	5281142	568744	130 cmbs Auger at surface	0-35 cmbs: Dark brown, organic silty loam. Groundwater at surface.	None.	No retention fo matrix in auger.
					35-70 cmbs: Grey, very coarse sand.		
					70-110 cmbs: Mix of brownish grey, coarse sand and peat.		
					110-130 cmbs: Dark brown, silty peat.		
N6	20 m N of N5	5281160	568746	170 cmbs Auger at 20 cmbs	0-20 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	No retention fo matrix in auger.
					20-60 cmbs: Grey clay with few reddish brown mottles.		
					60-65 cmbs: Yellowish brown, very fine sandy silt.		
					65-170 cmbs: Dark brown, silty peat.		
N7	20 m N of N6	5281183	568745	110 cmbs Auger at 20 cmbs	0-30 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	No retention fo matrix in auger.
					30-70 cmbs: Grey clay with few yellowish brown mottles.		
					70-80 cmbs: Yellowish brown, fine sandy silt.		
					80-110 cmbs: Brown, silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
N8	20 m N of N7	5281201	568744	135 cmbs Auger at 20 cmbs	0-45 cmbs: Dark brown, organic silty loam. Groundwater at 20 cmbs.	None.	Gravel obstruction.
					45-75 cmbs: Grey, silty clay with yellowish brown sandy inclusion from 65-75 cmbs.		
					75-130 cmbs: Very dark brown to reddish brown, silty peat.		
					130-135 cmbs: Peaty silt transitioning to grey clay.		
N9	20 m N of N8	5281217	568745	140 cmbs Auger at 30 cmbs	0-80 cmbs: Brownish grey, clayey, silty loam. Large sandy inclusions at 70-80 cmbs. Groundwater at 30 cmbs.	None.	Gravel obstruction.
					80-140 cmbs: Dark brown, organic peaty silt.		
N10	20 m N of N9	5281240	568744	70 cmbs Auger at 15 cmbs	0-20 cmbs: Brown, clayey, organic silt. Groundwater at 15 cmbs.	None.	Buried obstruction.
					20-50 cmbs: Grey, silty clay with few organics.		
					50-70 cmbs: Greyish brown, silty, peaty clay with many light yellowish brown, sandy silt inclusions.		
N11	20 m N of N10	5281263	568746	135 cmbs Auger at 10 cmbs	0-60 cmbs: Brown, loamy, organic silt. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					60-70 cmbs: Dark brown, organic peaty silt.		
					70-120 cmbs: Dark brown, silty peat.		
					120-135 cmbs: Dark grey clay with charcoal throughout.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
O1	20 m S of O2	5281101	568729	181 cmbs Auger at surface	0-30 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at surface.	None.	Practical refusal with auger.
					30-60 cmbs: Grey, compact, clayey silt. Charcoal flecks throughout.		
					60-65 cmbs: Yellowish brown, very fine sandy silt.		
					65-85 cmbs: Brownish grey, clayey, peaty silt.		
					85-150 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		
					150-160 cmbs: Dark grey, silty clay.		
					160-181 cmbs: Bluish grey, gleyey caly.		
O2	20 m N of O1	5281121	568727	146 cmbs Auger at 30 cmbs	0-12 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 8 cmbs.	None.	Practical refusal with auger.
					12-45 cmbs: Grey, compact, clayey silt. Charcoal flecks throughout.		
					45-50 cmbs: Light brown, sandy silt (ash-like) with charcoal flecks throughout.		
					50-55 cmbs: Brownish grey, clayey silt.		
					55-60 cmbs: Yellowish brown, very fine sandy silt.		
					60-85 cmbs: Brownish grey, clayey, peaty silt.		
					85-146 cmbs: Very dark brown to reddish brown, silty peat with charcoal flecks throughout.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
O3	20 m N of O2	5281140	568726	154 cmbs Auger at 15 cmbs	0-18 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
					18-50 cmbs: Grey, compact, clayey silt. Charcoal flecks throughout.		
					50-70 cmbs: Yellowish brown, very fine sandy silt.		
					70-90 cmbs: Brownish grey, clayey, peaty silt. Silt content increases at 80-90 cmbs.		
					90-154 cmbs: Very dark brown to reddish brown, silty peat. Silt content increases from 120-130 cmbs.		
O4	20 m N of O3	5281162	568727	93 cmbs Auger at surface	0-20 cmbs Very dark greyish brown, clayey silt with many roots. Groundwater at surface.	None.	Practical refusal with auger.
					20-30 cmbs: Yellowish brown, very fine sandy silt.		
					30-45 cmbs: Brownish grey, clayey, peaty silt.		
					45-93 cmbs: Very dark brown, silty peat with charcoal flecks throughout.		
O5	20 m N of O4	5281182	568727	80 cmbs Auger at surface	0-45 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at surface.	None.	No retention fo matrix in auger.
					45-52 cmbs: Yellowish brown silt with charcoal flecks throughout.		
					52-80 cmbs: Dark brown silt with many fibrous organics. Completely saturated and loose in auger bucket.		
O6	20 m N of O5	5281198	568723	127 cmbs Auger at	0-47 cmbs: Dark brown, organic silty loam. Groundwater at 33 cmbs.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
				40 cmbs	47-127 cmbs: Dark brown silt with coarse woody debris.		
O7	20 m N of O6	5281220	568726	103 cmbs Auger at 30 cmbs	0-55 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 23 cmbs.	None.	Practical refusal with auger.
					55-80 cmbs: Dark brown silt.		
					80-103 cmbs: Yellowish brown silt with many organics.		
O8	20 m N of O7	5281239	568726	100 cmbs Auger at 50 cmbs	0-50 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 40 cmbs.	None.	Gravel barrier.
					50-70 cmbs: Dark brown silt with coarse woody debris.		
					70-77 cmbs: Yellowish brown silt with charcoal flecks.		
					77-100 cmbs: Dark brown silt with many organics.		
O9	20 m N of O8	5281261	568727	116 cmbs Auger at 35 cmbs	0-57 cmbs: Dark brown, sandy silt with many organics. Groundwater at 30 cmbs.	None.	Gravel barrier.
					57-65 cmbs: Yellowish brown silt.		
					65-116 cmbs: Dark brown, organic, peaty silt.		
P1	20 m N of P2	5281257	568708	135 cmbs Auger at 60 cmbs	0-45 cmbs: Dark brown, organic silty loam. Groundwater at 45 cmbs.	None.	Gravel obstruction.
					45-65 cmbs: Brownish grey, silt.		
					65-135 cmbs: Brown silt transitioning to silty peat.		
P2	20 m S of P1	5281236	568703	143 cmbs Auger at 20 cmbs	0-24 cmbs: Dark brown, organic silty loam.	None.	Gravel obstruction.
					24-40 cmbs: Grey, compact silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					40-143 cmbs: Brown silt transitioning to peaty silt and silty peat. Groundwater at 50 cmbs.		
P3	20 m S of P2	5281219	568706	98 cmbs Auger at 47 cmbs	0-45 cmbs: Dark brown, organic silty loam.	None.	No retention fo matrix in auger.
					45-70 cmbs: Grey to light brown silt. Groundwater at 50 cmbs.		
					70-98 cmbs: Brown to dark brown silt transitioning to peaty silt and silty peat.		
P4	20 m S of P3	5281199	568702	150 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam.	None.	Gravel obstruction.
					30-60 cmbs: Grey to light brown silt. Groundwater at 50 cmbs.		
					60-150 cmbs: Brown to dark brown silt transitioning to peaty silt and silty peat.		
P5	20 m S of P4	5281184	568704	200 cmbs Auger at surface	0-20 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
					20-45 cmbs: Greyish brown silt with thin sand lens. Groundwater at 35 cmbs.		
					45-200 cmbs: Brown to dark brown silt transitioning to peaty silt and silty peat. Thin bluish grey, silty, medium to fine sand.		
Q1	20 m S of Q2	5281201	568687	182 cmbs Auger at 45 cmbs	0-182 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 40 cmbs.	None.	Practical refusal with auger.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
Q2	20 m N of Q1	5281219	568683	137 cmbs Auger at 47 cmbs	0-32 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 45 cmbs.	None.	Practical refusal with auger.
					32-50 cmbs: Light greyish brown silt.		
					50-60 cmbs: Reddish brown silt with charcoal flecks.		
					60-137 cmbs: Dark brown, organic silt.		
Q3	20 m N of Q2	5281243	568681	55 cmbs Auger at 30 cmbs	0-55 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 27 cmbs.	None.	Root obstructions.
Q4	20 m N of Q3	5281259	568683	139 cmbs Auger at 30 cmbs	0-60 cmbs: Dark brown, organic silty loam. Groundwater at 10 cmbs.	None.	Practical refusal with auger.
					60-70 cmbs: Dark yellowish brown silt.		
					70-139 cmbs: Dark brown, organic silt.		
Q5	20 m N of Q4	5281274	568687	133 cmbs Auger at surface	0-62 cmbs: Dark brown, organic sandy silt. Groundwater at 25 cmbs.	None.	Practical refusal with auger.
					62-68 cmbs: Dark yellowish brown silt.		
					68-133 cmbs: Dark brown, organic silt.		
R1	20 m S of R2	5281220	568667	170 cmbs Auger at 20 cmbs	0-55 cmbs: Very dark brown, organic silty loam. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
		5281220	568667		55-60 cmbs: Yellowish brown, very fine sandy silt.		
		5281220	568667		60-170 cmbs: Very dark brown, silty peat.		
		5281220	568667				

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
R2	20 m S of R3	5281200	568667	120 cmbs Auger at 30 cmbs	0-50 cmbs: Very dark brown ,silty loam with many organics.	None.	Practical refusal with auger.
		5281200	568667		50-55 cmbs: Grey, clayey silt.		
		5281200	568667		55-60 cmbs: Yellowish brown, very fine sandy silt.		
		5281200	568667		60-70 cmbs: Dark greyish brown, organic peaty silt.		
		5281200	568667		70-120 cmbs: Very dark brown, silty peat.		
R3	20 m M of R2	5281187	568668	46 cmbs	0-46 cmbs: Grey, loose, dry, gravelly, medium to coarse sand with many round to angular, poorly sorted gravels and cobbles throughout.	0-46 cmbs: Industrial fill material: concrete chunks, granite slab, brick fragments.	Cobble and concrete obstructions.
S1	20 m S of S2	5281199	568647	170 cmbs Auger at surface	0-30 cmbs: Dark brown, silty loam with many organics.	None.	No retention fo matrix in auger.
					30-45 cmbs: Grey to greyish brown silt.		
					45-170 cmbs: Dark brown peaty silt and peat.		
S2	20 m N of S1	5281219	568643	200 cmbs Auger at surface	0-30 cmbs: Dark brown, silty loam with many organics.	None.	Practical refusal with auger.
					30-45 cmbs: Grey to greyish brown silt.		
					45-200 cmbs: Dark brown peaty silt and peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
S3	20 m N of S2	5281238	568639	227 cmbs Auger at 40 cmbs	0-40 cmbs: Dark brown, organic silty loam. Groundwater at 15 cmbs.	None.	Practical refusal with auger.
					40-70 cmbs: Grey to greyish brown, loamy silt.		
					70-210 cmbs: Very dark brown, silty peat.		
					210-215 cmbs: Bluish grey, silty, very fine sand.		
					215-227 cmbs: Bluish grey, gleyed, clayey silt.		
T1	20 m N of T1	5281206	568623	135 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam. Groundwater at 15 cmbs.	None.	Maximum extent of auger.
		5281206	568623		30-40 cmbs: Grey to greyish brown silt with thin oxidation lens.		
		5281206	568623		40-135 cmbs: Dark brown peaty silt and peat.		
T2	20 m N of T2	5281222	568629	135 cmbs Auger at surface	0-55 cmbs: Dark brown, organic silty loam. Groundwater at 15 cmbs.	None.	Maximum extent of auger.
		5281222	568629		55-70 cmbs: Grey to greyish brown silt with thin oxidation lens.		
		5281222	568629		70-135 cmbs: Dark brown peaty silt and peat.		
T3	20 m N of T3	5281238	568627	135 cmbs Auger at surface	0-25 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
		5281238	568627		25-55 cmbs: Grey to greyish brown silt. Groundwater at 35 cmbs.		
		5281238	568627		55-135 cmbs: Dark brown silty transitioning to peaty silt and peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
U1	20 m S of U2	5281261	568603	150 cmbs Auger at 30 cmbs	0-50 cmbs: Brown, silt with common roots. Groundwater at 30 cmbs.	None.	No retention fo matrix in auger.
		5281261	568603		50-150 cmbs: Strong brown, clayey, silty peat.		
U2	20 m S of U3	5281240	568603	185 cmbs Auger at 55 cmbs	0-65 cmbs: Brown, slightly clayey silt.	None.	Practical refusal with auger.
		5281240	568603		65-180 cmbs: Strong brown, clayey, silty peat.		
		5281240	568603		180-185 cmbs: Bluish grey, gleyed clay.		
U3	20 m S of U4	5281219	568607	155 cmbs Auger at 60 cmbs	0-80 cmbs: Brown, slightly sand silt with common roots. Groundwater at 60 cmbs.	None.	Practical refusal with auger.
		5281219	568607		80-155 cmbs: Strong brown, silty peat.		
V1	20 m S of V2	5281243	568584	133 cmbs Auger at 28 cmbs	0-45 cmbs: Dark brown, organic silty loam. Groundwater at 28 cmbs.	None.	Practical refusal with auger.
		5281243	568584		45-50 cmbs: Brownish grey silt.		
		5281243	568584		50-55 cmbs: Light reddish brown, very fine sandy silt.		
		5281243	568584		55-130 cmbs: Very dark brown to reddish brown, silty peat.		
		5281243	568584		130-133 cmbs: Light reddish brown to tan, silt.		
V2	20 m S of V3	5281222	568584	18 cmbs Auger at surface	0-18 cmbs Very darkbrown, silty loam with many roots. Groundwater at 15 cmbs.	None.	Root obstructions.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
V3	20 m S of V4	5281201	568590	147 cmbs Auger at 50 cmbs	0-38 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
		5281201	568590		38-46 cmbs: Brownish grey silt.		
		5281201	568590		46-50 cmbs: Light reddish brown, very fine sandy silt.		
		5281201	568590		50-82 cmbs: Very dark brown to reddish brown, silty peat.		
		5281201	568590		82-95 cmbs: Bluish grey, very fine sandy silt.		
		5281201	568590		95-147 cmbs: Very dark brown to reddish brown, silty peat.		
W1	20 m W of V3	5281197	568562	153 cmbs Auger at 35 cmbs	0-50 cmbs: Dark brown, sandy silt with many organics and roots. Groundwater at 25 cmbs.	None.	Practical refusal with auger.
					50-153 cmbs: Dark reddish brown, organic silt. Many coarse organics and woody debris.		
W2	20 m N of W1	5281220	568568	139 cmbs Auger at 40 cmbs	0-40 cmbs: Dark brown, organic silty loam. Light brown and reddish brown oxidation lens at 23-27 cmbs. Groundwater at 35 cmbs.	None.	Practical refusal with auger.
					40-45 cmbs: Brownish grey silt.		
					45-50 cmbs: Ligh reddish brown, slightly moist, fine sandy silt.		
					50-139 cmbs: Very dark brown to reddish brown, silty peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
W3	20 m N of W2	5281243	568566	171 cmbs Auger at 65 cmbs	0-20 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					20-30 cmbs: Grey clay.		
					30-40 cmbs: Reddish brown, sandy silt.		
					40-120 cmbs: Dark brown silt with many organics. Groundwater at 80 cmbs.		
					120-145 cmbs: Bluish grey, gleyed sandy clay.		
					145-160 cmbs: Dark reddish brown, organic, peaty silt.		
					160-171 cmbs: Dark grey clay.		
X1	20 m E of Y1	5281258	568546	135 cmbs Auger at surface	0-25 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
					25-60 cmbs: Grey to greyish brown silt. Groundwater at 35 cmbs.		
					60-135 cmbs: Dark brown peaty silt and peat.		
X2	20 m S of X1	5281238	568545	135 cmbs Auger at surface	0-25 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
					25-40 cmbs: Grey to greyish brown silt. Groundwater at 35 cmbs.		
					40-135 cmbs: Dark brown peaty silt and peat.		
X3	20 m S of X2	5281222	568546	135 cmbs Auger at surface	0-30 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
					30-70 cmbs: Grey to greyish brown silt. Reddish brown silt lens at 60-65 cmbs. Groundwater at 35 cmbs.		
					70-135 cmbs: Dark brown peaty silt and peat.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
X4	20 m S of X3	5281204	568544	135 cmbs Auger at surface	0-40 cmbs: Dark brown, organic silty loam.	None.	Maximum extent of auger.
					40-60 cmbs: Grey to greyish brown silt. Groundwater at 40 cmbs.		
					60-135 cmbs: Dark brown peaty silt and peat.		
Y1	20 m W of X1	5281259	568527	160 cmbs Auger at 30 cmbs	0-30 cmbs: Brown, silty loam with common roots.	None.	Practical refusal with auger.
					30-50 cmbs: Greyish brown, silty clay.		
					50-80 cmbs: Yellowish brown to strong brown, peaty silt.		
					80-160 cmbs: Strong brown, silty peat.		
Y2	20 m N of Y1	5281238	568524	150 cmbs Auger at 50 cmbs	0-30 cmbs: Brown, silty loam with common roots.	None.	Practical refusal with auger.
					30-45 cmbs: Greyish brown, silty clay.		
					45-70 cmbs: Yellowish brown to strong brown, peaty silt. Groundwater at 50 cmbs.		
					70-150 cmbs: Strong brown, silty peat.		
Y3	20 m N of Y2	5281223	568524	165 cmbs Auger at 40 cmbs	0-70 cmbs: Brown, silty, organic loam. Groundwater at 50 cmbs.	None.	Practical refusal with auger.
					70-150 cmbs: Very dark brown, silty peat.		
					150-158 cmbs: Grey, coarse sand.		
					158-165 cmbs: Dark brown, silty peat.		
Z1	20 m N of	5281259	568504	173 cmbs	0-25 cmbs: Dark brown, organic silty loam.	None.	Practical refusal

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
	Z2			Auger at 65 cmbs	25-33 cmbs: Grey clay.		with auger.
					33-40 cmbs: Reddish brown sandy silt.		
					40-140 cmbs: Dark brown, organic silt. Groundwater at 65 cmbs.		
					140-155 cmbs: Grey, coarse sand.		
					155-165 cmbs: Greyish brown silt.		
					165-173 cmbs: Dark brown, organic silt.		
Z2	20 m S of Z1	5281240	568505	152 cmbs Auger at 57 cmbs	0-51 cmbs: Dark brown, organic silty loam. Groundwater at 50 cmbs.	None.	Practical refusal with auger.
					51-65 cmbs: Grey clay.		
					65-72 cmbs: Reddish brown sandy silt.		
					72-152 cmbs: Dark brown, organic silt. Many coarse organics and woody debris.		
Z3	20 m S of Z2	5281220	568503	139 cmbs Auger at 45 cmbs	0-40 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					30-40 cmbs: Grey clay. Groundwater at 40 cmbs.		
					40-48 cmbs: Reddish brown sandy silt.		
					48-139 cmbs: Dark brown, organic silt. Many coarse organics and woody debris.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
AA1	20 m N of AA2	5281262	568481	177 cmbs Auger at 37 cmbs	0-18 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					18-32 cmbs: Grey clay. Groundwater at 50 cmbs.		
					32-80 cmbs: Reddish brown sandy silt transitioning to dark reddish brown, organic silt. Groundwater at 50 cmbs.		
					80-130 cmbs: Light greyish brown, clayey silt.		
					130-150 cmbs: Grey, coarse sand.		
					150-177 cmbs: Dark brown, organic silt.		
AA2	20 m S of AA1	5281241	568483	151 cmbs Auger at 58 cmbs	0-18 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					18-34 cmbs: Grey clay.		
					34-42 cmbs: Reddish brown sandy silt transitioning to dark reddish brown, organic silt.		
					42-125 cmbs: Dark brown, organic silt. Groundwater at 45 cmbs.		
					125-145 cmbs: Grey, coarse sand.		
					145-151 cmbs: Dark brown, organic silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
AA3	20 m S of AA2	5281223	568486	157 cmbs Auger at 55 cmbs	0-40 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					40-55 cmbs: Grey clay.		
					55-65 cmbs: Reddish brown sandy silt transitioning to dark reddish brown, organic silt.		
					65-120 cmbs: Dark brown to yellowish brown, organic silt.		
					120-140 cmbs: Bluish grey, coarse sand.		
					140-157 cmbs: Dark brown, organic silt.		
BB1	20 m E of CC2	5281280	568463	212 cmbs Auger at 60 cmbs	0-37 cmbs: Dark brown, organic silty loam.	None.	Gravel barrier.
					37-46 cmbs: Light brown silt.		
					46-85 cmbs: Brownish grey silt with charcoal flecks. Groundwater at 50 cmbs.		
					85-115 cmbs: Very dark brown to reddish brown, silty peat and peaty silt.		
					115-180 cmbs: Grey, clayey, sandy silt with intermittent dark brown peaty silt and sandy silt lenses.		
					180-205 cmbs: Bluish grey, gleyed silty clay.		
					205-212 cmbs: Bluish grey, silty fine sand with 20% small-medium round to subround gravels.		
BB2	20 m S of BB1	5281262	568463	159 cmbs Auger at 50 cmbs	0-33 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					33-44 cmbs: Light brown silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					44-85 cmbs: Brownish grey silt with charcoal flecks. Groundwater at 45 cmbs.		
					85-130 cmbs: Very dark brown to reddish brown, silty peat and peaty silt.		
					130-135 cmbs: Grey, clayey, clayey silt.		
					135-140 cmbs: Dark bluish grey, silty sand.		
					140-159 cmbs: Grey, clayey, sandy silt with intermittent dark brown peaty silt and sandy silt lenses.		
BB3	20 m S of BB2	5281243	568467	157 cmbs Auger at 46 cmbs	0-31 cmbs: Dark brown, organic silty loam. Groundwater at 28 cmbs.	None.	Practical refusal with auger.
					31-42 cmbs: Brownish grey silt.		
					42-75 cmbs: Light reddish brown, very fine sandy silt.		
					75-115 cmbs: Very dark brown to reddish brown, silty peat.		
					115-125 cmbs: Grey, silty, coarse sand.		
					125-157 cmbs: Greyish brown to brownish grey, fine sandy, loam silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
BB4	20 m S of BB3	5281221	568464	136 cmbs Auger at 55 cmbs	0-24 cmbs: Dark brown, organic silty loam. Groundwater at 28 cmbs.	None.	Practical refusal with auger.
					24-55 cmbs: Brownish grey silt. Groundwater at 38 cmbs.		
					55-60 cmbs: Brown, peaty silt.		
					60-90 cmbs: Very dark brown to reddish brown, silty peat.		
					90-115 cmbs: Grey, silty, coarse sand.		
					115-125 cmbs: Greyish brown to brownish grey, fine sandy, loam silt.		
					125-136 cmbs: Grayish brown moist, compact and firm very fine sandy silts with few organics.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
CC1	20 m N of CC2	5281295	568446	195 cmbs Auger at 90 cmbs	0-30 cmbs: Dark brown silt with many roots. Typical moist topsoil.	None.	Practical refusal with auger.
					30-40 cmbs: Smooth transition, abruptly to grey-brown clayey silts, moist to wet with some roots.		
					40-45 cmbs: Grey silty sands, thin lens of fine- to medium-grained with depth. Wet.		
					45-55 cmbs: Strong brown fine to very fine sandy silts and silty sands, ~5 cm thick bleeding down into brown peaty silts. Some charcoal. Possibly ashy layer?		
					55-65 cmbs: Continued brown peaty silts to silty peats, varying fibrousness and increasingly silty with depth. Much preserved organics.		
					65-120 cmbs: Peats and peaty silts, with some lenses of grey silts at 65-80 cmbs. Peat with many coarse organic, increasingly fibrous.		
					120-125 cmbs: Transition to grey medium to coarse sands.		
					125-150 cmbs: grey clayey silts to silty clays with some lenses of silty fine sands. Some preserved organics.		
					150-195 cmbs: Dark brown to dark greyish brown organic silts. Continued peats and silty peats. Bore through decomposing wood. At 190 cm, transition to grey silts then abruptly to blue-grey gleyed silts to clayey silts. Some pea gravel in the base and halt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
CC3	20 m S of CC1	5281279	568446	160 cmbs Auger at 80cmbs	0-20 cmbs: Silt - same brown topsoil as seen elsewhere.	None.	Practical refusal with auger.
					20-30 cmbs: Dry compacted fine sandy silts. Greenish grey with much strong brown mottling, no gravels.		
					30-60 cmbs: Transition to pale brown silts with many preserved smaller organics (leaves, stems)		
					60-80 cmbs: Darker brown silts with many coarse organics. Not quite peats.		
					80-120 cmbs: Silty peat to peaty silts, same as seen elsewhere. Charcoal and some coarse organics (stems, leaves).		
					120-150 cmbs: Transition to greyish brown, medium sands. Some silt content with no gravels.		
					150-160 cmbs: Light brown to grey silts. Some fine sandy content. Increasingly moist to wet. Some brown staining at termination.		
CC2	20 m S of CC2	5281258	568447	200 cmbs Auger at 55 cmbs	0-30 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					30-80 cmbs: Greyish brown to grey, clayey silt.		
					80-85 cmbs: Grey, coarse sand.		
					85-95 cmbs: Dark reddish brown silty peat to peaty silt.		
					95-150 cmbs: Grey, slightly sandy silt.		
					150-200 cmbs: Grey, very fine sandy silt. Sand becomes coarse with depth.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
CC4	20 m S of CC3	5281240	568450	200 cmbs Auger at 55 cmbs	0-25 cmbs: Dark brown, saturated, silty, organic loam.	None.	Practical refusal with auger.
					25-45 cmbs: Lighty grey to greyish brown, silty loam with few organics and oxidation stains.		
					45-80 cmbs: Light brown silt with fine grey sand lens at 80 cmbs.		
					80-120 cmbs: Dark reddish brown, silty peat to peat.		
					120-145 cmbs: Dark grey to grey silt.		
					145-150 cmbs: Grey, coarse sand.		
					150-170 cmbs: Dark brown peat.		
					170-200 cmbs: Grey, slightly sandy silt.		
DD1	20 m N of DD2	5281299	568426	200 cmbs Auger at 60 cmbs	0-30 cmbs: Very dark brown, silty loam with organics.	None.	Practical refusal with auger.
					30-75 cmbs: Greyish brown, sandy silt.		
					75-96 cmbs: Dark reddish brown silty peat transitioning to peat.		
					96-200 cmbs: Grey silt with grey fine to coarse sand lenses.		
DD2	20 m S of DD1	5281280	568426	150 cmbs Auger at 40 cmbs	0-40 cmbs: Dark brown, organic silty loam.	None.	Practical refusal with auger.
					40-90 cmbs: Grey clay. Groundwater at 40 cmbs.		
					90-105 cmbs: Grey, coarse sand.		
					105-140 cmbs: Mottled grey and brown, sandy clay mixed with peat. Clay content increases with depth.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
DD3	20 m S of DD2	5281262	568427	130 cmbs Auger at 42 cmbs	0-29 cmbs: Dark brown, organic silty loam. Groundwater at 28 cmbs.	None.	Maximum extent of auger.
					29-45 cmbs: Brownish grey silt.		
					45-50 cmbs Brown, peaty silt.		
					50-100 cmbs: Very dark brown to reddish brown, silty peat.		
					100-104 cmbs: Yellowish brown, silty, very fine sand with few organics.		
					104-130 cmbs: Greyish brown, very fine sandy silt.		

Appendix B: State of Washington Archaeological Site Inventory Form

STATE OF WASHINGTON
ARCHAEOLOGICAL SITE INVENTORY FORM

Smithsonian No.:

***County:** King

***Date:** 09/16/2013 ***Compiler:** Jennifer Gebhardt**,** Jennifer Gilpin **Human Remains?** ☐

Location Information Restrictions *(Yes/No/Unknown)***:** **DAHP Case No.:**

SITE DESIGNATION

Site Name: Lind Farm Complex

Field/ Temporary ID: HRA-2045-1

***Site Type(s):** Multi-Component

SITE LOCATION

***USGS Quad Map Name(s):** Redmond, WA

***Legal Description: T**25 **R** 06 **E/W:** E **Section(s):** 06

Quarter Section(s): SE, SE

UTM: Zone 10 **Easting** 1251064 **Northing** 858194

Latitude: **Longitude:** **Elevation (ft/m):** 20 ft / 6.1 m

Other Maps: **Type:**

Scale: **Source:**

Drainage, Major: Sammamish River **Drainage, Minor:** Evans Creek **River Mile:** 2.5

Aspect: Southwest-west **Slope:** 0 to 5 degrees

Location Description** *(General to Specific):** Site 2045-1 is located in Redmond, Washington, approximately 1.5 miles (mi) northeast of Lake Sammamish in the Sammamish River valley. The site is situated just northwest of the intersection of Union Hill Rd and 196th Ave NE in Arthur Johnson Park. It is located on a raised terrace, east of Evans Creek, and encompasses the recorded aboveground historic-period resource called the Albert Lind Farm.

Directions** *(For Relocation Purposes):** From Interstate Highway 5, take Exit 168B, to WA-520 E toward Bellevue/Kirkland. Stay on WA-520E for 13.3 mi until it ends in Redmond, Washington. Take a right onto NE Union Hill Road and drive for 1.2 mi. Site 2045-1 (19416 NE Union Hill Rd) will be on your left in the Arthur Johnson Park, on the north side of Union Hill Road approximately 310 ft west of 196th Ave NE.

SITE DESCRIPTION

***Narrative Description:**

Site 2045-1 is a multi-component site with both subsurface and aboveground elements, located on the eastern floodplain and terrace of Evans Creek. The site comprised of two loci, Locus A and Locus B. Locus A encompasses and extends southwest and south from the existing above-ground structures of the Albert Lind Farm, recorded in 2005 and 2007 on Historic Property Inventory (HPI) forms (Flathman 2007; Melton 2005). The aboveground buildings recorded on the HPI forms include a barn, chicken house, and third shed-roof outbuilding. Additional surface components of Locus A are a modern concrete and wood bridge crossing Evans Creek; a grove of Hazelnut trees located southwest of the barn and on the eastern bank of Evans Creek; two fruit trees located to the south of the standing structures, close to the location of a razed farmhouse (demolished in the early 2000s); gravel driveways; and assorted large evergreen and deciduous trees surrounding the Lind Farm. The subsurface component of Locus A contains both historic and prehistoric artifacts, including lithic debitage and various brick, metal, and glass artifacts. All cultural items were found between 0-50 centimeters below the surface (cmbs), in a dark brown silty loam, containing approximately 35 percent poorly sorted gravels and cobbles. Both pre-historic and historic materials were found mixed together in some of the shovel tests, indicating that the soil has been disturbed.

Locus B is a small cluster, comprised of two positive shovel probes, located approximately 30 meters (m) north of Locus A. Locus B includes one tertiary cryptocrystalline silica (CCS) flake and one non-diagnostic nail fragment that were found between 0 and 40 cmbs in the same dark brown silty loam as was observed in Locus A.

The Lind Farm complex once contained a residence, which was removed in 2002. The two extant outbuildings (the chicken house and outbuilding) are cited as more common examples of mid-twentieth century agricultural construction and were not recommended eligible for the National Register of Historic Places (NRHP) or King County Landmarks Register (KCLR). The gambrel roof barn, however, retains characteristics of mid-twentieth century agricultural building construction and was recommended eligible for the NRHP under Criterion C. To date, the Department of Archaeology and Historic Preservation (DAHP) has not concurred with this recommendation (Flathman 2007).

SITE DESCRIPTION

***Narrative Description:**

According to Bureau of Land Management (BLM) records, Obidiah Evans first claimed the southeast quadrant of Section 6 in 1889 (WAOAA 064994, BLM 2013). By 1907, the quadrant was owned by Jas. Campbell, whose logging company cleared the land (Flathman 2007). In the succeeding decades, the lands encompassing the Area of Potential Effects (APE) were converted into smaller parcels, many of which were associated with farms—an example is the Lind Farm—but also industrial facilities (Flathman 2007).

Albert Lind first owned the property at the far southeast corner of the APE in 1941. A bungalow residence had been constructed on the property in 1933, perhaps by the owners from 1929 (Otto Sundholm and G. Leathers). Lind continued to develop the farm with the currently existing gambrel roof barn and chicken house (both constructed in the 1945) and the third shed-roof outbuilding (uncertain construction date). According to aerial photographs dating to the 1960s through the present day, the small bridge crossing Evans Creek appeared sometime in the later 1960s (NETR Online 2013). Sometime in the early 1970s, the property was sold to the Barrett family (Flathman 2007).

Site Dimensions** *(Overall Site Dimensions): Locus A:**

***Length:** ~130 m ***Direction: N-S** x ***Width:** ~80 m ***Direction:** E-W

***Method of Horizontal Measurement:** GIS measurements

***Depth:** 0-60 cmbs * **Method of Vertical Measurement:** Handheld tape measure

Site Dimensions *(Overall Site Dimensions)***: Locus B:**

***Length:** ~35m ***Direction: NE-SW** x ***Width:** ~10m ***Direction: NE-SW**

***Method of Horizontal Measurement:** GIS measurements

***Depth:** 0-50 cmbs * **Method of Vertical Measurement:** Handheld tape measure

SITE DESCRIPTION

***Narrative Description:**

Vegetation** *(On Site):** Mixed grasses, Himalayan and trailing blackberry, maple, Douglas fir, beech, hazelnut, reed canary grass.

Local: Same as above, with cattails, skunk cabbage, willow, cottonwood, alder and various riparian vegetation.

Regional: Coniferous Forest (*Tsuga heterophylla* zone)

Landforms *(On Site)***:** Flood plain of Evans Creek, river terrace

Local: Valley and flood plain of Sammamish River

Water Resources *(Type)***:** Evans Creek **Distance:** Adjacent **Permanence:** Year Round

CULTURAL MATERIALS AND FEATURES

Narrative Description** *(Specific Inventory Details):**

Locus A:

Site 2045-1, Locus A, contains aboveground features from the Albert Lind Farm property (Field Site No. 2468), including the previously recorded Barn, Chicken House, and third outbuilding (Photographs 1 and 2). Please see Melton 2005 and Flathman 2007 for a description of these aboveground resources.

To the south of these buildings, Locus A also includes non-native hazelnut (filbert) and two fruit trees that, due to their size, are believed to be old enough to be associated with the Albert Lind Farm. The hazelnut grove is located on the east bank of Evans Creek and includes at least ten trees planted in two rows (Photograph 3). The fruit trees—possibly apple trees—are located closer to the former location of the residential structure (as inferred from aerial photographs and topographic maps), southeast of the aboveground structures. One is larger than the other and is the more likely to be associated with the historic-period farming complex.

There are also various other evergreen and deciduous trees that, based on their large size, are likely older than 50 years and might be associated with the Lind Farm landscape. Tree varieties noted by HRA staff included Douglas fir, pine, beech, maple, and oak (see Photograph 2).

A small concrete and wood bridge was recorded as part of the overall farm complex. The bridge crosses Evans Creek approximately 20 m southwest of the barn (Photograph 4). The bridge appears on aerial photographs in the late 1960s (NETR Online 2013). Although it is included as an element of the site, as a part of the Lind Farm, it would not be considered a contributing element to the site or Farm Complex because it is less than 50 years of age.

Locus A also includes both precontact and historic period subsurface components. Sixteen positive shovel probes were identified in a cluster within Locus A. Please refer to the attached Shovel Probe Table for a list of the artifacts observed in each shovel probe.

CULTURAL MATERIALS AND FEATURES

***Narrative Description:**

Precontact artifacts recorded as part of Locus A include one CCS or jasper tertiary flake (0-10 cmbs in SPA12, Photographs 5 and 6); one fine-grained, basalt secondary flake (0-20 cmbs in SPA12.8, Photograph 7); two pieces of red or banded red and white CCS/jasper shatter (0-26 cmbs in SPA12.5 and 0-68 cmbs in SPA12.12, Photographs 8 and 9). One piece of fire-modified rock (FMR) was observed in SPB17 between 0 and 50 cmbs.

Precontact materials were observed between 0 and 50 cmbs, within increasingly gravelly yellowish-brown sandy silts. All shovel probes containing precontact materials also contained historic-period artifacts at the same depths. There were additional signs of historic-period disturbances, including utility wires observed around 20 cmbs in SPA12.4 and SPA12.6 (Photograph 10), and a metal tank or pipe buried approximately 25 cmbs in SPA12 (Photograph 11).

All 16 positive probes in Locus A contain historic period materials, two of which are diagnostic. The diagnostic items include a single clear glass patent medicine bottle lip and neck. It has a flat neck finish and a molding seam that extends from the neck to the top of the lip, indicating that it was made from an Automatic Bottle Machine dating to after 1904 (Kimball 1987, Photograph 12). Archaeologists also observed a small fragment of milk glass in SPA12.14 between 0 and 30 cmbs (Photograph 13). Milk glass was used in a variety of bottle and container types—primarily cosmetic and toiletry bottles or ointment jars, but also ink, bitters, liquor, and fruit or food jars—from the 1870s to the middle 1900s (Lindsey 2013).

Positive shovel probes were found south and southeast of the outbuildings (Photograph 14). Non-temporally diagnostic artifacts observed in this cluster of shovel probes included brick fragments, shards of clear flat and vessel glass, wire nails and nail fragments, plastic (hard white [perhaps PVC] and flexible black), and a few pieces of avian and small mammalian bone (Photographs 15-20). SPA12 also contained short lengths of pinched copper pipe and a small metal clip, along with a shred of white cloth, between 10 and 50 cmbs (Photographs 21 and 22).

CULTURAL MATERIALS AND FEATURES

***Narrative Description:**

A few of these artifacts, particularly the plastic, may be modern in date but they are undiagnostic. They might be the result of farming activities, demolition of the residence, and/or landscaping activities that have occurred in the APE during and after occupation of the Farm site by the City of Redmond.

The fact that the prehistoric and historic items are mixed together subsurface indicates that the ground has been disturbed. Please refer to the Shovel Probe Table located on the Addendum Sheet for the cultural materials and depths found within Locus A.

Locus B:

Locus B, consists of two positive shovel tests: SPC16 and SPD15, respectively located east and west of a modern fenceline along the west side of the Albert Lind Farm terrace's mowed grassy field (Photograph 23). SPC16 contains one CCS tertiary flake from 0-30 cmbs (Photograph 24) and five pieces of FMR observed between 0 and 48 cmbs (Photograph 25). SPD15 contains a heavily oxidized, non-diagnostic nail fragment observed between 17 and 30 cmbs (Photograph 26).

***Method of Collection:** Artifacts were bagged with provenience noted on the outside.

Location of Artifacts** *(Temporary/Permanent):** The bagged artifacts were replaced in their respective shovel probes, beneath the grassy cover.

SITE AGE

Component:** Historic period ***Dates** *(Overall Site Age Approximation):** 1930s to 1990s

***Dating Method:** Archival research **Phase:** **Basis for Phase Designation:**

(Only those historic sites that meet the minimum National Register (36CFR60) age threshold (50 years of age or older) will be retained as historic archaeological records and assigned Smithsonian Trinomials by DAHP.)

SITE RECORDERS

Observed by: Jennifer Gilpin **Address: Historical Research Associates**

1904 Third Ave, Suite 240 Seattle, WA 98101

***Date Recorded:** 09/16/2013

Recorded by** *(Professional Archaeologist):** Jennifer Gilpin

***Organization:** Historical Research Associates ***Organization Phone Number:** 206-343-0226

***Organization Address:** 1904 Third Ave, Suite 240 Seattle, WA 98101

***Organization E-mail:** jgilpin@hrassoc.com

Date Revisited: **Revisited By:**

SITE HISTORY

Previous Archaeological Work** *(Done at Site):** None done on-site.

LAND OWNERSHIP

***Owner:** City of Redmond, Finance Dept-PSFIN

***Address:** PO Box 97010

***Tax Lot/ Parcel No:** 0625069060

RESEARCH REFERENCES

Items/Documents Used In Research** *(Specify):**

Flathman, J.
2007 19416 NE Union Hill Road, Albert Lind Farm, Historic Property Inventory Form. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

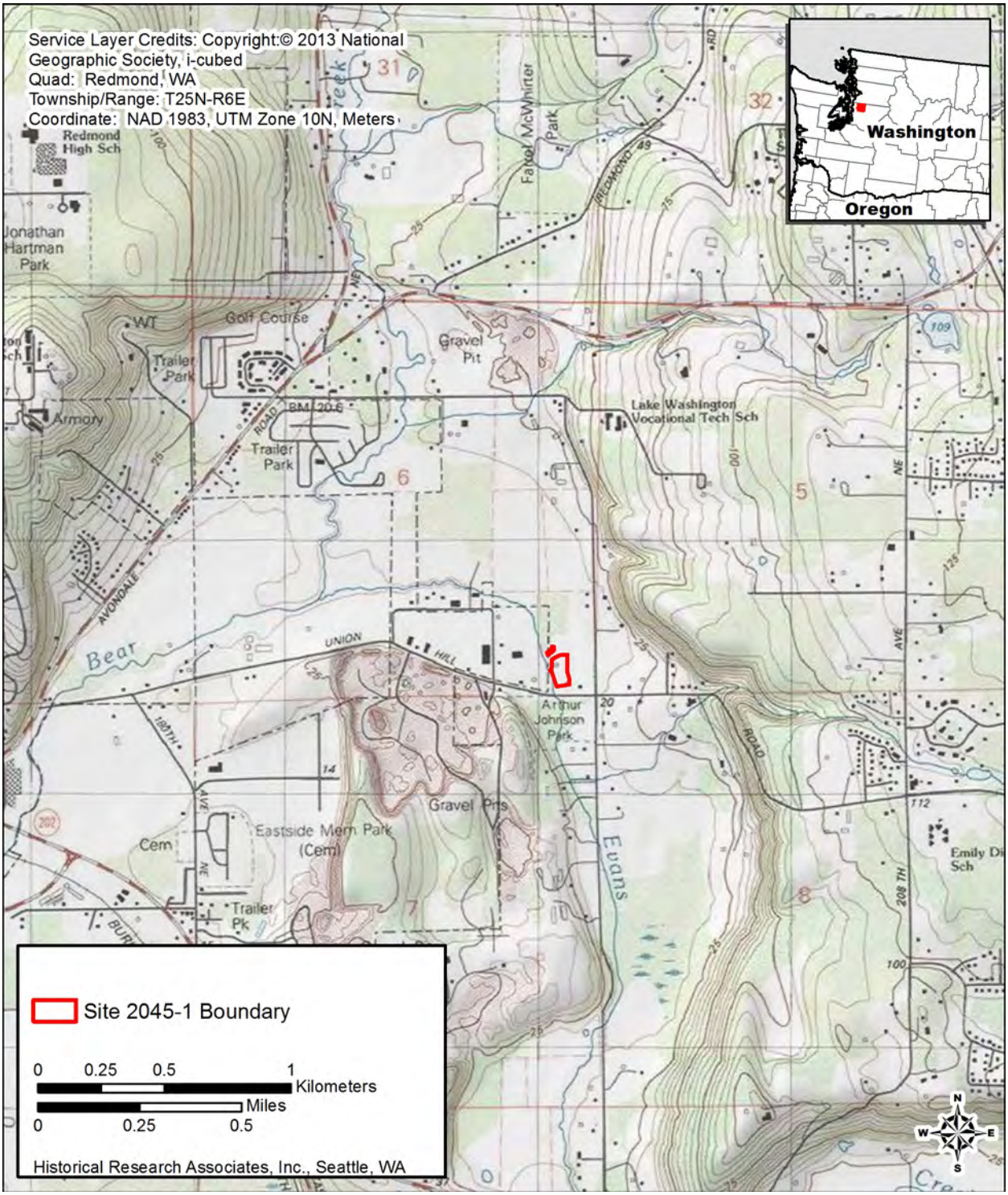
Kimball, Monique
1997 Guide to Historic Artifacts. Compiled by Monique E. Kimball. Manuscript on file at HRA Office, Seattle.

Lindsey, Bill
2013 Bottle/Glass Colors. Historic Glass Bottle Identification and Information Website. Electronic document, http://www.sha.org/bottle/colors.htm, accessed October 20, 2013.

Melton, L.
2005 19416 NE Union Hill Road, Albert Lind Farm, Historic Property Inventory Form. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

NETR Online
2013 Historic aerials search Redmond, Washington. Electronic resource, http://www.historicaerials.com/, accessed September 24, 2013.

USGS MAP


Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
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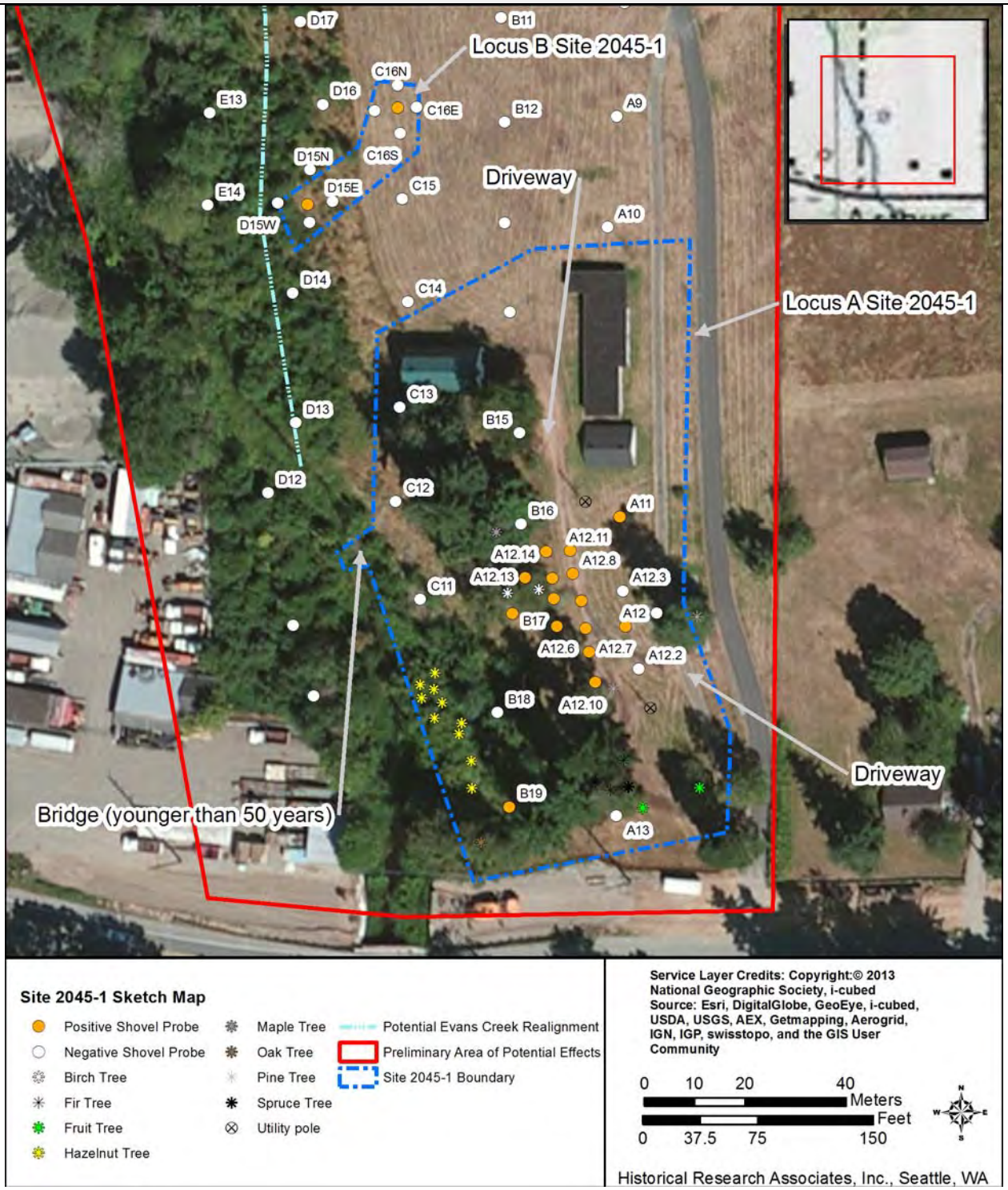
Township/Range: T25N-R6E
Coordinate: NAD 1983, UTM Zone 10N, Meters
Washington
Oregon
Site 2045-1 Boundary
0 0.25 0.5 1 Kilometers
0 0.25 0.5 Miles
Historical Research Associates, Inc., Seattle, WA
Redmond High Sch
Jonathan Hartman Park
Golf Course
Trailer Park
Armory
Gravel Pit
Lake Washington Vocational Tech Sch
Arthur Johnson Park
Eastside Mem Park (Cem)
Cem
Trailer Pk
Bear
Evans
Emily Di Sch

SKETCH MAP


Locus B Site 2045-1
Locus A Site 2045-1
Driveway
Driveway
Bridge (younger than 50 years)
D17
B11
C16N
D16
E13
C16E
B12
A9
D15N
C16S
E14
D15E
C15
D15W
A10
D14
C14
C13
D13
B15
D12
C12
B16
A11
A12.11
A12.14
A12.8
A12.13
A12.3
C11
A12
B17
A12.6
A12.7
A12.2
B18
A12.10
B19
A13
Site 2045-1 Sketch Map
Positive Shovel Probe
Negative Shovel Probe
Birch Tree
Fir Tree
Fruit Tree
Hazelnut Tree
Maple Tree
Oak Tree
Pine Tree
Spruce Tree
Utility pole
Potential Evans Creek Realignment
Preliminary Area of Potential Effects
Site 2045-1 Boundary
Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
0 10 20 40 Meters
0 37.5 75 150 Feet
Historical Research Associates, Inc., Seattle, WA

PHOTOGRAPH(S)

Photograph 1: Overview of Lind Farm Complex, showing barn (right) and outbuilding (left) across mowed field (view to south).

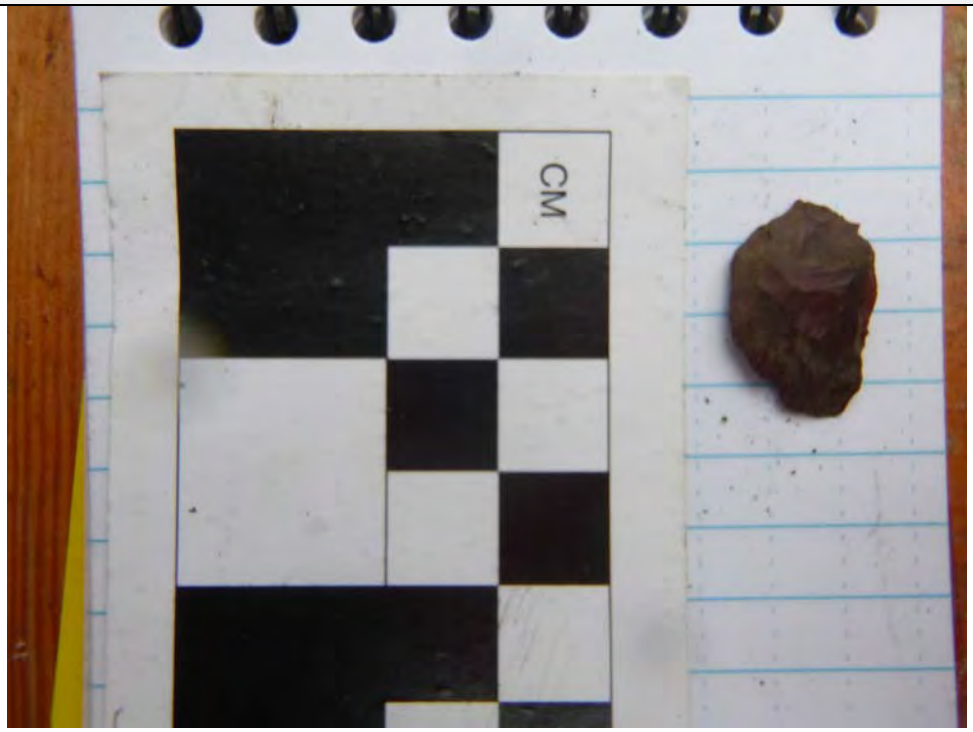
Photograph 2: View of fruit tree and driveway leading to Lind Farm buildings (view to northwest).

PHOTOGRAPH(S)

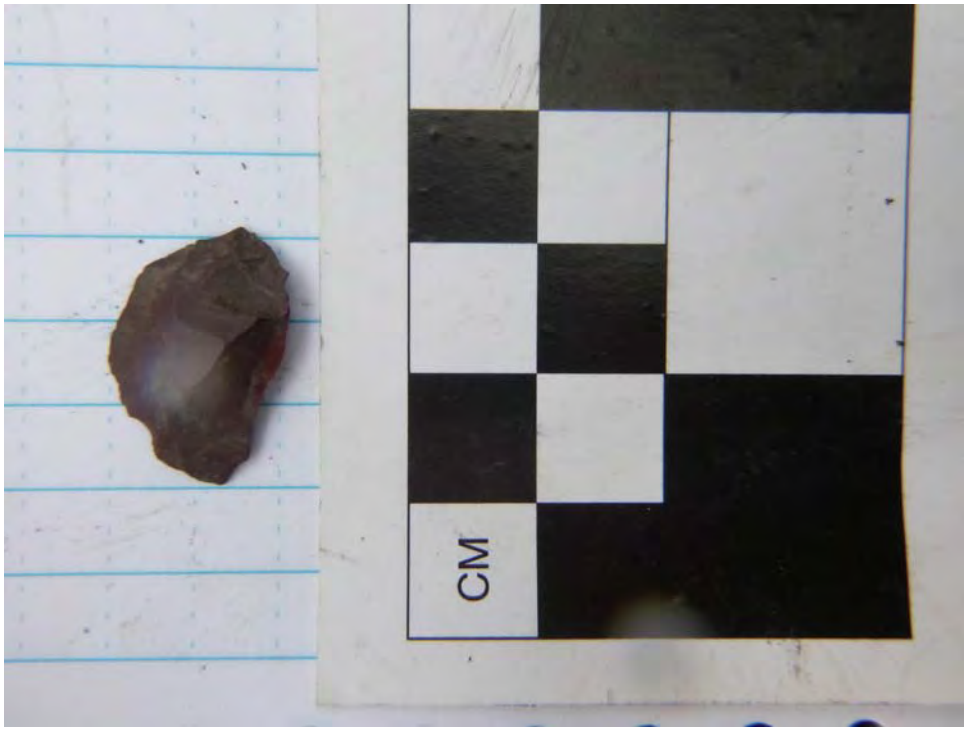
Photograph 3: View west into hazelnut grove on east bank Evans Creek.

Photograph 4: View northwest of small concrete and wood bridge crossing Evans Creek.

PHOTOGRAPH(S)



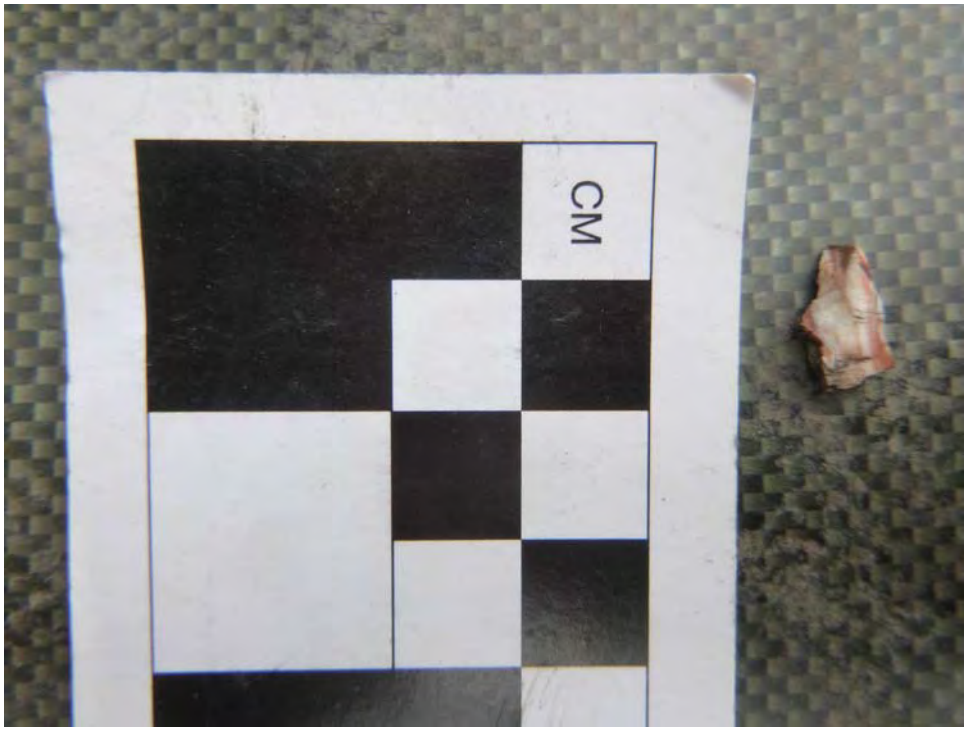
Photograph 5: Red jasper/CCS flake observed from 0-30 cmbs in SPA12, dorsal view.



Photograph 6: Red jasper/CCS flake observed from 0-30 cmbs in SPA12, ventral view.

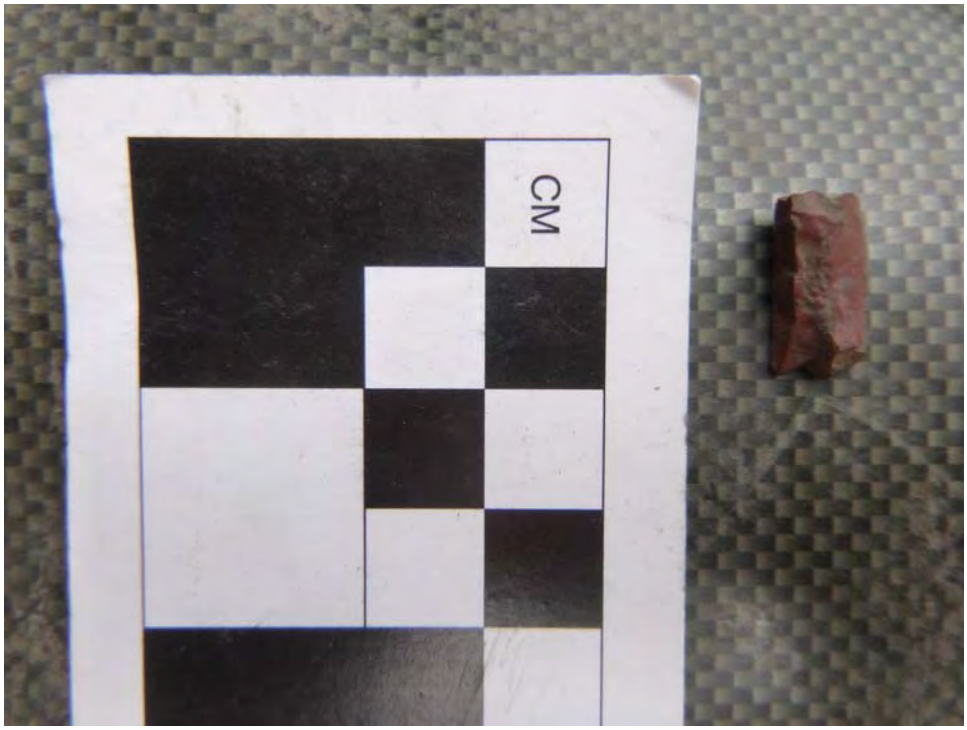
PHOTOGRAPH(S)

Photograph 7: Basalt flake, possibly edge-modified, observed from 0-30 cmbs in SPA12.8.



Photograph 8: Fragment of banded CCS shatter observed from 0-30 cmbs in SPA12.5.

PHOTOGRAPH(S)



Photograph 9: Fragment of red CCS/jasper shatter observed from 0-44 cmbs in SPA12.12.

PHOTOGRAPH(S)

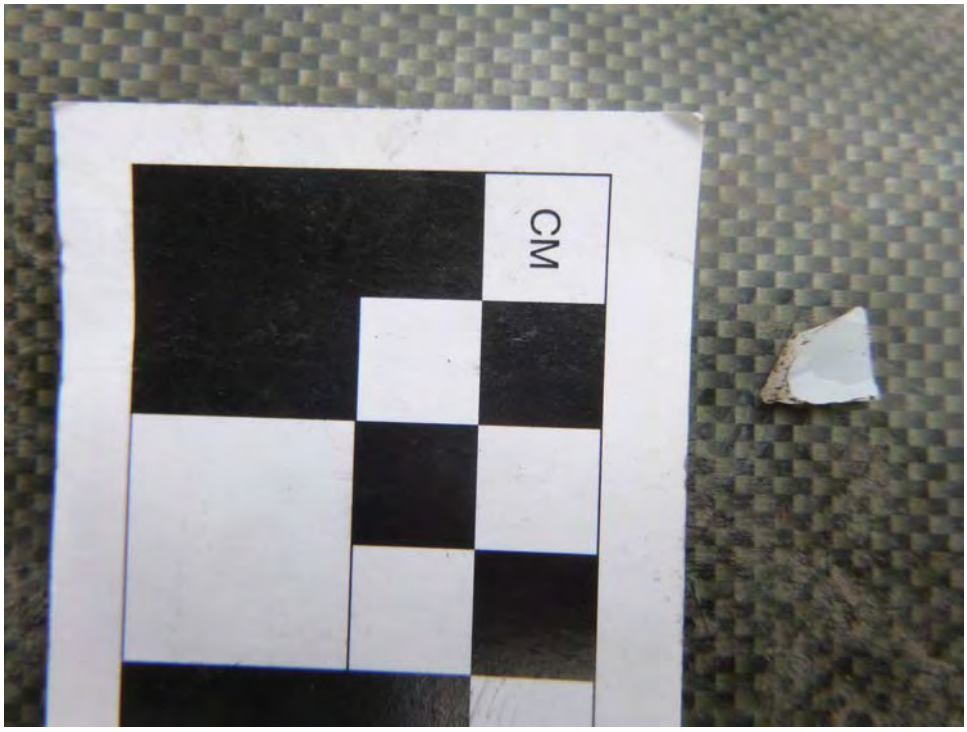
Photograph 10: Overview buried utilities in SPA12.4 at 20 cmbs (north to top of view).

PHOTOGRAPH(S)

Photograph 11: Overview of buried tank or pipe in SPA12, 20-25 cmbs.

PHOTOGRAPH(S)

Photograph 12: Bottle lip and neck fragment, diagnostic, from SPA12.12.



Photograph 13: Shard of milk glass, diagnostic, from SPA12.14 (0-30 cmbs).

PHOTOGRAPH(S)

Photograph 14: Overview of positive shovel probe cluster, showing chicken house and driveways (view to northeast).

Photograph 15: Historic-period artifacts from SPA12.9, 0-30 cmbs (brick, slag, and wire nail).

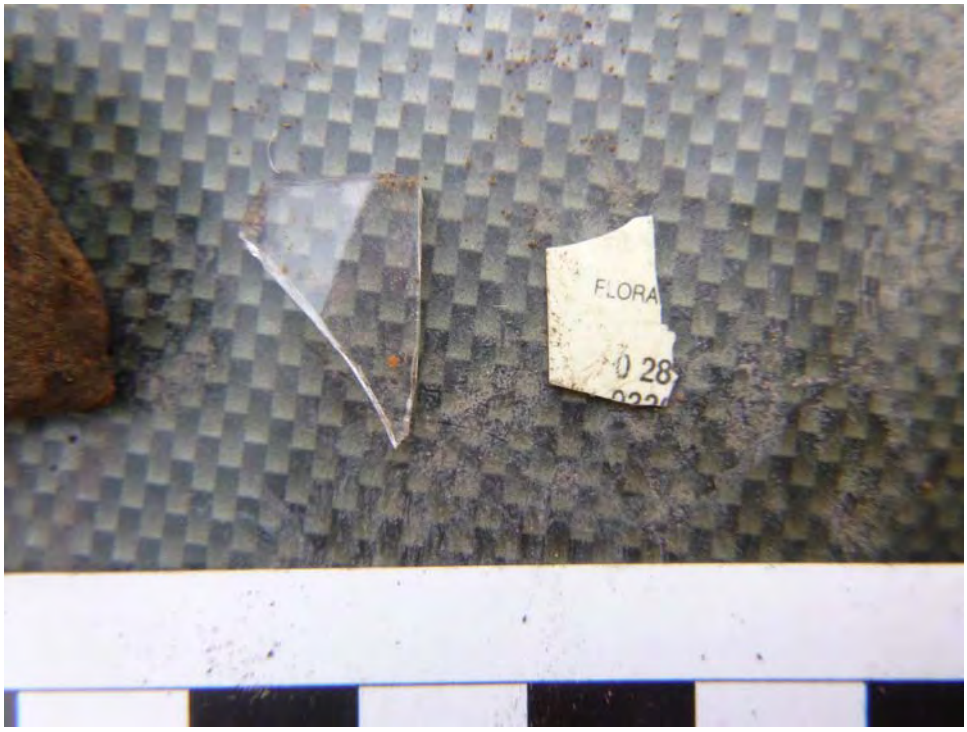
PHOTOGRAPH(S)

Photograph 16: Nail fragments and avian bone fragment from SPA12.7 (0-30 cmbs).

Photograph 17: Clear flat and curved glass shards from 0-30 cmbs in SPA12.8.

PHOTOGRAPH(S)

Photograph 18: Wire nails of varying sizes in SPA12.11 (varying from 2 ¼ to 3 ½ inches long with heads between 5/16 and ½-in).



Photograph 19: Curved glass shard and possibly modern plastic fragment from SPA12.13 (0-30 cmbs).

PHOTOGRAPH(S)

Photograph 20: Clear glass shards, wire, brick, and plastic fragments from SPA12.4 (0-20 cmbs).

Photograph 21: Pinched copper pipe observed from 10-30 cmbs in SPA12.

PHOTOGRAPH(S)

Photograph 22: Metal clip and white cloth fragment from 10-30 cmbs in SPA12.

Photograph 23: Overview of the location of Locus B, archaeologist digging at SPC16 radial probe (view to north).

PHOTOGRAPH(S)

Photograph 24: Small CCS/jasper flake fragment observed from 0-30 cmbs in SPC16.

Photograph 25: Fire modified rock fragments observed in SPC16 above approximately 50 cmbs.

PHOTOGRAPH(S)

Photograph 26: Heavily oxidized nail—likely wire-drawn—from SPD15.

CONTINUATION/ ADDENDUM SHEET

Label all additional pages by corresponding headings.

(e.g. Site Description, Site History, Research References)

Site 2045-1 Positive Shovel Probe Table:

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
A11	10 m S of old chicken coop	5280680	569008	60 cmbs	0-20 cmbs: Dark brown, silty loam with 35% poorly sorted gravels and cobbles.	0-20 cmbs: wire-cut nail.	Cobble obstruction.
					20-60 cmbs: Dark reddish brown, sandy silt with 35% gravels and cobbles. Charcoal at 31 cmbs and 58 cmbs.		
A12	20 m N of A13	5280659	569009	59 cmbs	0-14 cmbs: Brown, dry, compact, silty loam. 15% poorly sorted gravels and cobbles. Charcoal flecks throughout.	0-10 cmbs: 1 red jasper flake, 1 copper unknown object.	Large metal tank obstruction.
					14-59 cmbs: Strong brown, dry, compact, silty medium to coarse sand. 35% poorly sorted gravels and cobbles.	10-50 cmbs: 2 copper pipe fragments, 1 white cloth fragment, 1 brick fragment, other modern trash: plastic and foil fragments.	
A12.4	5 m W of A12	5280658	569001	20 cmbs	0-20 cmbs: Dark brown, fine sandy silt with 30% poorly sorted gravels and cobbles.	0-20 cmbs: 2 curved colorless glass fragments, 1 brick fragment, 1 black plastic fragment.	2 rubber coated wire obstructions
A12.5	5 m W of A12.3	5280664	569001	47 cmbs	0-26 cmbs: Dark brown, sandy silt with 30% poorly sorted gravels and cobbles.	0-26 cmbs: 1 wire-cut nail, 1 terra cotta	Cobble obstruction.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					26-47 cmbs: Yellowish brown, sandy silt with 45% gravels and cobbles with charcoal flecks throughout.	fragment, 2 CCS shatter.	
A12.6	5 m W of A12.4	5280659	568996	80 cmbs	0-30 cmbs: Dark brown, fine sandy silt with few pea gravels.	0-20 cmbs: 2 brick fragments.	Cobble obstruction.
					30-70 cmbs: Dark yellowish brown, fine sandy silt with 60-70% gravels and cobbles.		
					70-80 cmbs: Pale yellowish brown silt with 70% gravels and cobbles.		
A12.7	5 m S of A12.4	5280654	569002	60 cmbs	0-30 cmbs: Dark brown, silty loam with 35% poorly sorted gravels and cobbles.	0-30 cmbs: 3 wire-cut nail fragments, 1 wire tack nail, 1 small decomposing mammal bone, modern trash: plastic and foil fragments.	Gravel barrier.
					30-58 cmbs: Light brown to brown, gravelly loam.		
					58-60 cmbs: Coarse sand and poorly sorted gravels.		
A12.8	5 m N of A12.5	5280669	568999	53 cmbs	0-20 cmbs: Dark brown, silty loam with 20% poorly sorted gravels and cobbles.	0-20 cmbs: 1 saw-cut wood fragment, 5 pieces of terra cotta, 14 colorless glass fragments, 1 head of wire-cut nail, 1 basalt flake.	Cobble obstruction.
					20-53 cmbs: Dark reddish brown, sandy silt with 45% gravels and cobbles.		
A12.9	5 m W of A12.5	5280664	568995	20 cmbs	0-20 cmbs: Dark brown, silty loam with 15% poorly sorted gravels and 5% cobbles.	0-20 cmbs: wire-cut nail, 1 brick fragment, 1 ceramic fragment, 1 piece of slag/carbonized trash.	Root obstruction.
A12.10	5 m S of A12.7	5280648	569003	40 cmbs	0-36 cmbs: Dark brown, silty loam with 10% poorly sorted gravels and cobbles.	0-30 cmbs: 2 wire-cut nail fragments, 1	Cobble obstruction.

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					36-40 cmbs: Strong brown, slightly sandy silt. 40% large gravels and cobbles.	colorless glass fragment, 2 ceramic fragments, 1 pink flagging fragment.	
A12.11	5 m N of A12.8	5280674	568998	85 cmbs	0-25 cmbs: Dark brown, organic, gravelly, sandy silt.	0-25 cmbs: 3 machine-cut wire nails.	Gravel barrier.
					25-70 cmbs: Dark yellowish brown, gravelly, fine to medium sandy silt. 35% gravels and 10% cobbles.		
					70-85 cmbs: Olive grey, coarse sandy gravels.		
A12.12	5 m W of A12.8	5280668	568995	68 cmbs	0-20 cmbs: Greyish brown, gravelly loam.	0-68 cmbs: 2 nail fragments, 2 colorless glass (pane) fragments, 1 colorless glass (bottle) fragment, 1 CCS flake shatter.	Cobble obstruction.
					34-68 cmbs: Light brown, gravelly loam. 30-50% gravels and cobbles.		
A12.13	5 m W of A12.12	5280668	568989	47 cmbs	0-13 cmbs: Dark brown, silty loam with 20% poorly sorted gravels and cobbles.	0-13 cmbs: 1 terra cotta fragment, 1 colorless glass fragment, 1 plastic fragment.	Cobble obstruction.
					13-47 cmbs: Dark reddish brown, sandy silt with 45% gravels and cobbles.		
A12.14	5 m W of A12.11	5280673	568994	60 cmbs	0-14 cmbs: Dark brown, silty loam with 10% poorly sorted gravels and cobbles.	0-20 cmbs: wire-cut nail.	Cobble obstruction.
					14-60 cmbs: Yellowish brown, sandy silt with 35% gravels and cobbles.	0-30 cmbs: 8 brick fragments, 1 white (milk) glass fragment.	
B17	20 m N of B16	5280661	568987	60 cmbs	0-10 cmbs: Dark brown, silty loam.	0-50 cmbs: 1 large FCR cobble, 1 colorless glass fragment, 1 wire-cut nail, 1 burned bone fragment.	Compact gravel barrier.
					10-60 cmbs: Greyish brown, sandy loam with 20% round to subround, small to large gravels and small cobbles. Common roots		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
B19	20 m S of B18	5280623	568986	45 cmbs	0-45 cmbs: Light greyish brown, very compact, sandy, gravelly clay with mottled blue clay inclusions.	0-40 cmbs: several small pieces of coal, 1 colorless glass bottle base fragment.	Compact gravel barrier.
C16	20 m S of C15	5280762	568964	67 cmbs	0-14 cmbs: Dark brown, dry, compact, gravelly silt. 50% poorly sorted gravels and cobbles. Charcoal flecks throughout.	0-30 cmbs: 1 CCS flake shatter.	Gravel barrier.
					14-36 cmbs: Strong brown, dry, compact, sandy, gravelly silt. 60-70% gravels. Few charcoal flecks throughout.	0-48 cmbs: 5 pieces of FMR.	
					36-48 cmbs: Yellowish brown, slightly compact, dry, silty, medium to coarse sand. 70% small, round gravels. Dark charcoal stain in N wall at 32-40 cmbs.		
					48-67 cmbs: Light brown to tan silty gravel. 70% small to large gravels and medium cobbles.		
					35-72 cmbs: Olive brown to grey, loamy, fine to medium sand with gravels. Heavy oxidation at 35 cmbs.		
					72-83 cmbs: Grey, moist, loamy, medium to coarse sand with gravels. Groundwater at 75 cmbs.		
D15	20 m S of D16	5280742	568946	40 cmbs	0-8 cmbs: Dark brown silt with many roots.		Cobble obstructions.
					8-20 cmbs: Very dark greyish brown silty loam with few gravels and cobbles.	17-30 cmbs: rusted nail fragment.	
					20-40 cmbs: Grey gravelly, micaceous sand.		
					20-54 cmbs: Dark yellowish brown, loose, dry, sandy silt. >50% round to subround gravels and cobbles.		
					54-60 cmbs: Dark grey, silty, gravelly, medium to coarse sand.		
					60-70 cmbs: Light yellowish brown transitioning to grey silt.		

Shovel Probe	Location	UTM North	UTM East	Total Depth	Sediments	Cultural Materials	Reason for Termination
					70-120 cmbs: Dark brown, organic silt. Organics decrease with depth.		
					120-142 cmbs: Light bluish grey, gleyed clay.		

Appendix F - Concept Refinement Technical Memorandum

Technical Memorandum

To: Mike Haley and Roger Dane (City of Redmond)

From: Mike Garello, PE; Dan Heckendorf (HDR), and Shane Cherry (Confluence)

Reviewed: Chad Wiseman

Date: April 23, 2014

Subject: Evans Creek Relocation - Concept Refinement

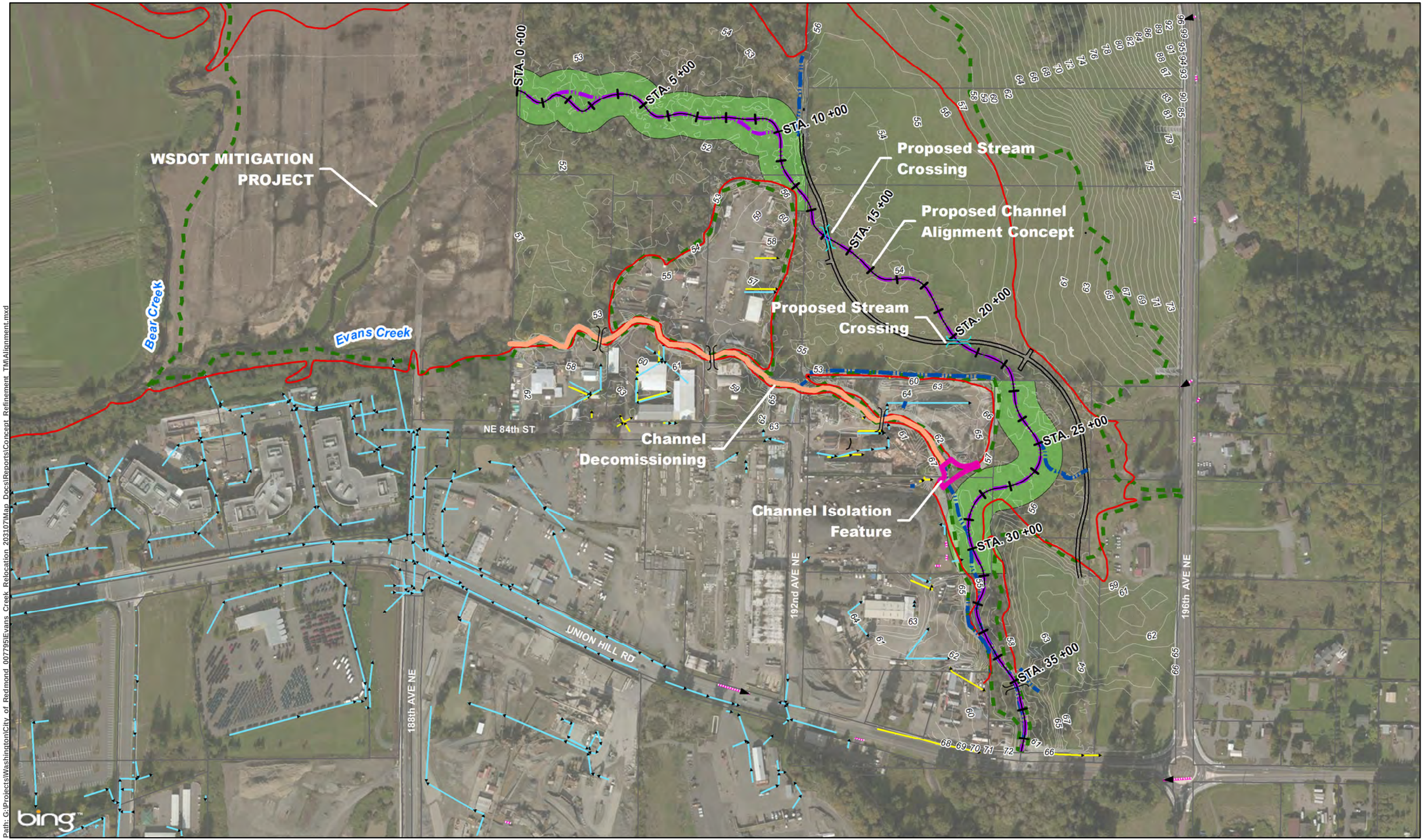
1.0 Introduction

HDR has been retained by the City of Redmond to provide a design for the relocation of a portion of Evans Creek in Redmond, WA. The proposed project is anticipated to begin at the existing upstream limit of the Washington State Department of Transportation (WSDOT) SR520 Eastside Wetlands Mitigation Project. The proposed project will extend upstream to approximately RM 0.74 just downstream of the NE Union Hill Road Bridge Crossing. Currently this reach of Evans Creek has a narrow riparian buffer, is channelized, is encroached by multiple industrial land uses, and is affected by limited water quality treatment or flow control of stormwater runoff. The proposed relocation will direct the creek through existing wetlands, resulting in a higher-functioning ecological system. It is anticipated that the proposed channel relocation will provide improvements to riparian buffer and floodplain connectivity, enhanced fish passage to the upper watershed, maintain or improve beneficial community access, and help facilitate potential redevelopment of adjacent industrial properties. A map showing the initial project elements as well as the general project location and vicinity is shown as Figure 1 for reference.

Multiple design and construction approaches were considered during the initial phases of project development. The initial concept identified the potential for establishing a channel path through the existing forested wetland using a “soft-touch” type of design and construction approach where the initial physical modification to the wetland floor could be minimized. This document explores existing and new information relative to project hydrology and topography, evaluates a total of four potential design and construction approaches, and recommends an approach that appears to suit the existing site characteristics and overall project objectives.

2.0 Purpose and Objective of this Document

The purpose of this TM is to collectively formulate and identify a preferred approach that could be carried forward through conceptual design, final design, and implementation. Information resulting from this effort can be used to initiate further alternative development and to provide the basic framework for conceptual and final design.



Path: G:\Projects\Washington\City of Redmond 007795\Evans Creek Relocation 203107\Map Docs\Reports\Concept Refinement TM\Alignment.mxd

Source: City of Redmond (2013), BING Online Imagery.

HDR

N

0 125 250 500 Feet

- Draft Proposed Channel Alignment
- Proposed Stream Crossing
- Proposed Channel Isolation Feature
- Proposed Channel Decomission
- Forested Wetland
- Existing Flow Path
- FEMA 100-Year Floodplain Delineation
- Existing Trail
- Culvert
- Storm pipe (COR)
- Storm pipe (Survey)
- Existing Bridge
- Approximate Wetland Boundary
- Parcel

Conceptual Refinement Memorandum

Figure 1

Evans Creek Relocation - Redmond, WA

The objective of this Technical Memorandum (TM) is to evaluate potential design and construction approaches in the context of pertinent information obtained during the initial phases of concept development. The evaluation considers alternatives in regards to the extent and specificity of proposed clearing, ground manipulation, and surface restoration requirements. Variations in the definition and implementation of the proposed channel planform and cross-sectional geometry are also considered as well as the required level of collaboration between the design team and the contractor.

Specifically, the following actions were conducted during development of this document:

- Obtained and reviewed available sources of project data,
- Performed hydrologic analysis and subsequent development of design flows,
- Evaluated existing reach hydraulics from a geomorphic perspective,
- Performed site reconnaissance,
- Reviewed and evaluated different design and construction approaches, and
- Recommended a design approach for review by the City and other project participants.

3.0 Overall Goals of Project

This project is listed in the WRIA 8 Chinook Conservation plan and will fulfill both local and Federal habitat improvement goals documented in that plan. The overall project goal is to provide a functioning urban stream relocation project that will improve environmental function within the context of existing and proposed urban land uses within the project area. Specifically, this goal will be met by:

- Enhancing in-stream habitat conditions,
- Providing an ample riparian buffer and floodplain,
- Improving fish passage to the upper watershed,
- Enhancing passive recreation,
- Heightening the potential for redevelopment of adjacent industrial properties.

4.0 Background

4.1 Integration with Previous Projects

The recently completed WSDOT SR520 Eastside Wetlands Mitigation Project has relocated a portion of Evans Creek downstream of the project site. This completed project dead ends along the western border of the project area and will serve as the downstream connection point for the proposed relocation of Evans Creek. The WSDOT SR520 project reach is identified in Figure 1 and shows how the upstream ending point of the channel is located on the western border of the Evans Creek Relocation project area. Currently, flow continues to be conveyed down the existing channel, which is routed south westerly through the industrial properties.

The channel design geometry for the WSDOT mitigation project was established using an active channel reference reach. The chosen section is located within the lowland floodplain, upstream

of the Union Hill Road NE Bridge, and at that time, was considered to be less impacted by adjacent development activities. During design, a typical bank full width of 20 feet and bank full flow depth of 2 and 2.5 feet were specified (WSDOT, 2012). The proposed dimensions of the meander planform mimics conditions observed within the upstream reference reaches, accounting for the active channel and most of the secondary, or side, channels. The active channel sinuosity was designed to mimic the value associated with the inferred pre-settlement channel. The radius of curvature was not specified due to the fact that no significant meander bends were identified within the reference reach (WSDOT, 2012). The following table and figure provide the typical section geometry and planform characteristics used by WSDOT for the constructed channel. As noted, the use of this channel geometry is appropriate for reaches with average gradients near 0.14%.

Table 1. Typical WSDOT Channel Design Characteristics.

Section Geometry	
Top Width (ft)	20
Bottom Width (ft)	12
Side Slopes (z:1)	2
Depth of Flow (ft)	2
Depth of Streambed Sediment (ft)	1
Planform and Profile Characteristics	
Meander Belt (ft)	100
Sinuosity	1.2
Profile Gradient (%)	0.14

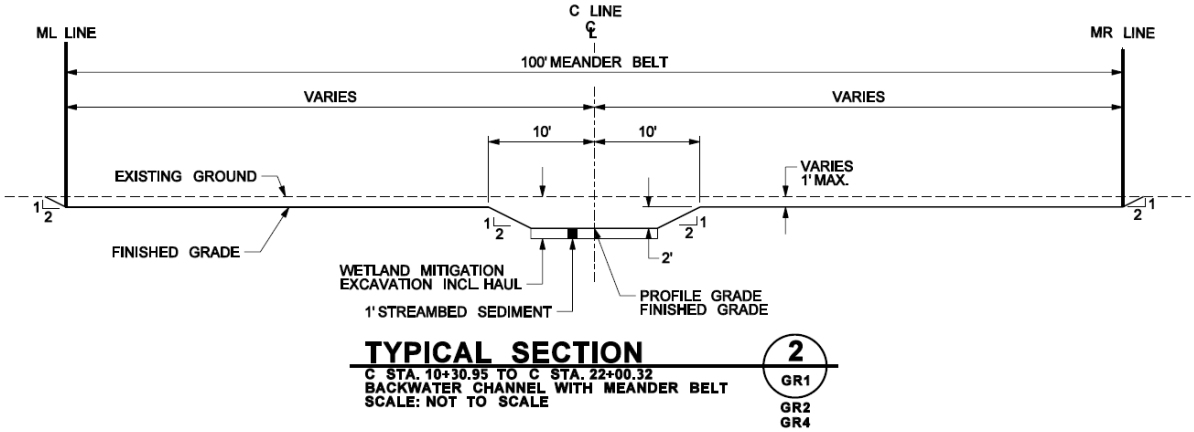


Figure 2. Typical channel cross-section implemented in the WSDOT project located downstream of the proposed project reach.

5.0 Site Reconnaissance

Two site visits were conducted by staff from both HDR and Confluence Environmental on May 15, 2013, and on September 18, 2013. Both site visits focused on the proposed new alignment

through the forested wetland on City of Redmond property. During the site visits, observations and measurements of topography, soils, and vegetation were made along the proposed alignment corridor.

The proposed alignment will have a very low gradient as it traverses a nearly flat landscape. From the proposed takeoff point from the existing channel to the upstream end of the new stream channel constructed by WSDOT, the new channel will fall less than 4 feet over almost 4,000 feet of length.

Within the forested wetland, the overall topography is flat, but at a small scale the ground surface is very irregular with micro-topographic variations. Fallen trees leave deep voids containing standing water among adjacent hummock laden surfaces. Soil conditions resulting from hand auger test pits indicate that the near surface soils at the site consist of a thin layer of topsoil/forest duff overlying alluvium. The alluvium is generally fine-grained consisting of interbedded layers of soft to medium stiff silt, organic silt and clay with varying amounts of sand. In some locations coarse-grained alluvium exists and is generally composed of medium dense or denser sand and gravel with variable silt and cobble content (GeoEngineers, 2013). Dense understory vegetation and numerous live and fallen trees occur throughout the site. Standing water was observed in locations throughout the wetland during both site visits even though both visits were preceded by dry weather. These observations suggest the forested wetland is perennially wet and wet soil conditions should be expected during construction regardless of timing. This implies that construction techniques using larger equipment and more conventional methods may be impaired due to presence of wet unstable soils without causing greater impacts to forested wetland resources. Alternative (i.e. softer) approaches can be used in these areas to accomplish the same goal but with less impact to existing resources.

6.0 Selection of Design and Construction Approach

Four design and construction approaches were considered: Soft Touch, Conventional Design and Construction, Adaptive, and an Integrative Approach.

- Soft Touch – The “Soft Touch” approach minimizes the direct modification of the landscape and relies on existing topography to allow stream flow introduced at the eastern edge of the forested wetland to find its way generally westward where it would flow into the WSDOT mitigation site. This approach would require that the overall topography exhibits a continuous gradient to the southwest where Evans Creek can be routed through the forested wetland with limited clearing and ground manipulation. Although a defined approach to accomplishing this would be specified during the design process, this method relies heavily on field interpretation of landforms and collaboration between the contractor and design team as construction occurs. Initial reconnaissance combined with the topographic survey indicates that this approach runs a high risk of routing overbank flow southward where it would impact adjacent properties outside of the project.
- Conventional Design and Construction – This approach is used in most construction projects. This method includes development of detailed design drawings and specifications which would clearly define and prescribe all aspects of proposed clearing,

ground manipulation, and surface restoration requirements. The proposed channel planform and cross-sectional geometry would be well defined and constructed on a prescribed path through the forested wetland. Although a high level of collaboration is still required between the design team and the contractor, implementation would rely less on field interpretation and more on the prescribed design elements.

- Adaptive – This approach includes the design and implementation of a series of prescribed design elements based upon field interpretation of performance specifications. Implementation of each design element would be based upon knowledge of the existing landform but would be influenced greatly by field interpretation as construction occurs. A general stream alignment corridor would be defined and design elements would be implemented as necessary to meet project performance criteria and conveyance requirements. Construction would occur in a step-wise process with a high level of collaboration with the project geomorphologist and engineer. Pre-defined design elements would be selected as construction moves forward to achieve performance objectives while still avoiding impacts to large trees, habitat elements such as logs with root wads, and stands of wetland vegetation that provide essential shade and slope stability for the project. The result is a stream channel configuration that is centered on inclusion of existing wetland habitat and avoidance of impact to sensitive wetland components.
- Integrative – The integrative method includes a combination of both Conventional and Adaptive construction techniques. Where the general planform and cross-section geometry is implemented, and where appropriate topography and landforms exist, impact to the existing landform will be limited by incorporating prescribed adaptive design elements which limit impacts to habitat features such as larger trees, downed trees with root wads, and stands of other vegetation that could be incorporated into the implemented project. Conventional design elements would include definition of a stream corridor and potential zone of channel excavation, earth berm structures to guide water flow westward and prevent flood impacts to neighboring properties to the south, stream crossings, and configuration of the channel transition zones. These zones would include areas where Evans Creek transitions longitudinally from a very defined stream channel into a variable, multiple channel, wetland feature, and then back again to a defined existing channel. The construction path implemented through the forested wetland would be based upon a performance specification in concert with field interpretation as defined in the adaptive approach.

To evaluate the general appropriateness of each potential design and construction approach a screening level evaluation table was developed that indicates advantages and disadvantages for each approach (Table 2).

Table 2. Screening level evaluation of design and construction approaches.

Method	Advantages	Disadvantages
Soft Touch	• Minimizes ecological impacts to the forested wetland. • Allows faster wetland/system recovery after construction. • Maintains high levels of shade which will reduce colonization of invasive vegetation. • Permitting: may be well-received by wetland-focused agencies due to wetland impact minimization	• Higher potential for unforeseen flooding impacts to neighboring properties to the south. • Uncertainty of construction scope may drive up construction bid prices. • May not ensure continuous fish passage. • Will require a longer period of time to evaluate performance. Adaptive management needed. • Relies more heavily on field interpretation. • Permitting: may be scrutinized by WDFW and tribes for fish passage.
Conventional Design and Construction	• Provides certainty for initial channel capacity and defined level of impact. • Design specificity may improve predictability of construction bids and performance. • Relies less on field interpretation. • Provides certainty for continuous fish passage. • Permitting: may be well-received by fish-focused agencies	• Has maximum impact footprint within the forested wetland. • May require a more extensive invasive vegetation maintenance program. • Permitting: May be scrutinized by wetland-focused agencies for greater temporary wetland impacts.
Adaptive	• Increases confidence in meeting project performance objectives over the “soft touch” approach. • Provides a real-time decision tree which fosters inclusion of existing wetland habitat features and limits impacts. • Permitting: helps to achieve both fish and wetland related objectives leading to broader agency support.	• Uncertainty of project scope may drive up construction bid prices. • Relies heavily on field interpretation to implement specified elements. • May require additional defined features to mitigate for flood conveyance requirements. • Permitting: agencies will require more detailed performance monitoring.

Method	Advantages	Disadvantages
Integrative	• Combines attributes of both Conventional and Adaptive methods which provides a balanced approach. • Improves the level of scope definition over the Adaptive and Soft Touch methods which will improve Contractor confidence during bidding. • Improves confidence in achieving all desired project goals by providing well-defined actions in certain reaches and then also using the adaptive approach where applicable to increase the use of existing habitat and limit impact to wetland features.	• Increases the potential impact to existing wetland resources above the Soft-Touch and Adaptive approach but less than the Conventional approach. • May require additional defined features to mitigate for flood conveyance requirements. • Permitting: Agencies will require more detailed performance monitoring.

6.1 Recommended Design and Construction Approach

Based upon the results from site reconnaissance, preliminary topographic data collection, and review of available hydrology data the design team recommends for the City's consideration that an Integrative approach be utilized during design and construction for this project. To the extent practical, this approach incorporates the advantages of both the "Soft Touch," and the "Conventional," techniques and applies them to appropriate areas of the project. This approach is believed to provide a sufficient level of specificity such that Contractors are able to bid and construct the project successfully with a higher level of confidence while also meeting project objectives associated with limiting construction related impacts and protecting sensitive wetland habitat. Use of Adaptive elements are also believed to maintain the highest level of overhead shade throughout construction which will ultimately be a key factor in controlling colonization of invasive plant species.

As briefly described above, the Integrative approach will be formulated around a number of Conventional design elements as well as a series of performance specifications that will guide construction through forested wetland sections. In general, Conventional design elements will clearly define the planform and cross-sectional channel geometry at locations where adaptive techniques are not considered appropriate, such as: upstream and downstream tie-ins with existing channels, areas where structures that redirect or isolate overbank flow are required to maintain flood conveyance, and where pedestrian trail network crossings occur. The adaptive approach will be utilized in reaches where appropriate topography and landforms exist – such as the forested wetland - limiting the overall land disturbance created by the project.

The Adaptive elements of this project can be implemented through development of a functional decision tree based upon a list of defined performance specifications. The list of performance specifications can be used as a guide by the Contractor as various wetland features are encountered during construction. Based on the observed perennial wet condition through the forested wetland even after dry weather periods in summer, a channel liner is not

recommended. Together with the design engineers, the path forward can be interpreted as construction proceeds. It is anticipated that considerable collaboration between the design team and the contractor will be required to ensure project performance and conveyance requirements are met. A visual representation of two potential channel geometry configurations has been provided within the two figures below. Specifically, Figure 3 displays a configuration where the conveyance requirements are met through a deeper single channel. Figure 4 showcases a multiple channel layout in which conveyance is provided within a primary creek channel and supplementary secondary side channels.

Although the final list of performance specifications will exhibit a much higher level of detail, the following example offers some insight into how this approach may be used as a decision guide through areas such as the forested wetland. The performance specifications applied and the level of detail can be developed later in the process as construction documents for this project are further developed.

- Contractor shall perform all construction activity within the 80 foot migration corridor indicated on the drawings and flagged in the field.
- Contractor shall excavate and remove native wetland material and substrate to create up to 60 cubic feet of conveyance area per every foot of channel created.
- Contractor shall maintain an average channel gradient, as outlined in Plan and Profile X of the drawings.
- Channels shall be excavated to a projected hydraulic depth of 1.5 feet unless the area is designated to be a pool. Contractor shall over excavate by 1-foot for placement of select streambed material prior to completion of channel construction.
- Channel top widths shall be no more than 40 feet and no less than 8 feet.
- Channel side slopes shall be no more than 2H:1V.
- Contractor shall create both single and multiple threaded channels with single thread reaches being no longer than 80 feet in length.
- Pools shall be excavated at the apex of each meander and/or as specified by the field geomorphologist. Pool areas shall be excavated to a depth of 3 feet and shall have an approximate length of two channel widths.
- The maximum number of channels shall be limited to three (3).
- Contractor shall avoid removal of live trees over 12-inches DBH. If such trees are to be cleared, Contractor shall reintegrate them as downed trees into the channel configuration within 50 feet of their original position.
- Contractor shall avoid removal of tree trunks with attached root masses. If such root masses are to me moved, Contractor shall reintegrate them into the channel configuration within 50 feet of their original position.
- Contractor shall coordinate review and gain approval of tree and root mass removal and/or relocation by City and Engineer.

- All final channel configurations shall be restored with 1 foot of select channel bed material as indicated in the contract specifications as shown in the contract drawings.
- Disturbed overbank areas for all final channel configurations shall be revegetated as indicated in the contract drawings.

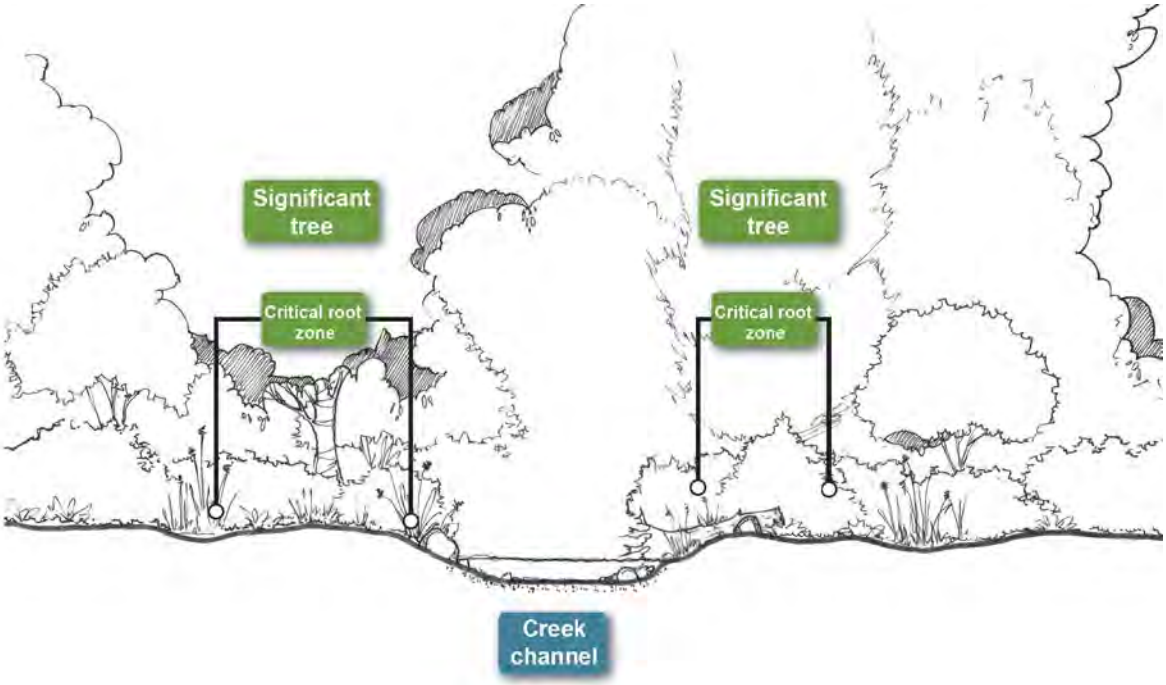


Figure 3. Illustration of single creek channel routed through forested wetland.

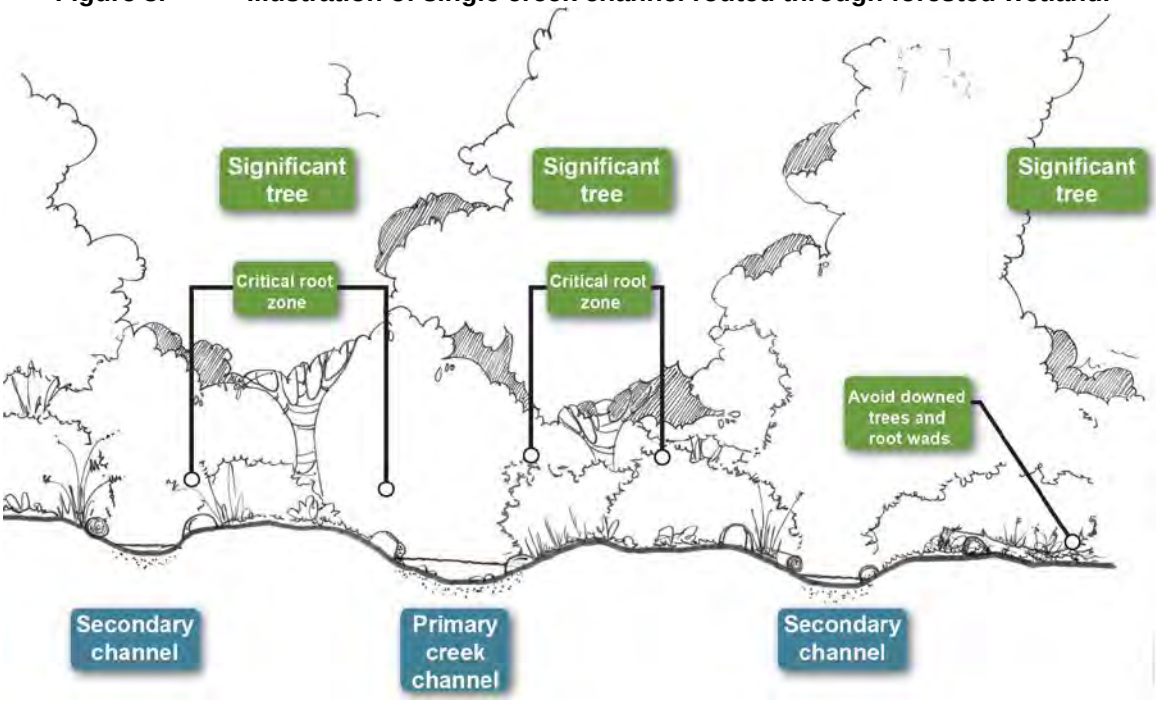


Figure 4. Illustration of alternate multiple creek channel configuration routed through forested wetland.

7.0 Preliminary Design Criteria

Through the existing forested wetland, the extremely low gradient of the landscape dictates a channel with a larger typical cross sectional configuration relative to stream flow due to the presence of lower velocities. Channel forming discharge for alluvial streams typically corresponds to flood flow recurrence of events between 1 and 5 years. The existing channel cross section shows a high channel top width relative to depth for flows in this frequency range.

Sediment dynamics will likely play a very small role in determining channel geometry. The low gradient will produce low bed shear stress values not capable of eroding or transporting most sediment. This is true for both existing and proposed future conditions. Encroachment of vegetation into the channel will more likely be a dominant factor in determining the effective channel dimensions, and it should be expected that as the effective channel is constricted by vegetation the frequency of overbank flooding will increase. The constructed dimensions of the channel will only be a starting point, and vegetation encroachment over time will dictate the actual hydraulic performance of the channel.

This perspective suggests that a notable challenge will be to ensure that overbank flow is routed in an acceptable way through the project site. Topographic survey indicates that the general trend is for water flowing over the landscape to move westward and southward. Overbank flow moving to the south through the forested wetland onto adjacent properties will need to be either acknowledged and accepted or routed westward to prevent unacceptable impacts to adjacent properties. The channel dimensions will not drive this aspect of hydraulic performance. Some other design feature (e.g. a low elevation berm or secondary parallel channels) will be needed to route overbank flow water generally westward. These will be added to the project as the more conventional design elements are formulated.

Recommended initial channel dimensions may be derived by comparison to existing channel dimensions corresponding to the 1-, 1.25-, and 1.5-year recurrence flood flows. The ultimate channel (after modified by vegetation encroachment) will probably be a multi-thread irregular channel with a high width to depth ratio (possibly over 30). The potential for cross-sectional channel changes will be studied further as design activities for this project continue.

7.1 Hydrology and Selection of Design Flows

Characterization of potential design flows was performed by fitting annual instantaneous peak flow data to Log Pearson Type III distribution as well as by conducting a flow duration analysis on the median daily flows. Hydrologic data for Evans Creek is available from a streamflow gaging site just upstream of the project extents at the Union Hill Bridge crossing. The period of record and historic ownership for this site are provided in Table 3 below. Design flows for this project were established using data from the 1987-current period of record in order to characterize flows representative of recent changes in the physical characteristics of the basin and would therefore be more applicable to contemporary hydrologic conditions.

Table 3. Stream Gage Information.

Operator	Gage Identification	Period of Record
USGS	12124000	1955-1987(int.)
King County	18a - Evans Creek @ Union Hill Road	1987-current(int.)

The resulting flow duration data is provided in Table 4 and is graphed in Figure 5. Results show that mean daily flows of 4 cfs are exceeded 95% of the time while flows of 14 cfs are exceeded 50% of the time. These flows may represent those values observed in Evans Creek during both late summer and winter/spring base flow conditions.

Table 4. Flow Duration Analysis.

Percent of Time Exceeded	Design Flow (cfs)
99	2
95	4
90	5
75	7
50	14
25	26
10	44
5	57
1	95

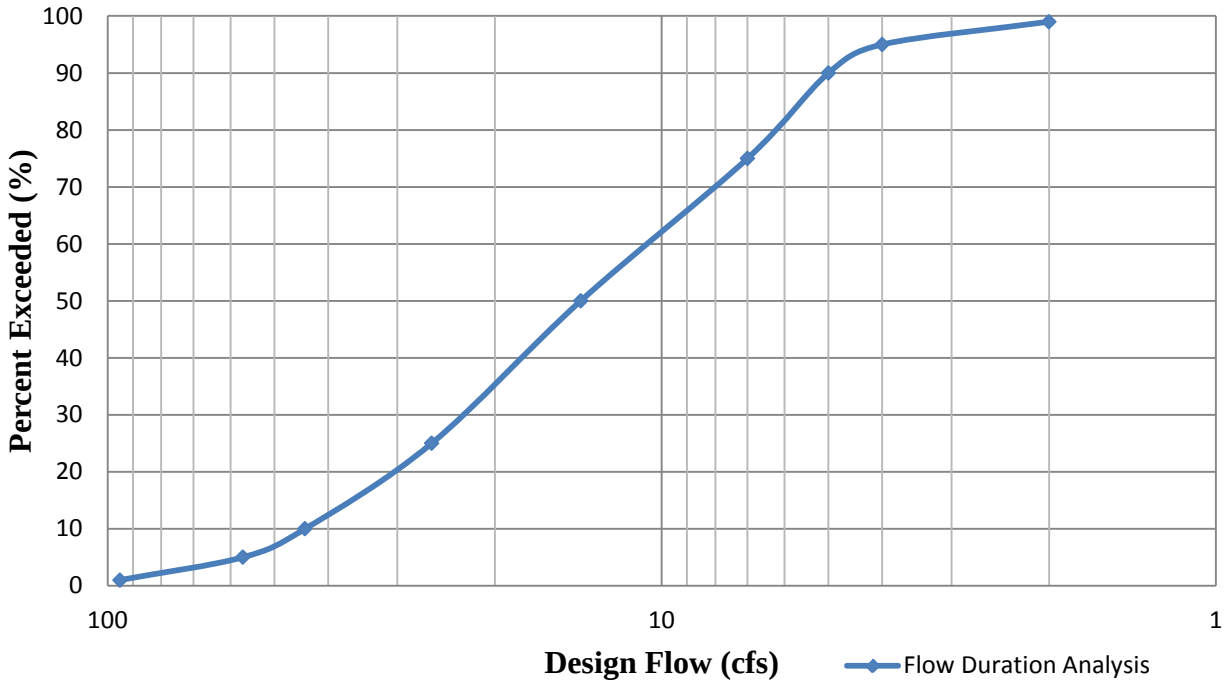


Figure 5. Flow Duration Analysis.

A flood frequency analysis was conducted for the available annual peak flow data. Specifically, the HEC-SSP software was used to conduct a standard Log-Pearson Type III (LP3) analysis for the entire period of record. Peak recurrence flows generated from this analysis were found to be lower – but still within approximately 20% of those published by FEMA in the current effective Flood Insurance Study (FIS) (FEMA, 2005). Results from the Flood frequency analysis are provided in Table 5 and Figure 6 below.

Through review of the analysis, it was observed that the published FIS peak recurrence flows are more conservative and will therefore be utilized during evaluation of the 100-year floodplain and floodway associated with the proposed project. The more frequent flood events resulting from the LP3 analysis performed for this project will be used to establish various design parameters for the proposed channel cross-section. The table and additional figure provided below display a comparison of the results from the flood frequency analysis.

Table 5. Flood Frequency Analysis.

Recurrence Interval	Peak Recurrence Flow (cfs)	
	Effective FIS	LP3 Analysis
500-Year	496	321
100-Year	400	291
50-Year	360	261
10-Year	280	195
5-year	N/A	165
2-year	N/A	121
1.5-year	N/A	94
1.25-year	N/A	79
1-year	N/A	49

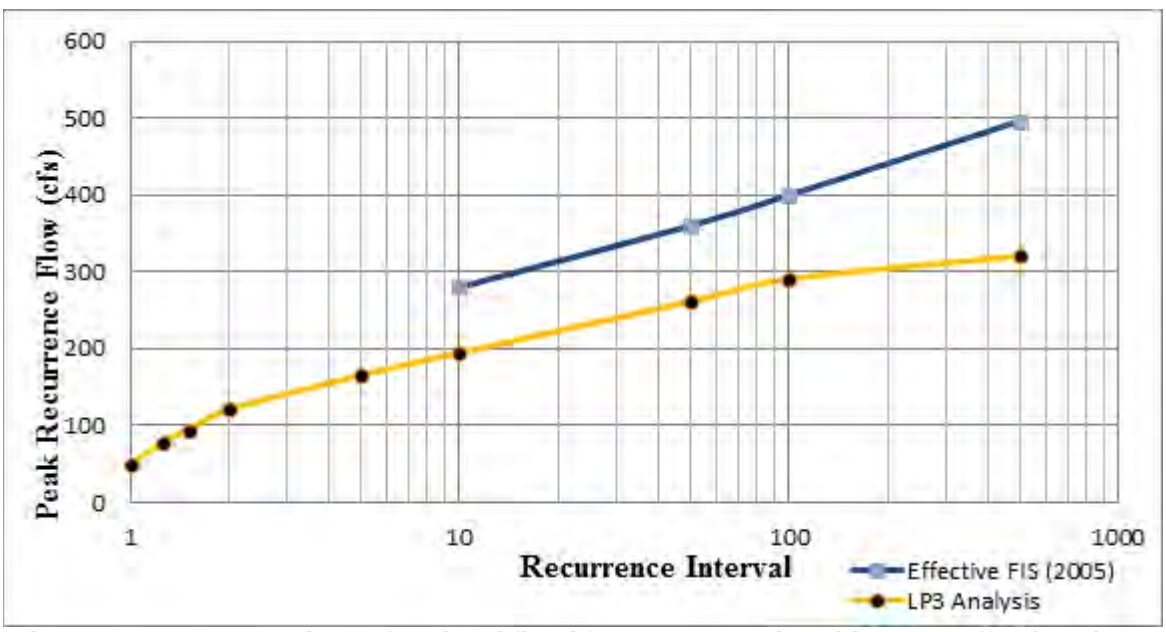


Figure 6. Comparison of updated flood frequency results with FEMA Effective Flows published in FIS.

7.2 Cross-sectional Geometry and Planform

The design cross section will be a physical starting point at construction completion. Following construction, the effective cross section for conveying flow will be dictated by the balance between the flow forces and the gradual encroachment of surrounding vegetation. Constructed channel dimensions derived using this approach would have a top width of 35 to 45 feet with a typical depth on the order of 1.5 feet and maximum depths ranging from 1.5 to 3 feet. This is larger than the 20 width used in the WSDOT design and reference reach to account for the flatter gradient of the new alignment and allowing for future vegetation encroachment. The ultimate channel (after modified by vegetation encroachment) will probably be a multi-thread irregular channel with a high width to depth ratio (e.g. over 30).

The anticipated planform for a natural alluvial channel through a low-gradient forested wetland would be a multi-thread, wide, shallow, irregular channel. A challenge will be to construct a starting channel that will allow this ultimate form to evolve while minimizing the temporary impact to the wetland and routing water generally westward in a way that minimizes potential effects on adjacent properties located south of the project site.

8.0 Further Considerations for Design

One key to implementing a successful project will be to anticipate the range of possible performance outcomes after the first phase is implemented and have appropriate contingencies defined and ready for implementation, should unintended results be observed.

One of the key challenges associated with the design will be to minimize potential surface water effects on neighboring properties. The most straightforward contingency to address this risk would be a low-profile earth berm along the southern project perimeter to steer overbank flows westward. This approach may prove effective, but it would introduce a hydrologic barrier to the existing wetlands on adjacent properties to the south. An alternative solution may include additional property acquisition to include a larger extent of existing wetlands available to accept additional overbank flow as part of the project. As the design process moves forward, consideration of integrating portions of adjacent parcels may be beneficial to the project outcome.

9.0 Next Steps

The following items are identified as next steps required in the project implementation process.

- Submit the results from this preliminary assessment to the City and other project participants such as permitting/regulatory agencies and County Flood Control for consideration;
- Obtain feedback and gain concurrence from the City and project participants on the proposed design approach and preliminary design criteria;
- Strategize regulatory approach and discuss acceptance of a potential methods with agency representatives;
- Complete all data collection activities and integrate data sources in the design process;

- Perform preliminary engineering calculations to determine basic size and configuration of conceptual alternative elements,
- Complete the hydrologic and hydraulic analysis for alternative channel configurations;
- Make modifications to the proposed channel configuration to more effectively achieve project objectives;
- Produce a 30 percent set of design drawings representing the overall design layout and construction approach for this project;
- Reevaluate both funding and regulatory requirements for the project as a whole; and
- Proceed to final design and implementation.

10.0 References Cited

Federal Emergency Management Agency (FEMA), 2005. Flood Insurance Rate Map, King County, Washington and Incorporated Areas.

GeoEngineers, 2013. Draft Geotechnical Engineering Services: Evans Creek Relocation Project Report.

Washington State Department of Transportation (WSDOT), 2012. SR520 Eastside Wetlands Mitigation Hydrology Report/Basis of Design.