



# East Lake Sammamish Apartments

City of Redmond, Washington

## Final PREP Storm Drainage Report

Prepared for  
MSPT XVIII, LLC  
12332 NE 115th Place  
Kirkland, WA 98033

Report Date: March 15, 2016  
Revision Date: May 19, 2016  
Revision Date: September 9, 2016



Blueline Job No. 15-188

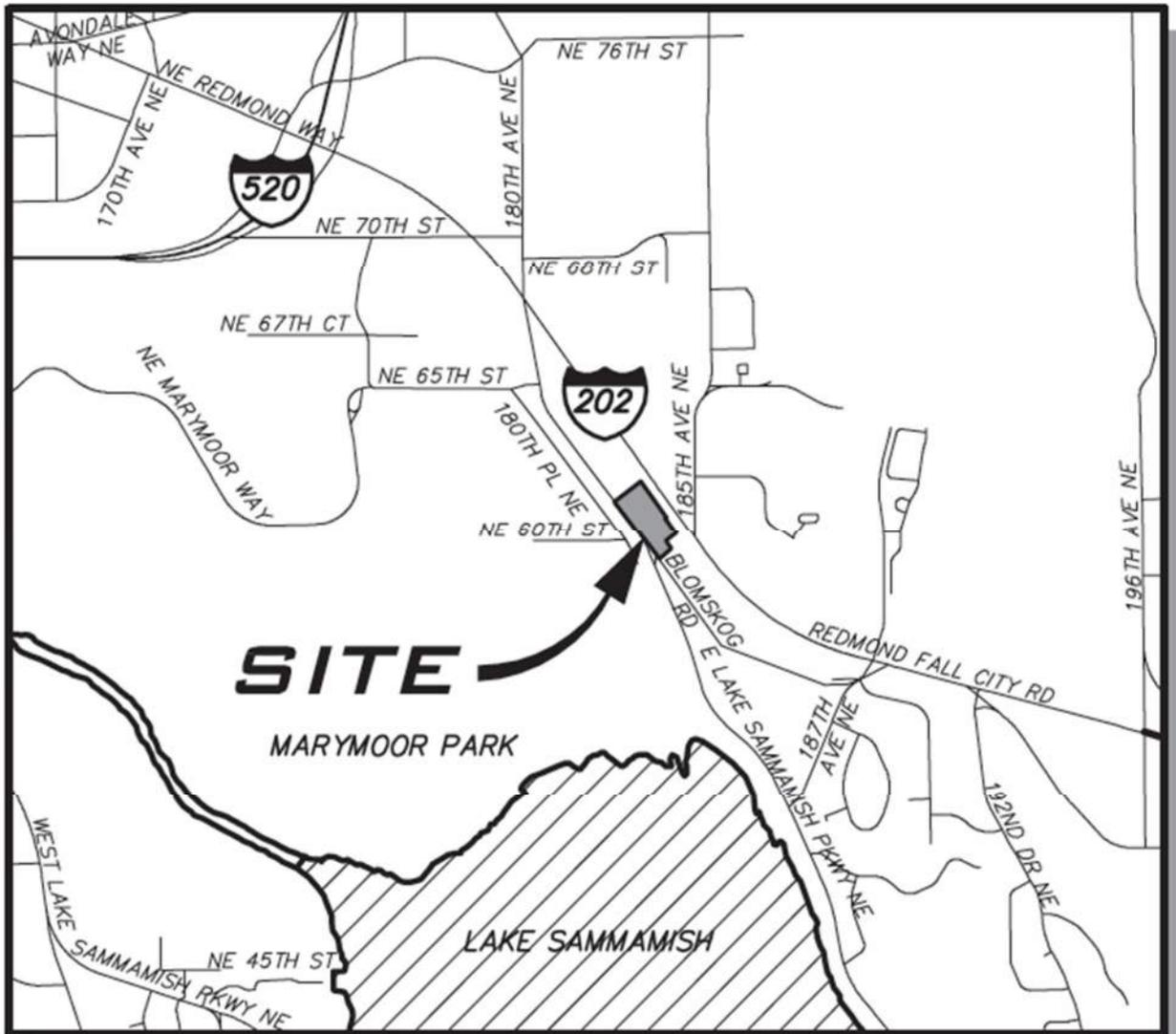
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## Section 1 Project Overview

The project is located at 6006 East Lake Sammamish Parkway in Redmond, WA 98052. More generally, the site is located in the SW ¼ of Section 25, Township 25 N, Range 6 E, W.M. Refer to the vicinity map below.



Vicinity Map

The project site is contained on seven parcels, #1318300120, #1318300125, #1318300142, #1318300144, #1318300156, #1318300164 and #1825069025 and totals approximately 4.85 acres. The project proposes frontage improvements along East Lake Sammamish Parkway as well as development of the existing site into a residential multifamily apartment complex comprised of 2 multi-story buildings with underground parking garages and associated infrastructure.

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The site currently contains a number of single family residences, garages and driveways of crushed gravel and asphalt as well as associated structures with impervious roofs and sidewalks. Ground cover consists of lawn, residential landscaping and scattered trees surrounding the residences with heavier forested areas toward the south/southwest portion of the site. Access to the parcels is via 2 driveways off of E Lake Sammamish Pkwy to the west and 2 driveways off of Redmond Fall City Rd NE (SR 202) to the east. These structures will be demolished and the majority of ground cover will be cleared in preparation for development. See the *Existing* and *Developed Conditions Exhibits* included in Section 4.

The subject property was analyzed as a Single Threshold Discharge area, per section 2.3 of 2012 COR Technical Notebook. The project area is tributary to sub-basin 470 according the City of Redmond (COR) GIS Watershed boundaries. Flows ultimately discharge into Lake Sammamish over 1/4 mile from the subject property. The basin areas and path are shown in the *Downstream Path Exhibits* included in section 3 of this report.

Soils on-site were determined to be predominately medium dense to very dense, silty sand with variable gravel and cobble content consistent with characteristics of glacial till as cited in the *Geotechnical Engineering Report* included in Section 6 of this report.

The proposed improvements for this project add greater than 5,000 SF of new impervious area on-site, thus the project, per 2012 COR Technical Notebook, is categorized as a Large Project and required to meet Minimum Requirements #1 - #9 as detailed in Chapter 2 of the Stormwater Notebook.

The stormwater elements to serve the developed drainage will be designed based on the 2012 COR Technical Notebook and the Washington State Department of Ecology's Stormwater Management Manual for Western Washington 2005 (2005 DOE Manual).

## Section 2 Minimum Requirements

The project will comply with minimum requirements 1-9 of the 2005 DOE Manual and the 2012 COR Technical Notebook. Minimum requirements are listed and met as detailed below and determined from the COR Flow Chart, Figure 3.2, included at the end of this section.

Minimum Requirement #1: Preparation of Stormwater Site Plans: Final PREP Plans (provided under separate cover) and Storm Drainage Report (herein) have been prepared showing the proposed system and stormwater flow control.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (SWPPP): See Section 5. Site construction will be in accordance with the twelve elements of Minimum Requirement #2 for construction stormwater pollution prevention. A Construction SWPPP will be provided with final engineering.

Minimum Requirement #3: Source Control of Pollution: Permanent Source Control Pollution requirements do not apply. The project is not a source of urban stormwater pollutants as described in Chapter 2, Volume IV of the 2005 DOE Manual; thus the need to reduce or eliminate stormwater pollutants is not present and no Operational or Structural source control BMPs will be required for the developed site. Minimum Requirement #2 addresses BMPs for construction sites. Source Control Pollution created during construction will be addressed by the SWPPP.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls: The proposed discharge location from the site is to the existing natural discharge location along the Southwest frontage of the site. A detention vault will be utilized to provide flow control and maintain pre-developed runoff rates from the site. See section 3 of this report for the downstream analysis.

Minimum Requirement #5: On-Site Stormwater Management: See Section 4. The project will incorporate the following Best Management Practices (BMPs) required by COR per Section 2.5.5 of the 2012 COR Technical Notebook. A Low Impact Development (LID) feasibility analysis was performed in accordance with City requirements. Please see the Appendix section of this report for a memorandum summarizing the findings.

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Minimum Requirement #6: Runoff Treatment: See Section 4. According to Section 2.5.6 of the 2012 COR Technical Notebook, a treatment facility will be required due to > 5,000 SF of Pollution Generating Impervious Surfaces (PGIS) on-site. The site will utilize a privately maintained Modular Wetland System (MWS) to provide enhanced, and phosphorous water quality treatment. The MWS has TAPE GULD Approval for Enhanced and Phosphorus treatment through the Washington State Department of Ecology. See appendix for MWS details.

Minimum Requirement #7: Flow Control: See Section 4. According to Section 2.5.7 of the 2012 COR Technical Notebook, a flow control facility as well as on-site stormwater BMPs will be required on-site due to > 5,000 SF of new impervious area on-site. A flow control facility will be provided and designed to meet the Standard Flow Control Requirement as specified by the City. This will be achieved using detention vaults. Placement of the flow control facilities is shown on the 90% PREP Plans under separate cover, and on the *Developed Conditions Exhibit*.

Minimum Requirement #8: Wetlands Protection: The project does discharge to a wetland and will therefore meet the standard requirements of the 2012 COR Technical Notebook by discharging runoff in amounts that maintain and support natural hydrologic conditions.

Minimum Requirement #9 Operation and Maintenance: See Section 9. Operation and Maintenance guidelines are taken from the 2005 DOE.

Minimum Requirement Flow Chart per Section 2.4 of the 2012 COR Technical Notebook.

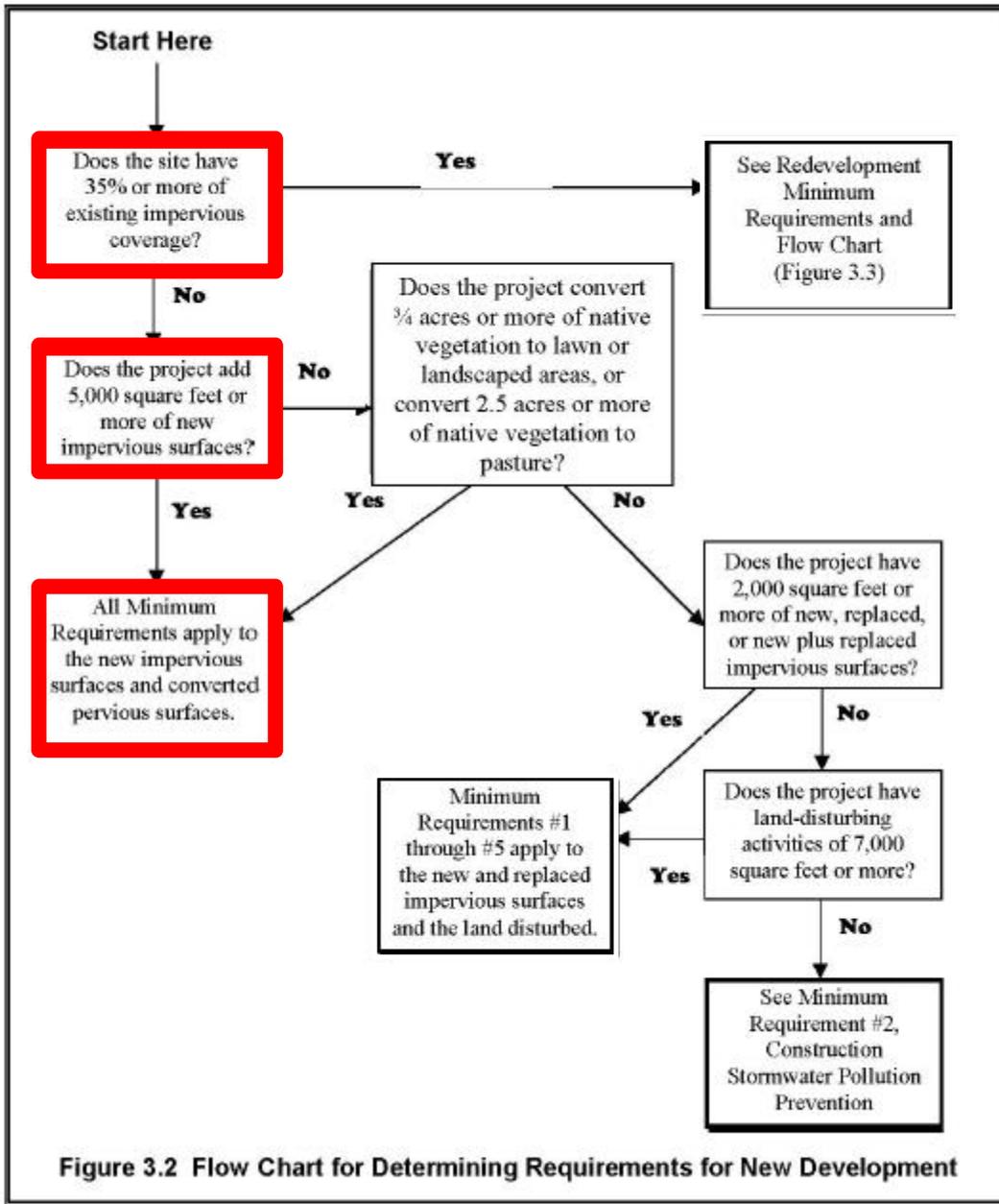


Figure 3.2 Flow Chart for Determining Requirements for New Development

## Section 3 Offsite Analysis

An offsite analysis was conducted for the East Lake Sammamish Apartments project on February 17 2016, an overcast day with some light rain and temperatures around 55° F. The offsite analysis was performed to determine the site's drainage basins and offsite drainage paths. An additional analysis was conducted on February 26, 2016, on a cloudy day with temperatures around 56° F to further explore downstream points of interest.

### TASK 1: DEFINE AND MAP THE STUDY AREA

The project is comprised of seven parcels (1318300120, 1318300125, 1318300142, 1318300144, 1318300156, 1318300164 and 1825069025). See Section 4 of this report for the *Existing Conditions Exhibit* and the *Developed Conditions Exhibit*. A Photo Exhibit and Downstream Path Exhibit are provided at the end of this section that show the study area boundaries and the observed stormwater runoff flow path from the site. The project site consists of one drainage basin which is further described in Task 3 and 4.

### TASK 2: RESOURCE REVIEW

The best available resource information was reviewed for existing or potential problems. The following is a summary of the findings from the information used in preparing this report.

- The site is underlain primarily by glacial till, as sited in the *Geotechnical Engineering Report* included in Section 6.
- The site is located within the Sammamish River Drainage Basin, part of the Lake Sammamish / Sammamish River Watershed (King County Water Features map). It is located in City of Redmond watershed 470.
- The site does not contain a stream but does contain a wetland. (COR Critical Areas Map – Wetlands)
- The site is not located in a 100-year flood plain or a FEMA floodway. (COR Critical Areas Map – Frequently Flooded Areas) The site falls within a FEMA non-printed flood map boundary.
- The site is not located in an Erosion Hazard Area. (COR Critical Areas Map – Erosion Hazard Areas)
- The site is not located in a Landslide Hazard Area. (COR Critical Areas Map –Landslide Hazard Areas)
- The site is not located in a Seismic Hazard Area. (COR Critical Areas Map –Seismic Hazard Areas)

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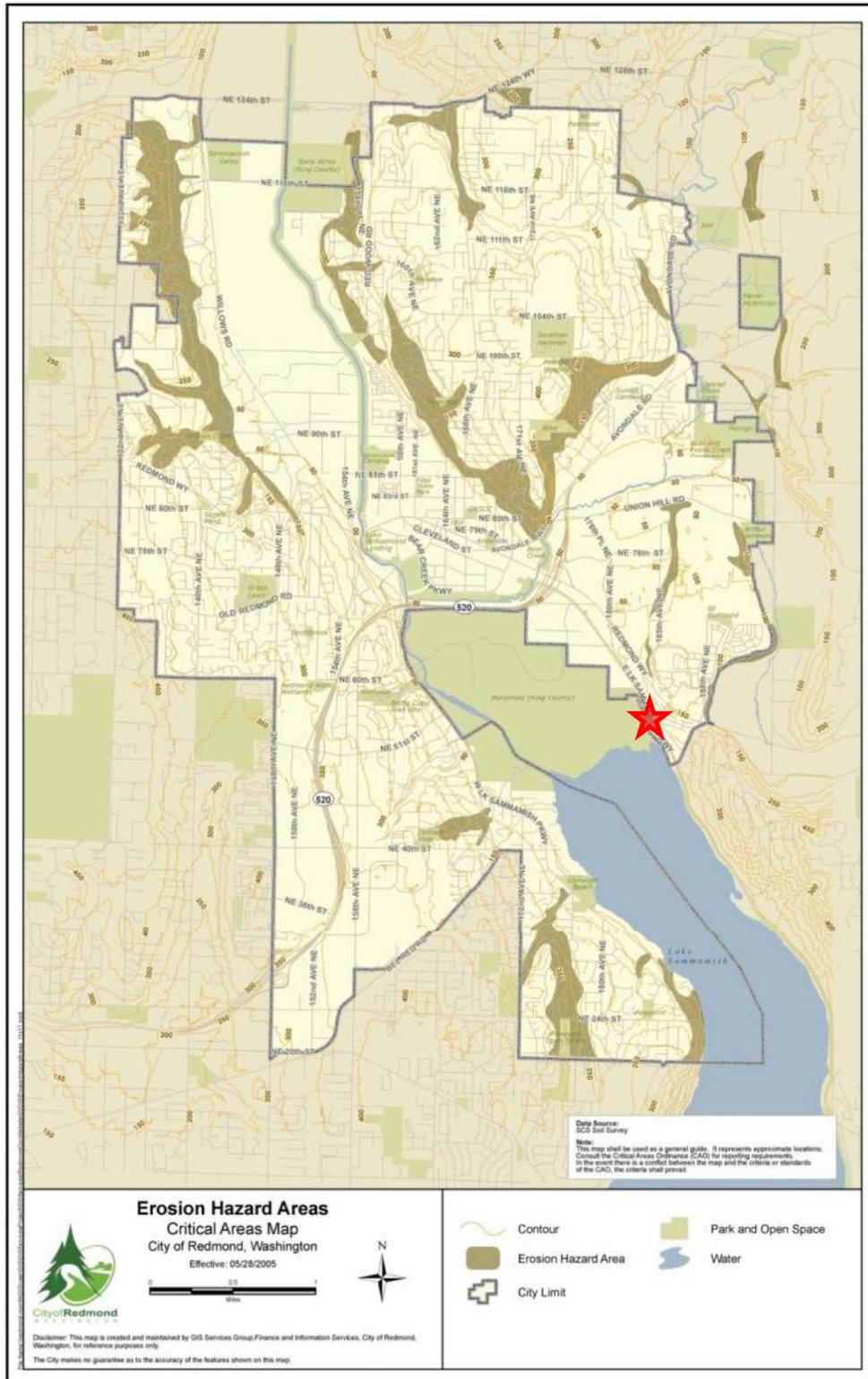
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- The site is not located in a Core Preservation Area. (COR Critical Areas Map – Fish and Wildlife Habitat Conservation Areas)
- The site contains some slopes and gradients in excess of 40 percent. (See *Existing Conditions Exhibit*)

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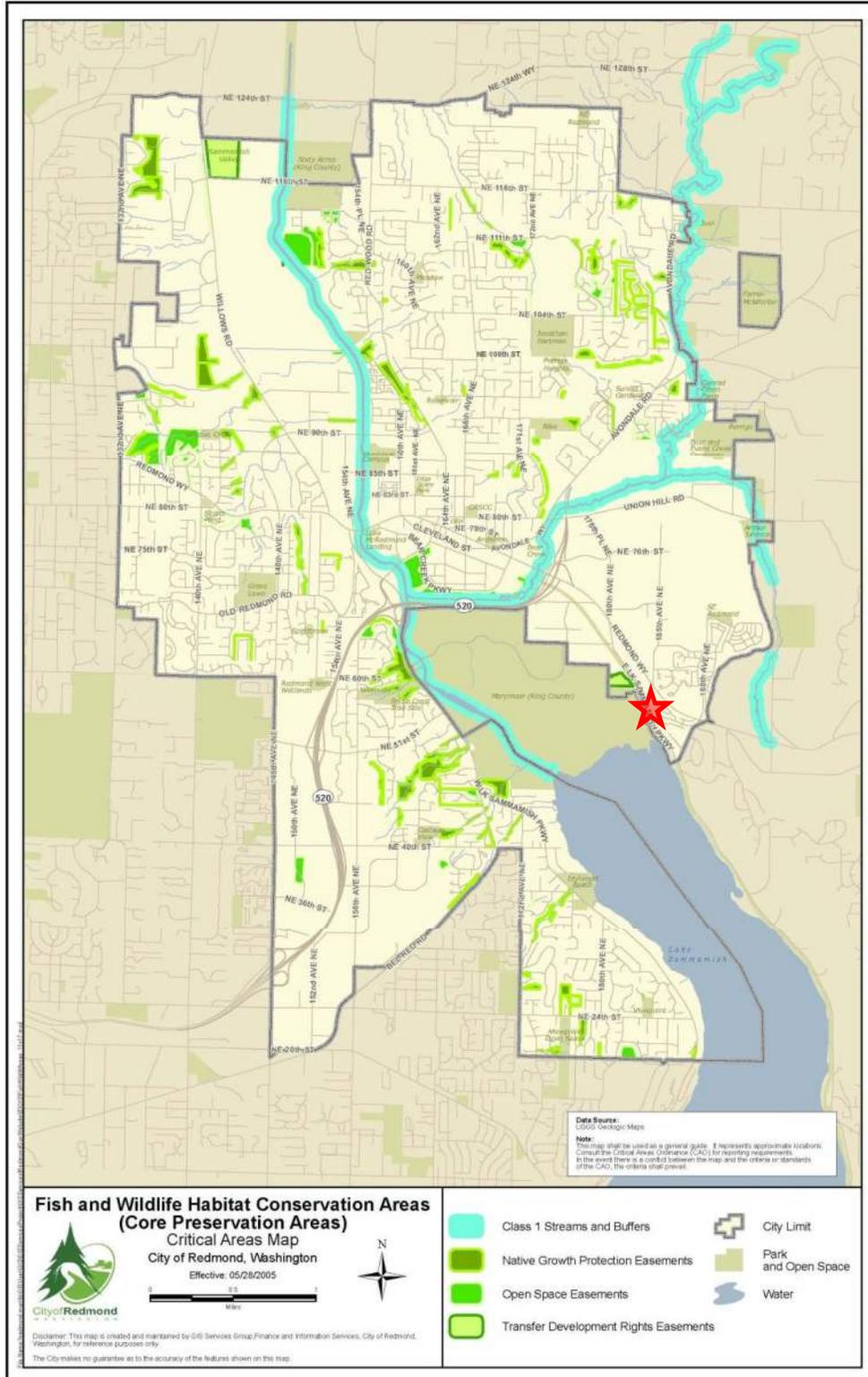
CRITICAL AREAS MAPS

COR – Erosion Hazard Areas



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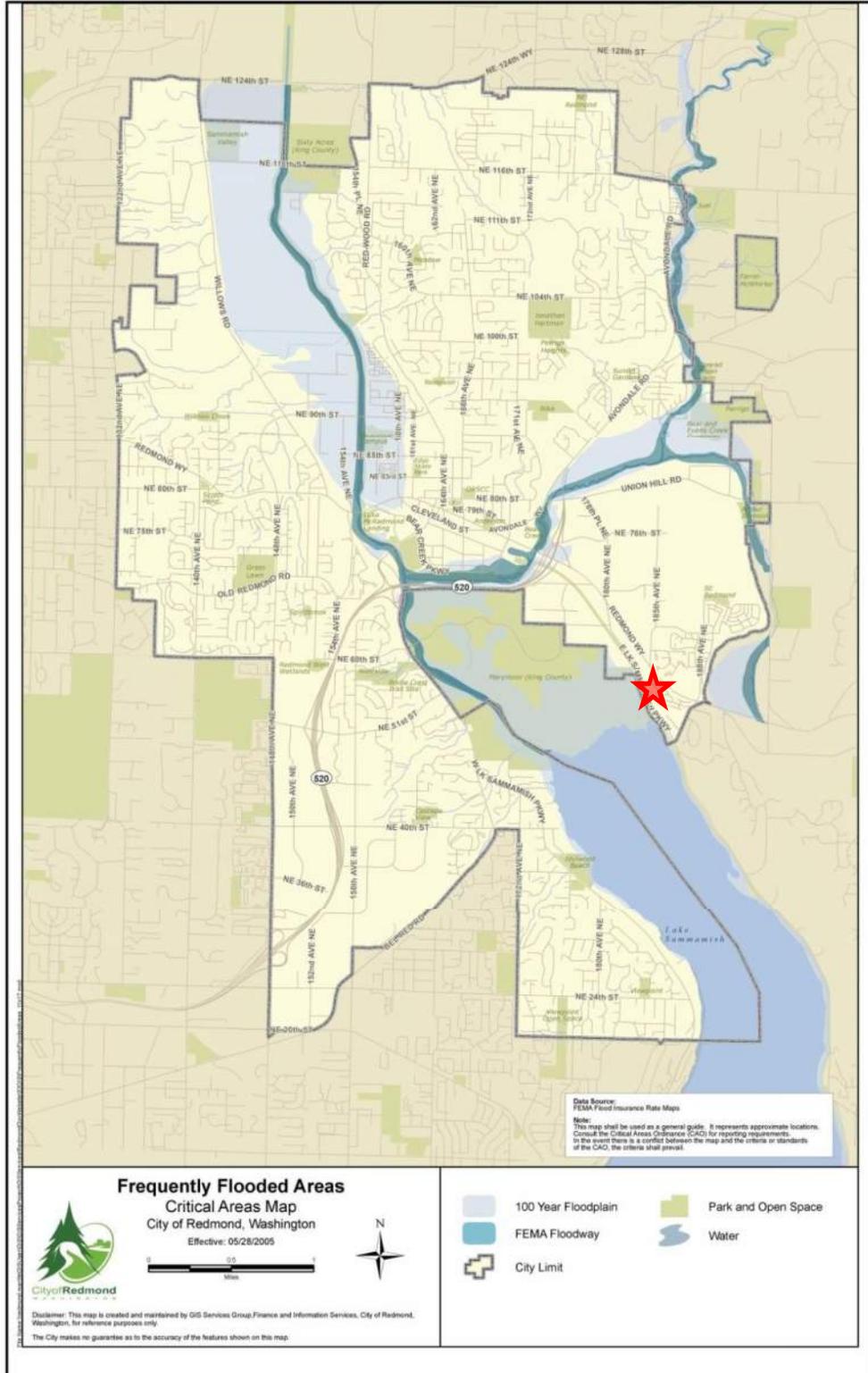
COR – Fish and Wildlife Habitat Conservation Areas (Core Preservation Areas)



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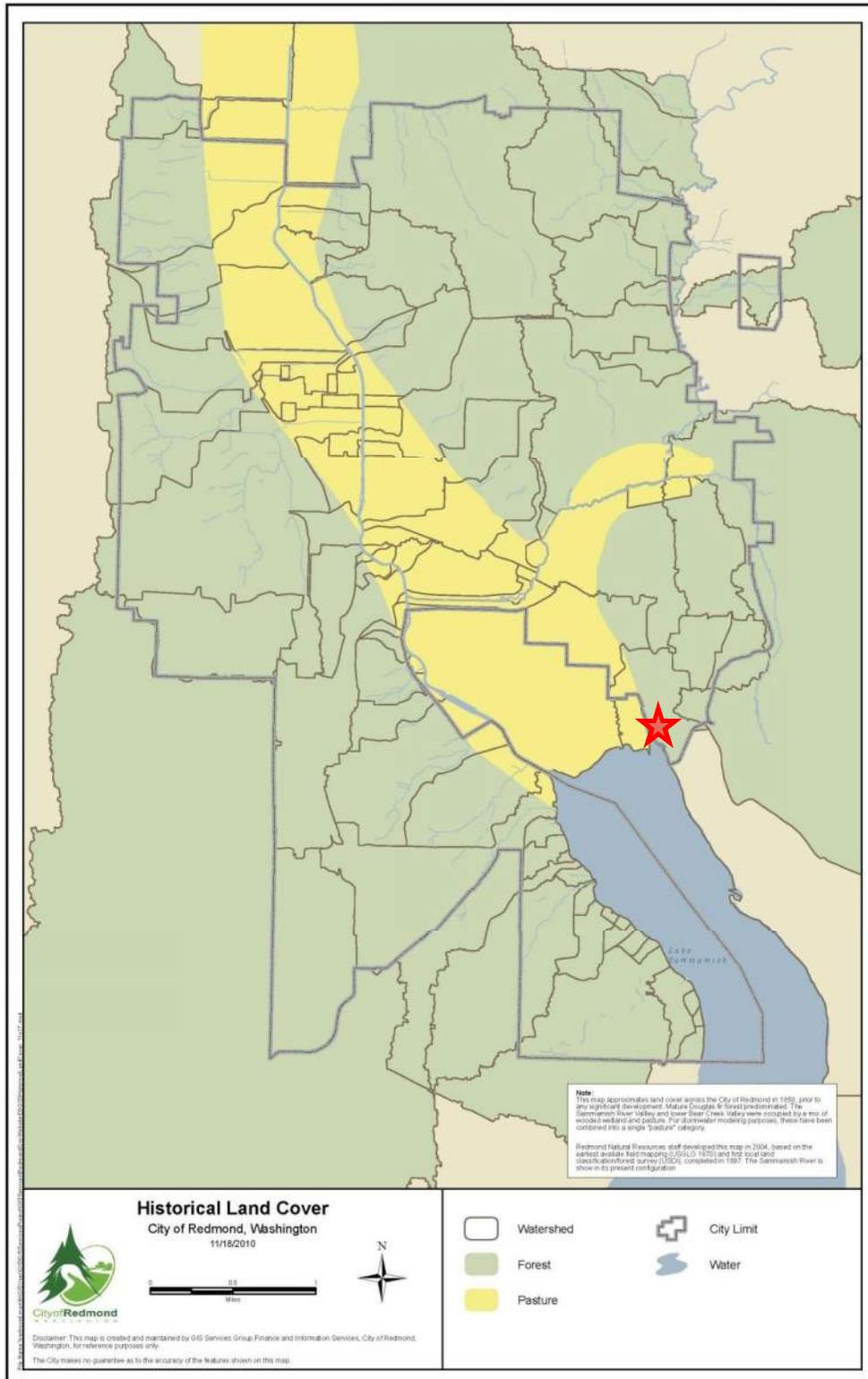
COR – Frequently Flooded Areas



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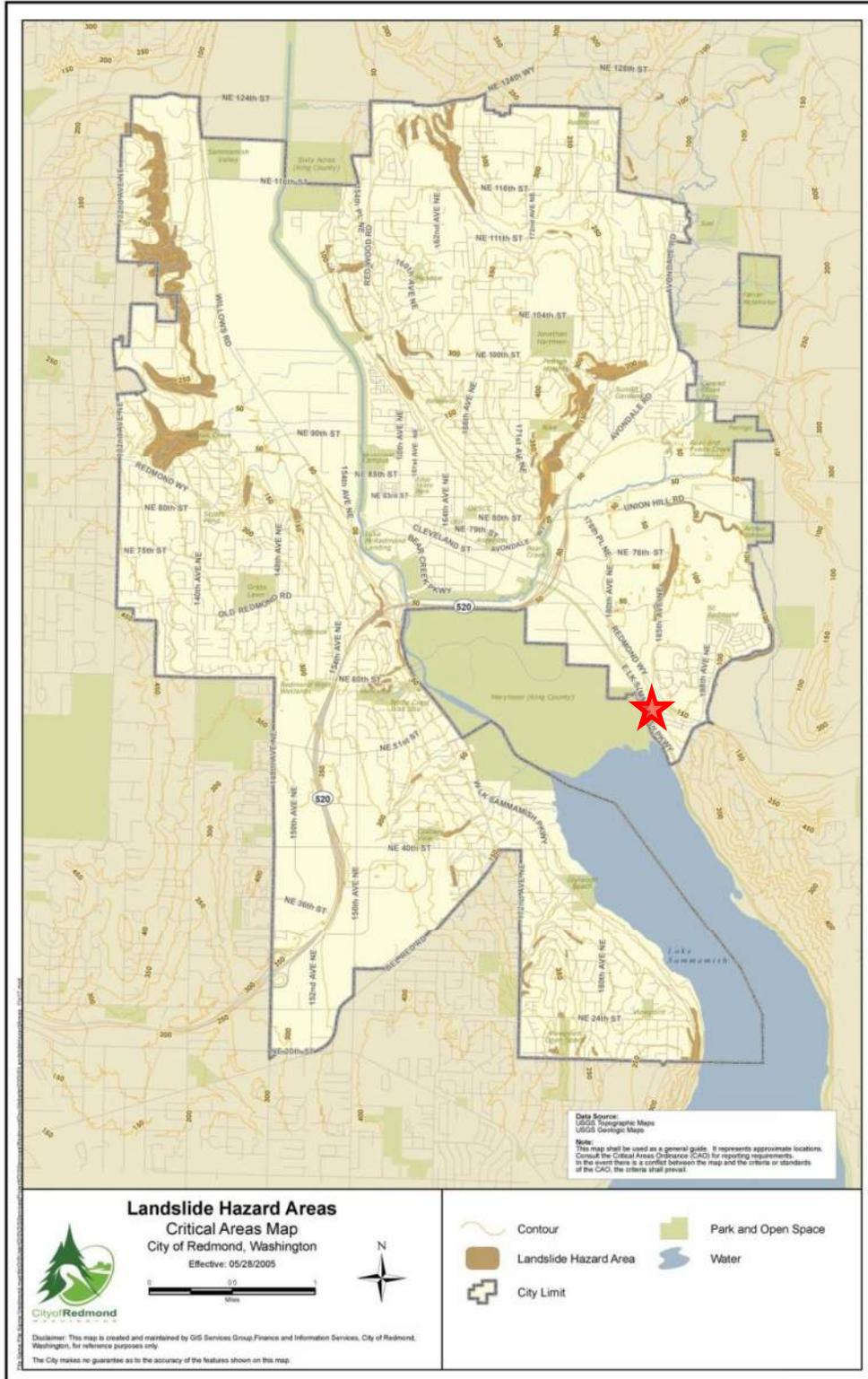
# East Lake Sammamish Apartments Storm Drainage Report

## COR – Historical Land Cover



# East Lake Sammamish Apartments Storm Drainage Report

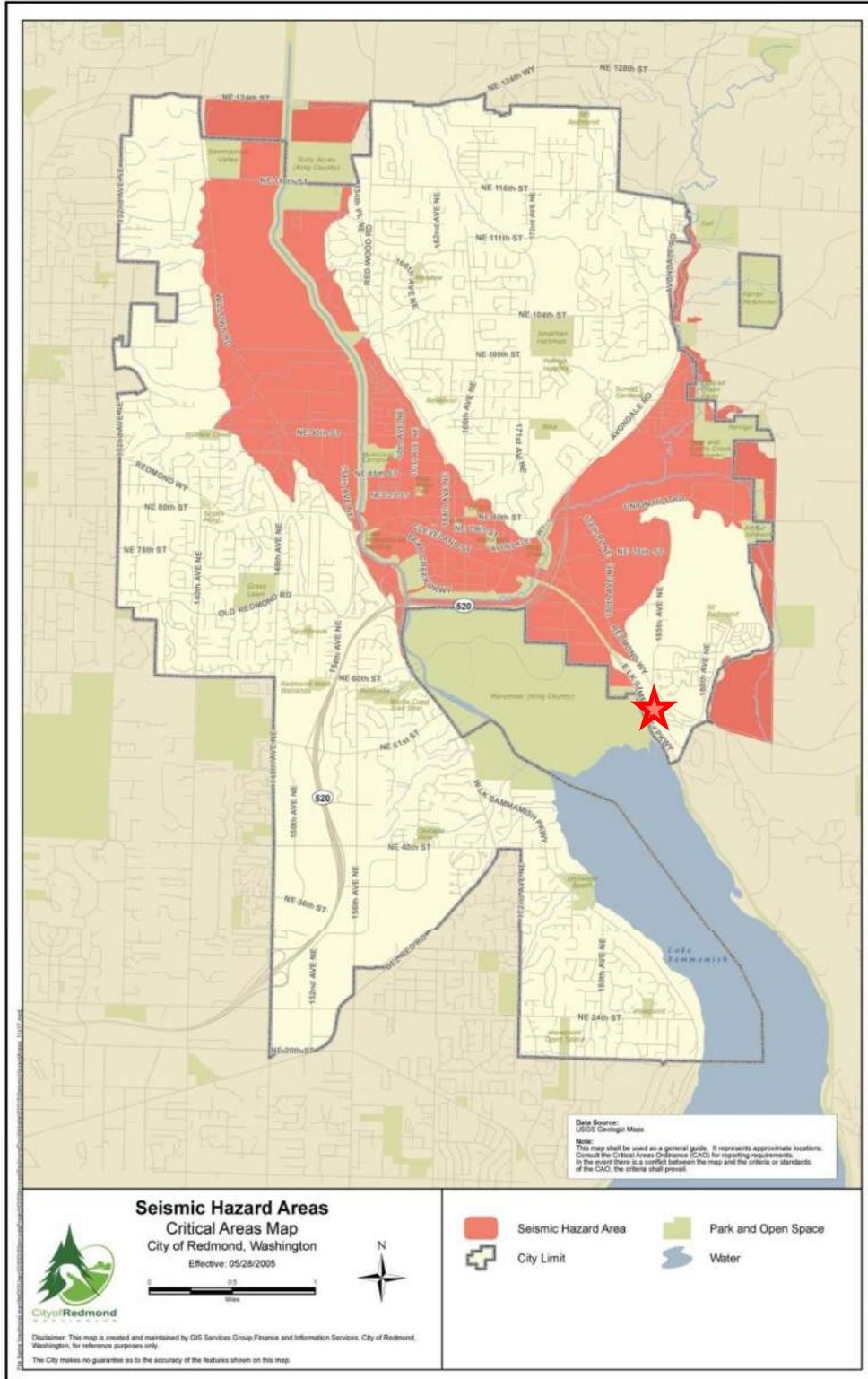
COR – Landslide Hazard Areas



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# East Lake Sammamish Apartments Storm Drainage Report

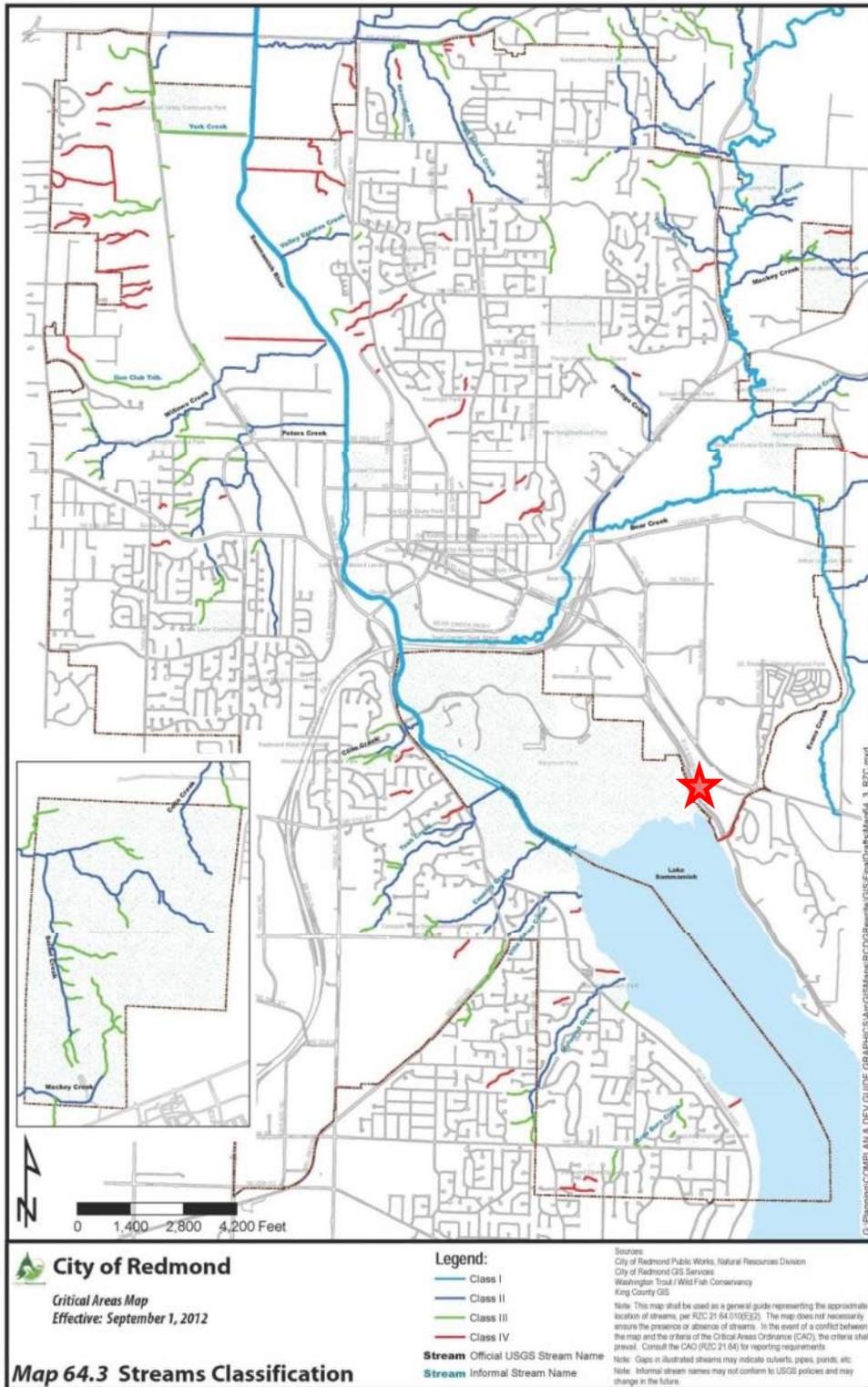
COR – Seismic Hazard Areas



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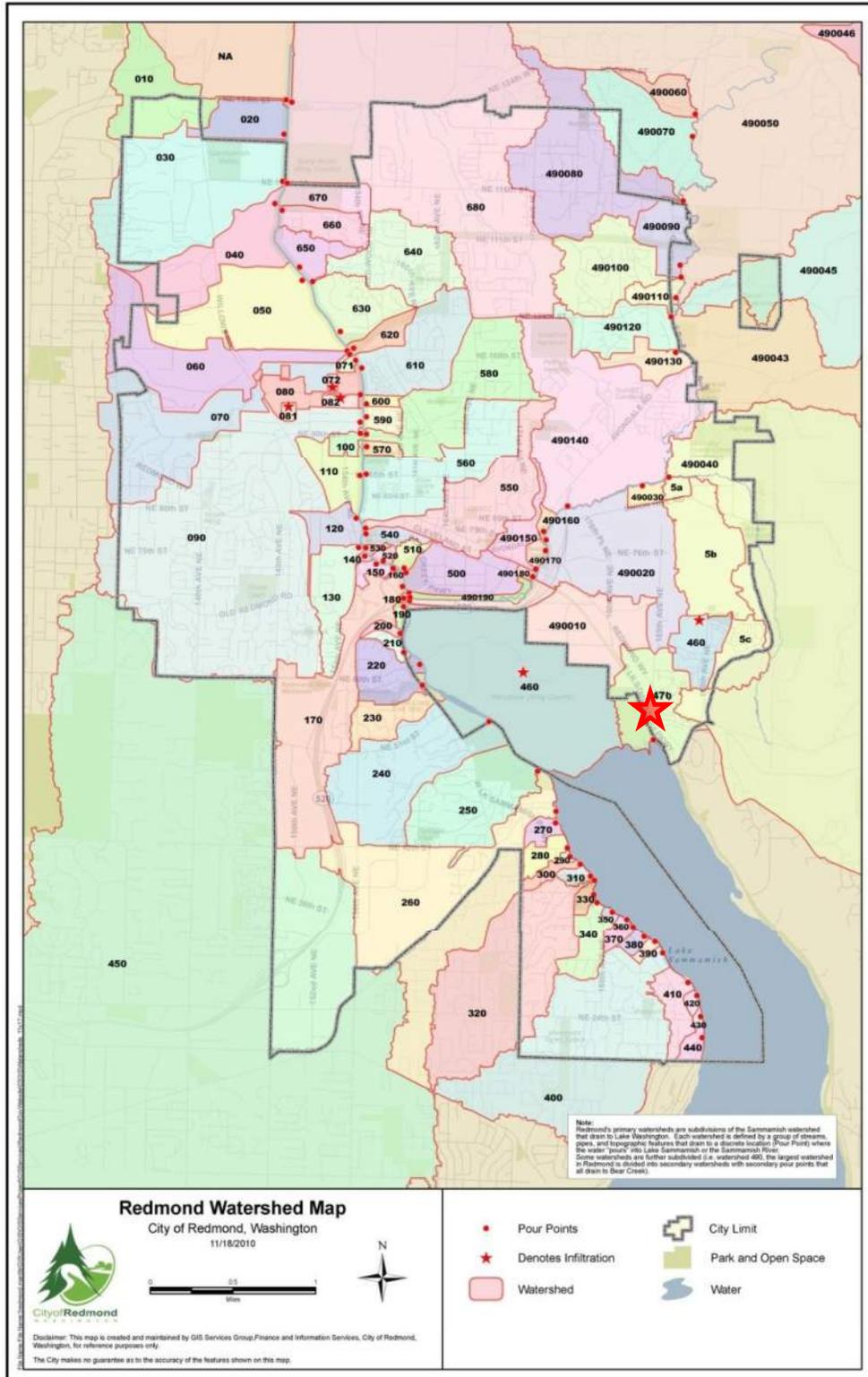
**East Lake Sammamish Apartments  
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COR – Stream Classification



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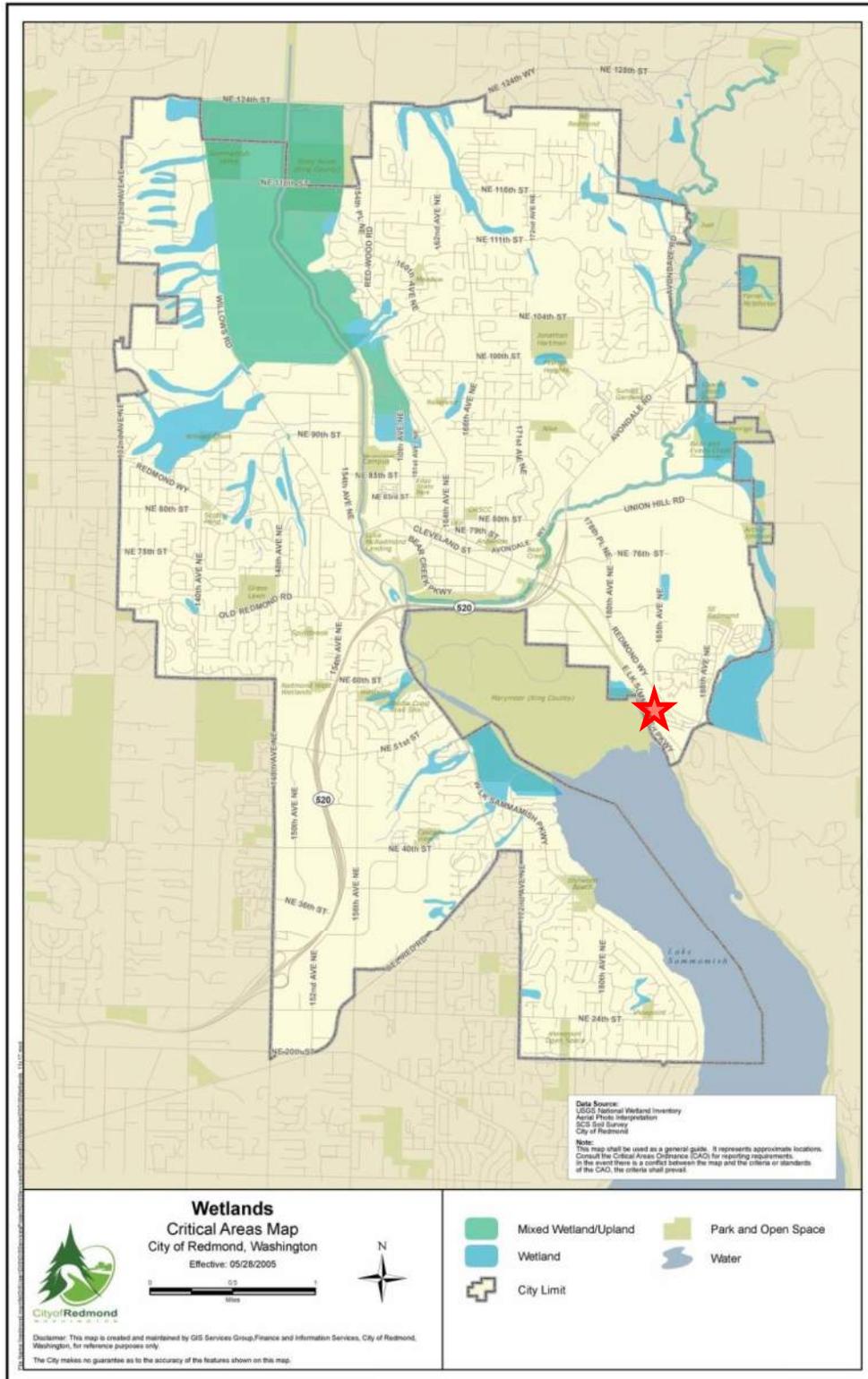
COR – Redmond Watershed Map



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# East Lake Sammamish Apartments Storm Drainage Report

COR - Wetlands



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### TASK 3: FIELD INSPECTION

Field inspections were conducted for the project at 6006 East Lake Sammamish Pkwy NE on February 17, 2016, on an overcast day with light rain and temperatures around 55° F. An additional inspection was conducted on February 26, 2016 on a cloudy day with temperatures around 56° F. Task 4 of this section contains a detailed drainage path description for the on-site basin as well as a *Downstream Path Exhibit*.

#### ON-SITE BASIN

The site consists of one drainage basin with topography that drains outward toward the western boundary of the site (E Lake Sammamish Pkwy). The project site is currently occupied by several single-family residences, two garages, various sheds, and gravel access drives and driveways. The residences are surrounded by lawn with residential landscaping dissipating into scattered trees, thick brush/blackberry bushes, and mature tree cover.

The *Geotechnical Engineering Report*, included in Section 6, prepared by GeoEngineers on June 16, 2015, indicates on-site native soils consist predominantly of medium dense to very dense silty sand with variable gravel and sand with silt (USCS: SM) typical of recent deposits and glacially consolidated soils. Groundwater was encountered at a depth range of 15 to 25 feet below current site grades.

#### UPSTREAM BASIN

The area upstream is SR 202, which has its own separate Stormwater system that prevents flow onto the site, and the development to the south. The development to the south is currently under construction with BMP measures installed (silt fence, CB inserts, etc.) and diverts approximately 2.99 acres of the upstream site to the downstream city stormwater system.

#### DOWNSTREAM DRAINAGE PATH

The project site slopes to the west toward E Lake Sammamish Pkwy and contains a single drainage path that results in stormwater collection along the grass lined roadside ditch bordering the east side of E lake Sammamish Pkwy. The stormwater is then gravity transported north along the east side of E Lake Sammamish Pkwy where is collected by the city storm system via a 12" pvc pipe that is protected with quarry spalls (Photo 2). The water is then piped north until it reaches catch basin (1820) where it is directed west across E Lake Sammamish Pkwy via an 18" ADS pipe draining into the grass/bramble lined shoulder where it ponds/infiltrates into the ground before being picked up

by the city drainage system along the east side of the Lake Sammamish Trail system. The stormwater is then conveyed south via the city storm drainage system through a series of existing type-II catch basins until it is diverted west to an existing vault with an oil/water separator on the west side of the Sammamish trail. The vault diverts the stormwater south where it outlets from a cage protected 36" conc. storm pipe (Photo 11) into the wetland and eventually into Lake Sammamish. See Task 4 for a description of the drainage system.

**REPORTED DRAINAGE PROBLEMS**

The best available resource information (King County iMap) was reviewed for existing or potential drainage problems. According to iMap stormwater maps drainage complaints related to the portion of the downstream path adjacent to the E Lake Sammamish Trail have been filed due to localized ponding during rain events. The developed project proposes to transport stormwater via a tight-lined storm system adjacent to the Lake Sammamish Trail which will relieve associated ponding concerns.

**EXISTING / POTENTIAL DRAINAGE PROBLEMS**

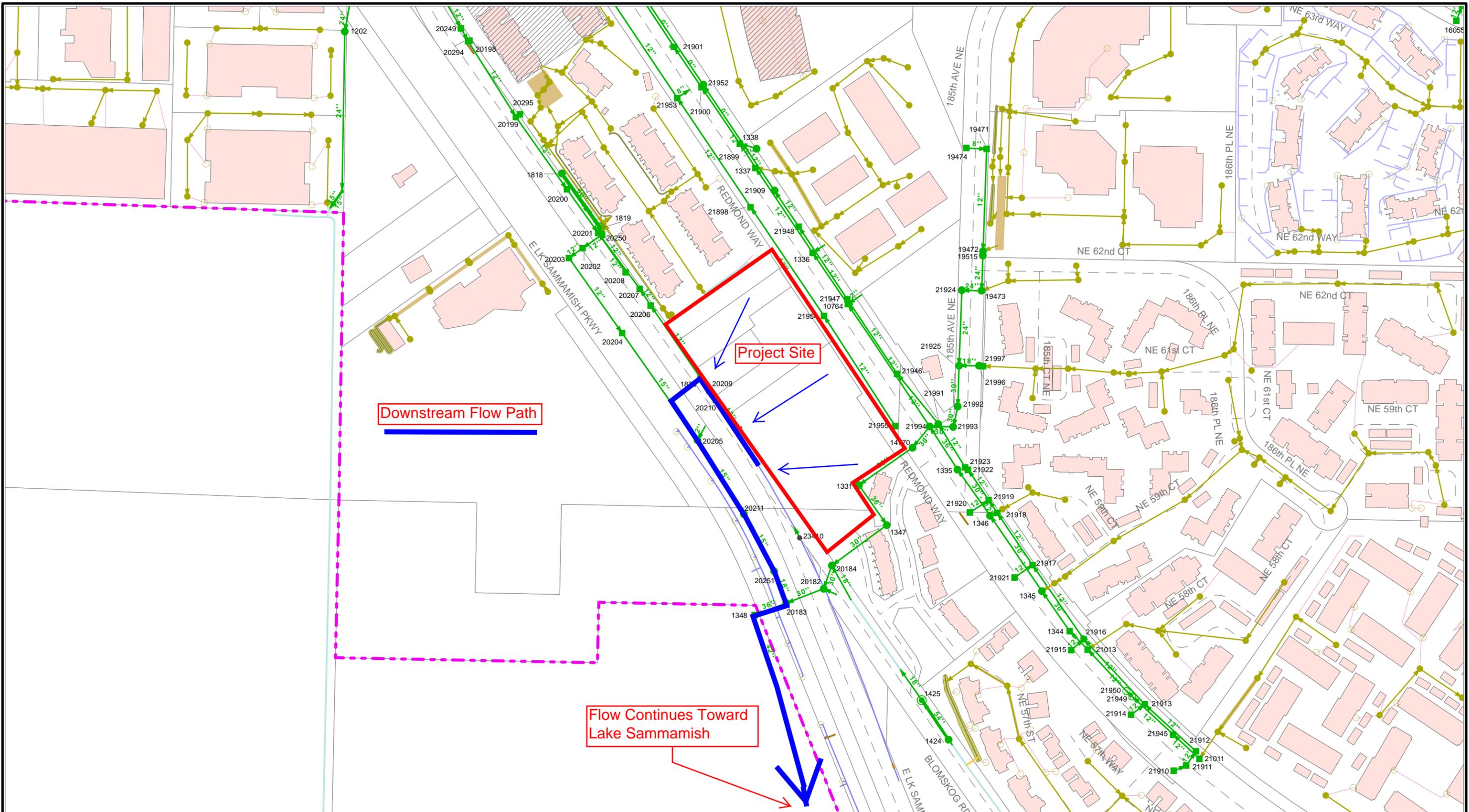
No existing or potential erosion or drainage concerns were observed during on-site inspection of the subject parcels and the downstream drainage path of runoff from the site. The ponding that was encountered along the east side of the Lake Sammamish Trail from the 18" ADS outfall will be remediated in the developed conditions by piped conveyance connecting the 18" ADS to the existing storm drainage system along the east side of the trail.

#### **TASK 4: DRAINAGE SYSTEM DESCRIPTION**

The downstream drainage path was investigated approximately ¼ mile downstream from the site. Refer to the *Downstream Drainage Exhibits* for path and photo locations referred to in this section.

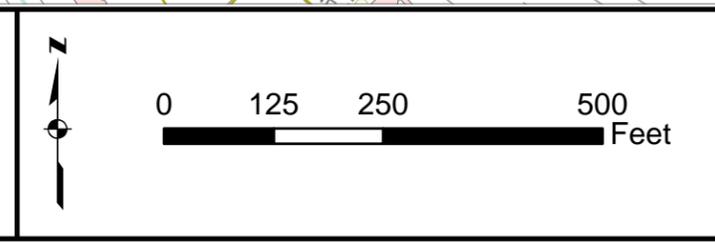
##### **DRAINAGE PATH:**

Runoff from the site sheet flows west into the grass lined ditch bordering the east side of E Lake Sammamish Pkwy NE. The stormwater runoff is then conveyed north via open channel flow approximately 60' along the east side of the E Lake Sammamish Pkwy NE where it is picked up via an existing 12" pvc pipe that is part of the city storm system and is protected by quarry spalls (Photo 2). The water is then piped approximately 120' north through a series of catch basins along the east side of E Lake Sammamish Pkwy NE until it reaches catch basin (1820) that sits in front of an existing rockery. From catch basin (1820), the water is conveyed west under E Lake Sammamish Pkwy NE through an 18" ADS pipe approximately 40' where it outfalls into the grass/bramble lined roadside shoulder and ponds along the east side of the Lake Sammamish Trail (Photo 5). This 18" ADS pipe will be connected to the existing city drainage system along the east side of the Lake Sammamish Trail in the developed condition. The ponded stormwater is then picked up by the storm system along the east side of the trail and is conveyed via a series of type-II catch basins approximately 1100'-1200' south where it travels through a vault with an oil/water separator (Photo 10). Water is then conveyed south from the vault where it outfalls via a 36" conc. pipe with debris cage into the existing wetland (Photo 11). The water is eventually transported through the wetland where it drains into Lake Sammamish. This concludes the ¼ mile downstream drainage path.



# STORMWATER SYSTEM MAP

LEGEND			
Redmond MH	●	Valve	⊗
Redmond CB	■	Cleanout	○
Redmond MH CS	⊙	Redmond Pipe	→
Redmond CB CS	⊠	Non-Redmond Pipe	→
Redmond Unknown	⊗	Non-Redmond Culvert	→
Redmond Inlet/Area Drain	●	Redmond Culvert	→
Non-Redmond Chambers	●	SW SideSewer	→
Redmond Underdrain	—	Redmond Vault	■
Non-Redmond Underdrain	—	Non-Redmond Vault	■
Redmond Bioswale	—	Redmond Bioswale	—
Non-Redmond Bioswale	—	Non-Redmond Bioswale	—
Pump	⊕	City Limits	⊠
City Limits	⊠	Ponds	■
Ponds	■	Streams	—
Streams	—	Contours	—



DATE **3/8/2016**

FOR INFORMATION ONLY  
 THIS MAP AND RELATED DATA IS INTENDED TO ASSIST IN FIELD LOCATIONS AND IS NOT GUARANTEED TO BE ACCURATE. FIELD VERIFICATION IS REQUIRED FOR ALL DEVELOPMENT OR CONSTRUCTION PLANS.

Downstream Photo Exhibit: From proposed project site to outfall into existing wetland.



**Photo 1:** Grass lined drainage ditch bordering the west side of the project site facing south along E Lake Sammamish Pkwy NE.



**Photo 2:** Water flows north along the grass lined ditch where it is picked up by the 12" pvc storm pipe shown. Pipe is protected with quarry spalls and conveys water north.

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**Photo 3:** Water is conveyed north through the 12" pvc pipe and a series of catch basins until it reaches catch basin (1820) shown. Water is then conveyed west across E Lake Sammamish Pkwy.



**Photo 4:** Runoff is conveyed west across E Lake Sammamish Pkwy via an 18" ADS pipe that outfalls into the grass/bramble lined shoulder.



**Photo 5:** Water drains from the 18" ADS pipe and ponds along the east side of the Lake Sammamish Trail.



**Photo 6:** Water is then gathered by catch basin (20205) along the east side of the Lake Sammamish Trail and conveyed south.



**Photo 7:** Water is conveyed via 12" pipe approximately 200' to the next type-II catch basin (20211) shown.



**Photo 8:** Water continues to flow south via the city storm system along the east side of the Sammamish trail approximately 150' to another Type-II catch basin (20251) shown.



**Photo 9:** Water is conveyed via the city storm system south approximately 80' to the Type-II catch basin (20183) where it diverts west toward an existing vault with an oil/water separator.



**Photo 10:** Water flows into the vault with an oil/water separate and is directed south toward the existing wetland.



**Photo 11:** Water outfalls from the city storm system via a 36" concrete pipe into the existing wetland.



**Photo 12:** Water drains south from the wetland toward Lake Sammamish

## Section 4 PERMANENT STORMWATER CONTROL PLAN

The permanent stormwater control plan includes both flow control and water quality treatment facilities designed and sized according to the 2012 COR Technical Notebook and the adopted 2005 Stormwater Management Manual for Western Washington.

On-site flows will be collected by the proposed conveyance system and conveyed via pipe flow to the two detention vaults for flow control. A small area of the site (shown on the *Developed Conditions* exhibit) will bypass the West detention vault due to elevation constraints- the vaults will be sized to account for this by-pass area. Mitigated flows from the two detention vaults will combine downstream of the vaults in a junction structure and then enter the Modular Wetland System for enhanced and phosphorous water quality treatment before flowing out into the city system located within East Lake Sammamish Parkway. Flows will then be conveyed in the existing City storm system under the street to the southwest side of E Lake Sammamish Pkwy into a new catchbasin where flows will continue south in a new 12" pipe to another new catchbasin that will be installed at the stub of an existing stormdrain line that flows out into wetlands within Marymoor Park.

### FLOW CONTROL ANALYSIS AND DESIGN

The project basin was modeled using the Western Washington Hydrology Model, Version 2012 (WWHM 2012), a continuous rainfall simulation program recognized by the Washington State Department of Ecology (DOE). Soils were modeled as Hydrologic Soil Group C (per the geotech report) with a regional scale factor of 1.0 (SeaTac).

### EXISTING CONDITIONS AREA TOTALS

The project basin totals 2.66 acres along with 0.36 acres of improvements in the City right-of-way. In the existing conditions, the contributing developable area of 2.66 acres and 0.36 acres of right-of-way improvements were modeled as forested land cover. All area currently sheet flows out into East Lake Sammamish Pkwy where it is collected by the existing city storm drain system. The area within the project basin that will bypass the detention vault in the developed conditions due to proposed grades, 0.07 acres, is also modeled as forested land cover.

See *Existing Conditions Exhibit* in the following pages.

The following tables summarize the areas in the existing conditions:

**EXISTING CONDITIONS ONSITE TRIBUTARY BASIN**

Pervious

Forest	2.59 ac.
<i>Pervious Total</i>	<i>2.59 ac.</i>

Impervious

<i>Impervious Total</i>	<i>0.00 ac.</i>
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<b><i>Tributary Basin Total</i></b>	<b><i>2.59 ac.</i></b>
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**EXISTING CONDITIONS ONSITE BYPASS BASIN**

Pervious

Forest	0.07 ac.
<i>Pervious Total</i>	<i>0.07 ac.</i>

Impervious

<i>Impervious Total</i>	<i>0.00 ac.</i>
-------------------------	-----------------

<b><i>Bypass Basin Total</i></b>	<b><i>0.07 ac.</i></b>
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**EXISTING CONDITIONS PROJECT BASIN**

<i>Pervious Total</i>	<i>2.66 ac.</i>
<i>Impervious Total</i>	<i>0.00 ac.</i>

<b><i>Project Total</i></b>	<b><i>2.66 ac.</i></b>
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**EXISTING CONDITIONS CITY RIGHT-OF-WAY**

Pervious

Forest	0.37 ac.
<i>Pervious Total</i>	<i>0.37 ac.</i>

Impervious

<i>Impervious Total</i>	<i>0.00 ac.</i>
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<b><i>City Right-Of-Way Total</i></b>	<b><i>0.37 ac.</i></b>
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*Impervious Total* 0.39 ac.  
***Tributary Basin Total*** 0.75 ac.

**DEVELOPED CONDITIONS ONSITE BYPASS BASIN**

Pervious

Lawn 0.05 ac.  
*Pervious Total* 0.05 ac.

Impervious

Road 0.01 ac.  
Sidewalk 0.001 ac.  
*Impervious Total* 0.01 ac.

***Bypass Basin Total*** 0.07 ac.

**DEVELOPED CONDITIONS ONSITE PROJECT BASIN**

*Pervious Total* 0.97 ac.  
*Impervious Total* 1.69 ac.

***Project Total*** 2.66 ac.

**DEVELOPED CONDITIONS CITY RIGHT-OF-WAY**

Pervious

Lawn 0.18 ac.  
*Pervious Total* 0.18 ac.

Impervious

Road 0.09ac  
Sidewalk 0.10 ac  
*Impervious Total* 0.19 ac.

***City Right-Of-Way Total*** 0.37 ac.

According to The Standard Flow Control Requirement in section 2.5.7 of the 2012 COR Technical Notebook, the development is required to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The detention vault passes these requirements. The vault will include 6-inches of sediment storage along the bottom, and at least 6-inches of freeboard above the Maximum Water Surface (MWS). The MWS in the East Vault is actually 0.02' higher than the riser within the

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vault so the vault was deepened to 10.05' to maintain the minimum allowable freeboard, while still allowing for acceptable pipe slopes downstream of the vault. The West Vault has a MWS that falls less than 0.01' below the top of the riser and so the depth remains 7.0' Please see the WWHM2012 Project Report included on the following pages.

**DETENTION SUMMARY:**

West Vault Storage Volume Required	12,474 CF (108' X 16.5' X 7')
West Vault Storage Volume Provided	12,474 CF (108' X 16.5' X 7')

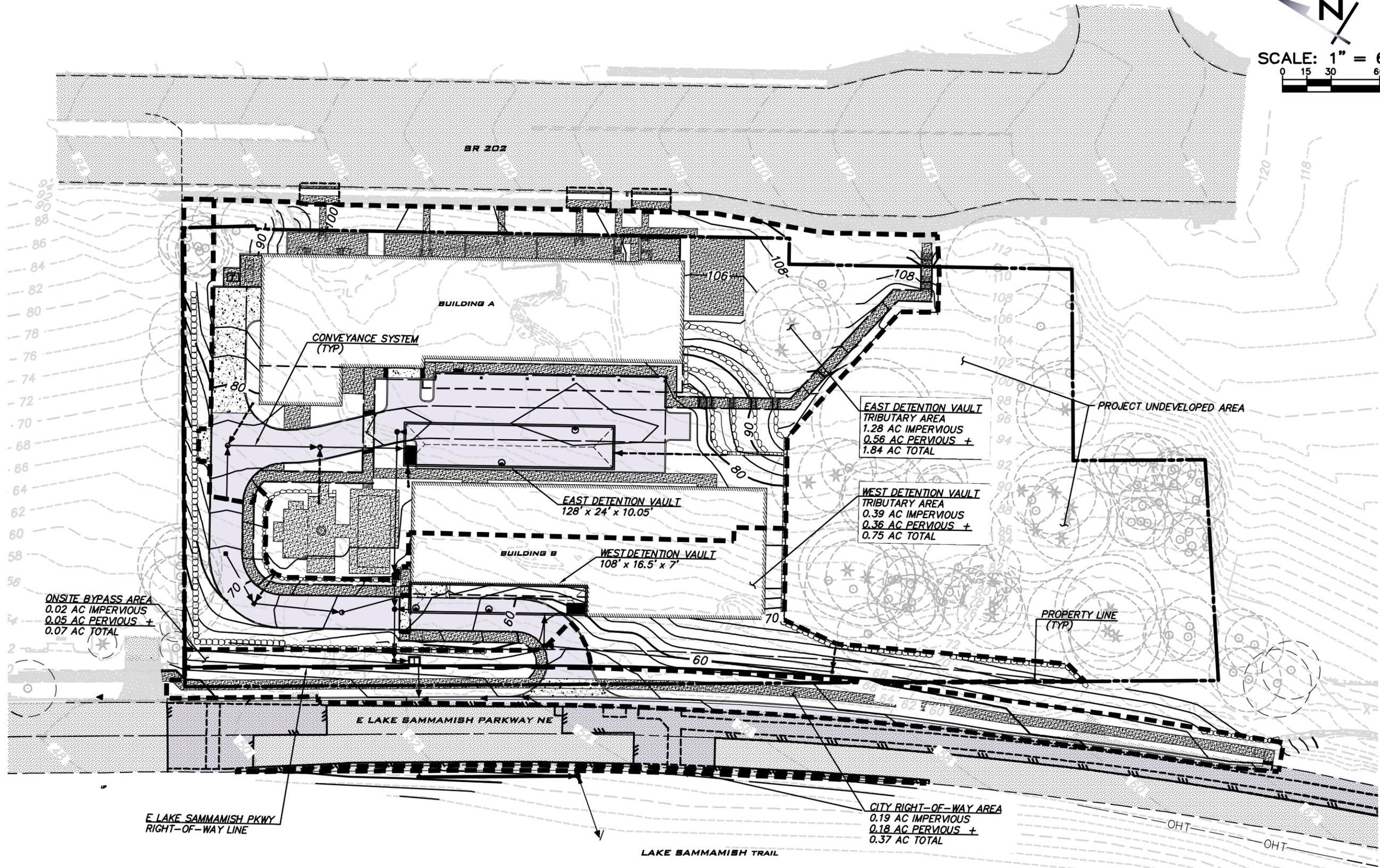
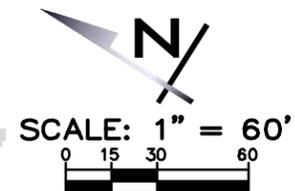
East Vault Storage Volume Required	30,874 CF (128' X 24' X 10.05')
East Vault Storage Volume Provided	30,874 CF (128' X 24' X 10.05')

# DEVELOPED CONDITIONS EXHIBIT



**DEVELOPED CONDITIONS  
EAST LAKE SAMMAMISH APARTMENTS  
TECHNICAL INFORMATION REPORT**

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Sep 12, 2016 - 3:19pm - User cmiller  
 E:\Projects\15188\Dwg\Exhibits\15188 DC-two vaults.dwg

SCALE	AS NOTED
PROJECT MANAGER	CHRISTOPHER MILLER, PE
DESIGNED BY	JON L. KOEPFGEN, PE
DRAWN BY	JON L. KOEPFGEN, PE
PLOT DATE	September 12, 2016
JOB NUMBER:	15-188
FIGURE:	DC

**East Lake Sammamish Apartments  
Storm Drainage Report**

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**WWHM2012  
PROJECT REPORT**

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**Project Name:** 2016-07-26 ELSP Two vaults  
**Site Name:** East Lake Sammamish Pkwy  
**Site Address:** 6006 East Lake Sammamish Pkwy NE  
**City** : Redmond, WA  
**Report Date:** 8/30/2016  
**Gage** : Seatac  
**Data Start** : 1948/10/01  
**Data End** : 2009/09/30  
**Precip Scale:** 1.00  
**Version** : 2015/05/26

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**Low Flow Threshold for POC 1** : 50 Percent of the 2 Year

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**High Flow Threshold for POC 1:** 50 year

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**PREDEVELOPED LAND USE**

**Name** : Basin 1  
**Bypass:** No

**GroundWater:** No

<u>Pervious Land Use</u>	<u>Acres</u>
C, Forest, Mod	2.6619

<b>Pervious Total</b>	<b>2.6619</b>
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<u>Impervious Land Use</u>	<u>Acres</u>
<b>Impervious Total</b>	<b>0</b>

<b>Basin Total</b>	<b>2.6619</b>
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<b>Element Flows To:</b>		
Surface	Interflow	Groundwater

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**MITIGATED LAND USE**

**Name** : West Bypass  
**Bypass:** Yes

**GroundWater:** No

<u>Pervious Land Use</u>	<u>Acres</u>
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C, Lawn, Mod	.0527
<b>Pervious Total</b>	<b>0.0527</b>
<b><u>Impervious Land Use</u></b>	<b><u>Acres</u></b>
ROADS MOD	0.0125
SIDEWALKS MOD	0.0016
<b>Impervious Total</b>	<b>0.0141</b>
<b>Basin Total</b>	<b>0.0668</b>

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<b>Element Flows To:</b>		
<b>Surface</b>	<b>Interflow</b>	<b>Groundwater</b>
Channel 1	Channel 1	

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**Name** : West Onsite  
**Bypass:** No

**GroundWater:** No

<b><u>Pervious Land Use</u></b>	<b><u>Acres</u></b>
C, Lawn, Flat	.3595
<b>Pervious Total</b>	<b>0.3595</b>
<b><u>Impervious Land Use</u></b>	<b><u>Acres</u></b>
ROADS MOD	0.128
ROOF TOPS FLAT	0.231
SIDEWALKS FLAT	0.0338
<b>Impervious Total</b>	<b>0.3928</b>
<b>Basin Total</b>	<b>0.7523</b>

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<b>Element Flows To:</b>		
<b>Surface</b>	<b>Interflow</b>	<b>Groundwater</b>
West Vault	West Vault	

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**Name** : West Vault  
**Width** : 16.5 ft.  
**Length** : 108 ft.  
**Depth**: 7 ft.  
**Discharge Structure**  
**Riser Height**: 6 ft.  
**Riser Diameter**: 18 in.  
**Orifice 1 Diameter**: 0.4375 in. **Elevation**: 0 ft.

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**Orifice 2 Diameter:** 0.625 in. **Elevation:** 3.932 ft.

**Orifice 3 Diameter:** 0.5 in. **Elevation:** 4.43 ft.

**Element Flows To:**

**Outlet 1**                      **Outlet 2**  
Channel 1

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**Vault Hydraulic Table**

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.040	0.000	0.000	0.000
0.0778	0.040	0.003	0.001	0.000
0.1556	0.040	0.006	0.002	0.000
0.2333	0.040	0.009	0.002	0.000
0.3111	0.040	0.012	0.002	0.000
0.3889	0.040	0.015	0.003	0.000
0.4667	0.040	0.019	0.003	0.000
0.5444	0.040	0.022	0.003	0.000
0.6222	0.040	0.025	0.004	0.000
0.7000	0.040	0.028	0.004	0.000
0.7778	0.040	0.031	0.004	0.000
0.8556	0.040	0.035	0.004	0.000
0.9333	0.040	0.038	0.004	0.000
1.0111	0.040	0.041	0.005	0.000
1.0889	0.040	0.044	0.005	0.000
1.1667	0.040	0.047	0.005	0.000
1.2444	0.040	0.050	0.005	0.000
1.3222	0.040	0.054	0.005	0.000
1.4000	0.040	0.057	0.005	0.000
1.4778	0.040	0.060	0.006	0.000
1.5556	0.040	0.063	0.006	0.000
1.6333	0.040	0.066	0.006	0.000
1.7111	0.040	0.070	0.006	0.000
1.7889	0.040	0.073	0.006	0.000
1.8667	0.040	0.076	0.006	0.000
1.9444	0.040	0.079	0.007	0.000
2.0222	0.040	0.082	0.007	0.000
2.1000	0.040	0.085	0.007	0.000
2.1778	0.040	0.089	0.007	0.000
2.2556	0.040	0.092	0.007	0.000
2.3333	0.040	0.095	0.007	0.000
2.4111	0.040	0.098	0.007	0.000
2.4889	0.040	0.101	0.007	0.000
2.5667	0.040	0.105	0.008	0.000
2.6444	0.040	0.108	0.008	0.000
2.7222	0.040	0.111	0.008	0.000
2.8000	0.040	0.114	0.008	0.000
2.8778	0.040	0.117	0.008	0.000
2.9556	0.040	0.120	0.008	0.000
3.0333	0.040	0.124	0.008	0.000
3.1111	0.040	0.127	0.008	0.000
3.1889	0.040	0.130	0.009	0.000
3.2667	0.040	0.133	0.009	0.000
3.3444	0.040	0.136	0.009	0.000
3.4222	0.040	0.140	0.009	0.000

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3.5000	0.040	0.143	0.009	0.000
3.5778	0.040	0.146	0.009	0.000
3.6556	0.040	0.149	0.009	0.000
3.7333	0.040	0.152	0.009	0.000
3.8111	0.040	0.155	0.009	0.000
3.8889	0.040	0.159	0.009	0.000
3.9667	0.040	0.162	0.011	0.000
4.0444	0.040	0.165	0.013	0.000
4.1222	0.040	0.168	0.014	0.000
4.2000	0.040	0.171	0.015	0.000
4.2778	0.040	0.175	0.016	0.000
4.3556	0.040	0.178	0.017	0.000
4.4333	0.040	0.181	0.018	0.000
4.5111	0.040	0.184	0.020	0.000
4.5889	0.040	0.187	0.021	0.000
4.6667	0.040	0.190	0.022	0.000
4.7444	0.040	0.194	0.023	0.000
4.8222	0.040	0.197	0.024	0.000
4.9000	0.040	0.200	0.025	0.000
4.9778	0.040	0.203	0.026	0.000
5.0556	0.040	0.206	0.027	0.000
5.1333	0.040	0.210	0.028	0.000
5.2111	0.040	0.213	0.028	0.000
5.2889	0.040	0.216	0.029	0.000
5.3667	0.040	0.219	0.030	0.000
5.4444	0.040	0.222	0.031	0.000
5.5222	0.040	0.225	0.031	0.000
5.6000	0.040	0.229	0.032	0.000
5.6778	0.040	0.232	0.032	0.000
5.7556	0.040	0.235	0.033	0.000
5.8333	0.040	0.238	0.034	0.000
5.9111	0.040	0.241	0.034	0.000
5.9889	0.040	0.245	0.035	0.000
6.0667	0.040	0.248	0.287	0.000
6.1444	0.040	0.251	0.838	0.000
6.2222	0.040	0.254	1.567	0.000
6.3000	0.040	0.257	2.437	0.000
6.3778	0.040	0.260	3.429	0.000
6.4556	0.040	0.264	4.530	0.000
6.5333	0.040	0.267	5.728	0.000
6.6111	0.040	0.270	7.018	0.000
6.6889	0.040	0.273	8.392	0.000
6.7667	0.040	0.276	9.846	0.000
6.8444	0.040	0.280	11.37	0.000
6.9222	0.040	0.283	12.97	0.000
7.0000	0.040	0.286	14.65	0.000
7.0778	0.040	0.289	16.38	0.000
7.1556	0.000	0.000	18.18	0.000

**Name** : East Onsite  
**Bypass:** No

**GroundWater:** No

**Pervious Land Use**                      **Acres**  
**C, Lawn, Flat**                                      **.5646**



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1.7778	0.070	0.125	0.013	0.000
1.8889	0.070	0.133	0.014	0.000
2.0000	0.070	0.141	0.014	0.000
2.1111	0.070	0.148	0.014	0.000
2.2222	0.070	0.156	0.015	0.000
2.3333	0.070	0.164	0.015	0.000
2.4444	0.070	0.172	0.016	0.000
2.5556	0.070	0.180	0.016	0.000
2.6667	0.070	0.188	0.016	0.000
2.7778	0.070	0.195	0.017	0.000
2.8889	0.070	0.203	0.017	0.000
3.0000	0.070	0.211	0.017	0.000
3.1111	0.070	0.219	0.018	0.000
3.2222	0.070	0.227	0.018	0.000
3.3333	0.070	0.235	0.018	0.000
3.4444	0.070	0.242	0.019	0.000
3.5556	0.070	0.250	0.019	0.000
3.6667	0.070	0.258	0.019	0.000
3.7778	0.070	0.266	0.019	0.000
3.8889	0.070	0.274	0.020	0.000
4.0000	0.070	0.282	0.020	0.000
4.1111	0.070	0.289	0.020	0.000
4.2222	0.070	0.297	0.021	0.000
4.3333	0.070	0.305	0.021	0.000
4.4444	0.070	0.313	0.021	0.000
4.5556	0.070	0.321	0.021	0.000
4.6667	0.070	0.329	0.022	0.000
4.7778	0.070	0.336	0.022	0.000
4.8889	0.070	0.344	0.022	0.000
5.0000	0.070	0.352	0.022	0.000
5.1111	0.070	0.360	0.023	0.000
5.2222	0.070	0.368	0.023	0.000
5.3333	0.070	0.376	0.023	0.000
5.4444	0.070	0.384	0.023	0.000
5.5556	0.070	0.391	0.024	0.000
5.6667	0.070	0.399	0.024	0.000
5.7778	0.070	0.407	0.024	0.000
5.8889	0.070	0.415	0.030	0.000
6.0000	0.070	0.423	0.034	0.000
6.1111	0.070	0.431	0.036	0.000
6.2222	0.070	0.438	0.038	0.000
6.3333	0.070	0.446	0.040	0.000
6.4444	0.070	0.454	0.042	0.000
6.5556	0.070	0.462	0.048	0.000
6.6667	0.070	0.470	0.052	0.000
6.7778	0.070	0.478	0.056	0.000
6.8889	0.070	0.485	0.059	0.000
7.0000	0.070	0.493	0.061	0.000
7.1111	0.070	0.501	0.064	0.000
7.2222	0.070	0.509	0.066	0.000
7.3333	0.070	0.517	0.068	0.000
7.4444	0.070	0.525	0.070	0.000
7.5556	0.070	0.532	0.072	0.000
7.6667	0.070	0.540	0.074	0.000
7.7778	0.070	0.548	0.076	0.000
7.8889	0.070	0.556	0.078	0.000
8.0000	0.070	0.564	0.080	0.000

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8.1111	0.070	0.572	0.082	0.000
8.2222	0.070	0.579	0.083	0.000
8.3333	0.070	0.587	0.085	0.000
8.4444	0.070	0.595	0.086	0.000
8.5556	0.070	0.603	0.088	0.000
8.6667	0.070	0.611	0.089	0.000
8.7778	0.070	0.619	0.091	0.000
8.8889	0.070	0.626	0.092	0.000
9.0000	0.070	0.634	0.094	0.000
9.1111	0.070	0.642	0.636	0.000
9.2222	0.070	0.650	1.627	0.000
9.3333	0.070	0.658	2.909	0.000
9.4444	0.070	0.666	4.428	0.000
9.5556	0.070	0.673	6.150	0.000
9.6667	0.070	0.681	8.054	0.000
9.7778	0.070	0.689	10.12	0.000
9.8889	0.070	0.697	12.34	0.000
10.000	0.070	0.705	14.71	0.000
10.111	0.070	0.713	17.21	0.000
10.222	0.000	0.000	19.84	0.000

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**Name** : Channel 1  
**Bottom Length:** 500.00 ft.  
**Bottom Width:** 5.00 ft.  
**Manning's n:** 0.03  
**Channel bottom slope 1:** 0.1 To 1  
**Channel left side slope 0:** 0 To 1  
**Channel right side slope 2:** 0 To 1  
**Discharge Structure**  
**Riser Height:** 0 ft.  
**Riser Diameter:** 0 in.

**Element Flows To:**  
**Outlet 1**                      **Outlet 2**

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**Channel Hydraulic Table**

<u>Stage(ft)</u>	<u>Area(ac)</u>	<u>Volume(ac-ft)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.057	0.000	0.000	0.000
0.0333	0.057	0.001	0.268	0.000
0.0667	0.057	0.003	0.845	0.000
0.1000	0.057	0.005	1.648	0.000
0.1333	0.057	0.007	2.639	0.000
0.1667	0.057	0.009	3.796	0.000
0.2000	0.057	0.011	5.102	0.000
0.2333	0.057	0.013	6.543	0.000
0.2667	0.057	0.015	8.109	0.000
0.3000	0.057	0.017	9.789	0.000
0.3333	0.057	0.019	11.57	0.000
0.3667	0.057	0.021	13.46	0.000
0.4000	0.057	0.023	15.44	0.000
0.4333	0.057	0.024	17.51	0.000
0.4667	0.057	0.026	19.67	0.000

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0.5000	0.057	0.028	21.90	0.000
0.5333	0.057	0.030	24.21	0.000
0.5667	0.057	0.032	26.59	0.000
0.6000	0.057	0.034	29.04	0.000
0.6333	0.057	0.036	31.55	0.000
0.6667	0.057	0.038	34.12	0.000
0.7000	0.057	0.040	36.76	0.000
0.7333	0.057	0.042	39.45	0.000
0.7667	0.057	0.044	42.19	0.000
0.8000	0.057	0.045	44.99	0.000
0.8333	0.057	0.047	47.83	0.000
0.8667	0.057	0.049	50.73	0.000
0.9000	0.057	0.051	53.67	0.000
0.9333	0.057	0.053	56.65	0.000
0.9667	0.057	0.055	59.68	0.000
1.0000	0.057	0.057	62.75	0.000
1.0333	0.057	0.059	65.85	0.000
1.0667	0.057	0.061	69.00	0.000
1.1000	0.057	0.063	72.18	0.000
1.1333	0.057	0.065	75.40	0.000
1.1667	0.057	0.067	78.65	0.000
1.2000	0.057	0.068	81.94	0.000
1.2333	0.057	0.070	85.25	0.000
1.2667	0.057	0.072	88.60	0.000
1.3000	0.057	0.074	91.98	0.000
1.3333	0.057	0.076	95.39	0.000
1.3667	0.057	0.078	98.82	0.000
1.4000	0.057	0.080	102.2	0.000
1.4333	0.057	0.082	105.7	0.000
1.4667	0.057	0.084	109.2	0.000
1.5000	0.057	0.086	112.8	0.000
1.5333	0.057	0.088	116.4	0.000
1.5667	0.057	0.089	119.9	0.000
1.6000	0.057	0.091	123.6	0.000
1.6333	0.057	0.093	127.2	0.000
1.6667	0.057	0.095	130.8	0.000
1.7000	0.057	0.097	134.5	0.000
1.7333	0.057	0.099	138.2	0.000
1.7667	0.057	0.101	141.9	0.000
1.8000	0.057	0.103	145.7	0.000
1.8333	0.057	0.105	149.4	0.000
1.8667	0.057	0.107	153.2	0.000
1.9000	0.057	0.109	157.0	0.000
1.9333	0.057	0.111	160.8	0.000
1.9667	0.057	0.112	164.6	0.000
2.0000	0.057	0.114	168.4	0.000
2.0333	0.057	0.116	172.3	0.000
2.0667	0.057	0.118	176.2	0.000
2.1000	0.057	0.120	180.1	0.000
2.1333	0.057	0.122	184.0	0.000
2.1667	0.057	0.124	187.9	0.000
2.2000	0.057	0.126	191.8	0.000
2.2333	0.057	0.128	195.8	0.000
2.2667	0.057	0.130	199.7	0.000
2.3000	0.057	0.132	203.7	0.000
2.3333	0.057	0.134	207.7	0.000
2.3667	0.057	0.135	211.7	0.000

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2.4000	0.057	0.137	215.7	0.000
2.4333	0.057	0.139	219.7	0.000
2.4667	0.057	0.141	223.7	0.000
2.5000	0.057	0.143	227.8	0.000
2.5333	0.057	0.145	231.8	0.000
2.5667	0.057	0.147	235.9	0.000
2.6000	0.057	0.149	240.0	0.000
2.6333	0.057	0.151	244.1	0.000
2.6667	0.057	0.153	248.2	0.000
2.7000	0.057	0.155	252.3	0.000
2.7333	0.057	0.157	256.4	0.000
2.7667	0.057	0.158	260.5	0.000
2.8000	0.057	0.160	264.6	0.000
2.8333	0.057	0.162	268.8	0.000
2.8667	0.057	0.164	272.9	0.000
2.9000	0.057	0.166	277.1	0.000
2.9333	0.057	0.168	281.3	0.000
2.9667	0.057	0.170	285.5	0.000
3.0000	0.057	0.172	289.7	0.000
3.0333	0.057	0.174	293.9	0.000

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**ANALYSIS RESULTS**

**Stream Protection Duration**

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**Predeveloped Landuse Totals for POC #1**  
**Total Pervious Area:2.6619**  
**Total Impervious Area:0**

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**Mitigated Landuse Totals for POC #1**  
**Total Pervious Area:0.9768**  
**Total Impervious Area:1.6852**

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**Flow Frequency Return Periods for Predeveloped. POC #1**

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.071729
5 year	0.116392
10 year	0.141353
25 year	0.167161
50 year	0.18267
100 year	0.19551

**Flow Frequency Return Periods for Mitigated. POC #1**

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.045391
5 year	0.075503
10 year	0.101862
25 year	0.143908
50 year	0.182567
100 year	0.228419

**East Lake Sammamish Apartments**  
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**Stream Protection Duration**

**Annual Peaks for Predeveloped and Mitigated. POC #1**

<b>Year</b>	<b>Predeveloped</b>	<b>Mitigated</b>
1949	0.079	0.031
1950	0.153	0.049
1951	0.168	0.125
1952	0.052	0.028
1953	0.040	0.044
1954	0.058	0.033
1955	0.103	0.032
1956	0.088	0.089
1957	0.067	0.032
1958	0.072	0.036
1959	0.060	0.033
1960	0.105	0.099
1961	0.061	0.054
1962	0.035	0.027
1963	0.048	0.036
1964	0.060	0.051
1965	0.045	0.069
1966	0.046	0.034
1967	0.103	0.045
1968	0.061	0.033
1969	0.060	0.033
1970	0.048	0.036
1971	0.043	0.035
1972	0.125	0.110
1973	0.054	0.066
1974	0.059	0.034
1975	0.090	0.033
1976	0.055	0.033
1977	0.005	0.028
1978	0.048	0.043
1979	0.028	0.025
1980	0.081	0.108
1981	0.043	0.034
1982	0.082	0.080
1983	0.074	0.034
1984	0.047	0.028
1985	0.026	0.028
1986	0.129	0.042
1987	0.109	0.087
1988	0.040	0.031
1989	0.025	0.029
1990	0.177	0.103
1991	0.155	0.103
1992	0.051	0.043
1993	0.057	0.027
1994	0.014	0.025
1995	0.081	0.055
1996	0.159	0.120
1997	0.146	0.118
1998	0.030	0.029
1999	0.091	0.103
2000	0.057	0.035

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2001	0.007	0.022
2002	0.071	0.048
2003	0.052	0.032
2004	0.132	0.113
2005	0.071	0.033
2006	0.094	0.083
2007	0.248	0.306
2008	0.195	0.110
2009	0.109	0.063

---

**Stream Protection Duration**

**Ranked Annual Peaks for Predeveloped and Mitigated. POC #1**

<b>Rank</b>	<b>Predeveloped</b>	<b>Mitigated</b>
1	0.2477	0.3063
2	0.1952	0.1254
3	0.1770	0.1198
4	0.1682	0.1180
5	0.1587	0.1130
6	0.1545	0.1095
7	0.1527	0.1095
8	0.1458	0.1079
9	0.1320	0.1033
10	0.1293	0.1027
11	0.1248	0.1026
12	0.1094	0.0987
13	0.1090	0.0886
14	0.1049	0.0873
15	0.1032	0.0828
16	0.1031	0.0797
17	0.0937	0.0690
18	0.0913	0.0656
19	0.0896	0.0631
20	0.0882	0.0548
21	0.0819	0.0544
22	0.0811	0.0508
23	0.0810	0.0489
24	0.0790	0.0479
25	0.0743	0.0451
26	0.0724	0.0443
27	0.0710	0.0429
28	0.0709	0.0427
29	0.0666	0.0416
30	0.0610	0.0358
31	0.0607	0.0356
32	0.0604	0.0355
33	0.0599	0.0351
34	0.0599	0.0346
35	0.0587	0.0344
36	0.0585	0.0341
37	0.0571	0.0341
38	0.0570	0.0340
39	0.0552	0.0333
40	0.0544	0.0333
41	0.0522	0.0333
42	0.0520	0.0329
43	0.0510	0.0329

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44	0.0482	0.0327
45	0.0478	0.0326
46	0.0477	0.0324
47	0.0473	0.0320
48	0.0458	0.0319
49	0.0446	0.0310
50	0.0435	0.0308
51	0.0428	0.0287
52	0.0399	0.0287
53	0.0396	0.0284
54	0.0354	0.0283
55	0.0296	0.0282
56	0.0280	0.0281
57	0.0256	0.0273
58	0.0251	0.0272
59	0.0144	0.0254
60	0.0069	0.0248
61	0.0055	0.0222

---

**Stream Protection Duration**

**POC #1**

**The Facility PASSED**

**The Facility PASSED.**

<b>Flow(cfs)</b>	<b>Predev</b>	<b>Mit</b>	<b>Percentage</b>	<b>Pass/Fail</b>
0.0359	4211	2865	68	Pass
0.0373	3878	2640	68	Pass
0.0388	3591	2492	69	Pass
0.0403	3306	2376	71	Pass
0.0418	3056	2270	74	Pass
0.0433	2819	2157	76	Pass
0.0448	2615	2061	78	Pass
0.0462	2439	1966	80	Pass
0.0477	2268	1855	81	Pass
0.0492	2131	1748	82	Pass
0.0507	1996	1642	82	Pass
0.0522	1862	1545	82	Pass
0.0537	1735	1435	82	Pass
0.0551	1618	1321	81	Pass
0.0566	1516	1218	80	Pass
0.0581	1422	1111	78	Pass
0.0596	1340	1023	76	Pass
0.0611	1260	972	77	Pass
0.0626	1189	945	79	Pass
0.0640	1132	913	80	Pass
0.0655	1053	887	84	Pass
0.0670	986	853	86	Pass
0.0685	931	823	88	Pass
0.0700	886	797	89	Pass
0.0715	830	776	93	Pass
0.0729	783	753	96	Pass
0.0744	744	719	96	Pass
0.0759	705	683	96	Pass
0.0774	663	655	98	Pass
0.0789	628	624	99	Pass

B

**East Lake Sammamish Apartments  
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0.0804	583	593	101	Pass
0.0818	550	562	102	Pass
0.0833	525	527	100	Pass
0.0848	491	496	101	Pass
0.0863	466	466	100	Pass
0.0878	436	435	99	Pass
0.0892	407	409	100	Pass
0.0907	384	388	101	Pass
0.0922	351	373	106	Pass
0.0937	334	354	105	Pass
0.0952	315	333	105	Pass
0.0967	296	311	105	Pass
0.0981	280	284	101	Pass
0.0996	265	256	96	Pass
0.1011	252	236	93	Pass
0.1026	244	212	86	Pass
0.1041	230	191	83	Pass
0.1056	220	174	79	Pass
0.1070	208	152	73	Pass
0.1085	200	122	61	Pass
0.1100	187	102	54	Pass
0.1115	183	93	50	Pass
0.1130	175	78	44	Pass
0.1145	173	68	39	Pass
0.1159	163	62	38	Pass
0.1174	153	51	33	Pass
0.1189	145	45	31	Pass
0.1204	139	38	27	Pass
0.1219	134	35	26	Pass
0.1234	122	33	27	Pass
0.1248	114	28	24	Pass
0.1263	107	19	17	Pass
0.1278	97	12	12	Pass
0.1293	90	8	8	Pass
0.1308	82	7	8	Pass
0.1323	77	7	9	Pass
0.1337	70	6	8	Pass
0.1352	64	5	7	Pass
0.1367	62	5	8	Pass
0.1382	55	5	9	Pass
0.1397	51	5	9	Pass
0.1411	47	5	10	Pass
0.1426	43	4	9	Pass
0.1441	40	4	10	Pass
0.1456	39	4	10	Pass
0.1471	35	4	11	Pass
0.1486	33	4	12	Pass
0.1500	31	4	12	Pass
0.1515	29	4	13	Pass
0.1530	28	4	14	Pass
0.1545	23	4	17	Pass
0.1560	22	4	18	Pass
0.1575	20	4	20	Pass
0.1589	14	4	28	Pass
0.1604	14	4	28	Pass
0.1619	13	4	30	Pass
0.1634	11	4	36	Pass

**East Lake Sammamish Apartments  
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0.1649	10	4	40	Pass
0.1664	9	4	44	Pass
0.1678	8	3	37	Pass
0.1693	7	3	42	Pass
0.1708	5	2	40	Pass
0.1723	5	2	40	Pass
0.1738	5	2	40	Pass
0.1753	3	2	66	Pass
0.1767	3	2	66	Pass
0.1782	2	2	100	Pass
0.1797	2	2	100	Pass
0.1812	2	2	100	Pass
0.1827	2	2	100	Pass

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**Water Quality BMP Flow and Volume for POC #1**  
On-line facility volume: 0.1185 acre-feet  
On-line facility target flow: 0.0641 cfs.  
Adjusted for 15 min: 0.0641 cfs.  
Off-line facility target flow: 0.0338 cfs.  
Adjusted for 15 min: 0.0338 cfs.

## WATER QUALITY ANALYSIS AND DESIGN

The project will create more than 5,000 sf of Pollution Generating Impervious Surfaces and will eventually discharge to Lake Sammamish, therefore enhanced water quality treatment as well as treatment for phosphorous will be provided. The project will provide this level of treatment via an onsite 4'x6' Modular Wetland System which is approved as GULD for enhanced and phosphorous treatment, and sized per the DOE's TAPE program. The approval letter from the DOE is included in the Appendix. The Modular Wetland System is sized to treat the mitigated 2 year flow coming from the detention vaults, but is also sized to bypass the 100 year unmitigated flow (1.02 cfs) should the detention vaults fail. See the WWHM readout below for treatment flow:

**Flow Frequency Return Periods for Mitigated. POC #1**

<b>Return Period</b>	<b>Flow(cfs)</b>
2 year	0.045391 (Treatment Flow)
5 year	0.075503
10 year	0.101862
25 year	0.143908
50 year	0.182567
100 year	0.228419

**Sizing Calculation:**

0.0454 cfs = 20.38 GPM

Per the Department of Ecology's GULD guidelines the Wetland should be sized at a rate of 1 sqf of surface area per 1 GPM of flow. Therefore 20.38 sqf of surface area within the MWS must be provided and a 4'x6' MWS will pass the criterion.

## CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The conveyance system was designed per the requirements within the 2005 DOE Manual and the 2012 COR Technical Notebook.

Per Section 8.4.2 Pipe Sizing of the 2012 COR Technical Notebook, if a stormwater detention facility lies downstream of the conveyance system, that conveyance system shall be sized to convey the peak flow to the facility.

At final engineering, the conveyance system downstream of the vault will be sized so that pipes can convey the unmitigated 100-year storm flows should the detention vault fail.

## Section 5 Stormwater Pollution Prevention Plan

Design of the SWPPP will be completed in conformance with the 2012 COR Technical Notebook and Minimum Requirement #2 of the 2005 DOE Manual. SWPPP will be provided at final engineering. See Construction Plans under separate cover for location of BMPs.

## Section 6 Special Reports and Studies

Additional reports and studies within this section include the following:

- *Geotechnical Due Diligence Services*, dated June 16, 2015, prepared by GeoEngineers, Inc.
- *Critical Area Study and Mitigation Plan for East Lake Sammamish Apartments*, dated March 10, 2016 by Wetland Resources, Inc.



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Redmond, Washington 98052  
425.861.6000

June 16, 2015

Wolff Enterprises II, LLC  
911 East Pike Street, Suite 310  
Seattle, Washington 98122

Attention: Chris Rossman

Subject: Geotechnical Due Diligence Services  
Proposed Redmond Senior Living Development  
6006 East Lake Sammamish Parkway.  
Redmond, Washington  
File No. 12406-012-00

## **INTRODUCTION**

This letter summarizes the key geotechnical considerations for the proposed Redmond Senior Living Community project at 6006 East Lake Sammamish Parkway in Redmond, Washington. In preparing this letter, GeoEngineers reviewed existing information and exploration logs in the site vicinity available in our library and through other resources. In addition, GeoEngineers completed four borings at the site to better characterize the subsurface and groundwater conditions. GeoEngineers' services have been completed in accordance with our services agreement with Wolff Enterprises II, LLC executed on May 18, 2015.

## **PROJECT DESCRIPTION**

GeoEngineers understands that Wolff Enterprises II, LLC is interested in redeveloping seven King County parcels (1318300120, 1318300125, 1318300142, 1318300144, 1318300156, 1318300164 and 1825069025). The site is shown relative to surrounding physical features on the Vicinity Map (Figure 1) and the Site Plan (Figure 2).

The site is irregularly shaped and bounded by multi-family housing to the northwest, multi-family housing to the southeast, the Redmond – Fall City Road (SR 202) to the northeast and East Lake Sammamish Parkway NE to the southwest. The approximately 3.5-acre site is currently occupied by several single family residential buildings. The proposed development plan includes construction of four buildings with up to four stories and either partial below-grade parking or surface parking around each of the buildings. The main access to the site will be located off of East Lake Sammamish Parkway NE with service access located along SR 202.



The key geotechnical considerations that GeoEngineers has investigated as part of this evaluation include: (1) the nature and extent of fill soils and the depth to glacially consolidated soils below the building footprint, (2) preliminary allowable bearing pressures for shallow foundations and (3) appropriate temporary shoring options, and (4) an assessment of the groundwater conditions at the site. Preliminary geotechnical recommendations related to these key issues along with a summary of known subsurface conditions are presented in the following sections.

## FIELD EXPLORATIONS AND LABORATORY TESTING

### Field Explorations

The subsurface and groundwater conditions at the site were evaluated by GeoEngineers by completing four borings. The explorations (GEI-1 through GEI-4) were completed depths ranging from 21.5 to 41.5 feet below existing site grades. The borings were conducted on May 28, 2015 using a track-mounted Dietrich D-50 drill rig owned and operated by Geologic Drill XL, of Spokane, Washington.

The location of the explorations completed for this project are presented on Figure 2, together with previous explorations in the site vicinity. Details of the field exploration program and the logs of the explorations are presented in Appendix A.

### Laboratory Testing

Soil samples were obtained during drilling and were taken to GeoEngineers' laboratory for further evaluation. Selected samples were tested for the determination of the grain size distribution, fines content, and moisture content. A description of the laboratory testing and the test results are presented in Appendix B.

## PREVIOUS STUDIES

The logs of explorations completed as part of previous studies in the project vicinity were reviewed as part of this study. The previous studies reviewed are listed in the "References" section at the end of this report.

## SITE CONDITIONS

### Geology

The project site is located in the Puget Lowland. Our review of available geologic information indicates subsurface conditions in the project area are the result of several episodes of interglacial erosion, scour by glaciers, depositions of glacial and non-glacial sediments, and post-glacial deposition and erosion. The Fraser glaciation is the most recent in western Washington and includes the Vashon stage. Erosion and deposition during and following the Fraser glaciation have resulted in the modern topography of the Puget Lowland.

Alluvium, glacial outwash, glacial till, and glacio-lacustrine deposits are mapped in the project vicinity. Alluvium refers to the recent deposits left behind by the Sammamish River, which typically consist of loose to medium dense sand with variable silt content and occasional gravel with related peat and organic layers. The glacial outwash is deposited by meltwater in front of the glacier as it advances or recedes. Cobbles,



gravel, sand and silt settle out of the meltwater in stratified layers. Glacial outwash may or may not have been consolidated by the glacier. Glacial till is deposited directly by the glacier and typically consists of non-stratified deposits of silty sand with gravel and occasional cobbles and boulders. The till encountered has varying degrees of weathering. The till has been glacially consolidated and typically grades to dense to very dense at depth. The underlying glacio-lacustrine deposits typically consist of stiff to hard blocky jointed silt, clay and silty clay. These glacio-lacustrine deposits are likely associated with the transitional beds and were deposited in glacial lakes during the interglacial period before the Fraser glaciation.

### **Subsurface Conditions**

Based on our review of the existing subsurface information and our borings, the explorations encountered three distinct soil units: fill, recent deposits and glacially consolidated soils. Descriptions of these soil units are provided below.

**Fill** was observed in borings GEI-2 and GEI-4 and generally consisted of loose to medium dense silty sand and sand with silt. The fill ranged from 3 to 8 feet thick.

**Recent deposits** were encountered in boring GEI-4 and consists of loose sand with silt. The recent deposits were approximately 8 feet thick at the GEI-4 location.

**Glacially consolidated soils** were encountered in each of the borings completed for this evaluation either at the ground surface or below the fill and recent deposits, where present. The glacially consolidated soils consist of medium dense to very dense silty sand with variable gravel and cobble content, sandy silt, or gravel with variable sand and silt content. The glacially consolidated soils extended to depths explored.

### **Groundwater Conditions**

Groundwater was inferred in the explorations completed at our site during drilling at depths between 15 and 25 feet below current site grades. The groundwater is interpreted to be a perched groundwater on top of a very dense or hard layer of glacially consolidated soils. Based on the current development plans, we anticipate the static groundwater table is below the base of the planned excavations; however, perched groundwater will likely be encountered within the soils located above the base of the planned excavation. Groundwater conditions will likely vary by location and season.

## **CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS**

### **Seismic Evaluation**

#### **Ground Surface Rupture**

The site is located approximately 6 miles north of the Seattle Fault zone. Because of the anticipated infrequent recurrence of earthquake events and the project site's location with respect to the nearest known fault (Seattle Fault), it is our opinion that the risk of ground rupture at the site resulting from surface faulting is low.

#### **Liquefaction and Lateral Spreading**

Liquefaction is a phenomenon where soils experience a rapid loss of internal strength as a consequence of strong ground shaking. Ground settlement, lateral spreading and/or sand boils may result from soil



liquefaction. Conditions favorable to liquefaction occur in loose to medium dense, clean to moderately silty sand that is below the groundwater level. We conclude that the dense to very dense glacially consolidated soils below the site result in a low potential for liquefaction and liquefaction-induced displacements at the site.

### **Seismically Induced Landslides**

Based on the presence of the competent glacially consolidated soils in the site vicinity, it is our opinion that the risk of seismically induced land sliding is low.

### **Seismic Design Criteria**

Depending on the extent of fill at the project site, it may be classified as either Site Class C or Site Class D; this will need to be confirmed with additional explorations during the design phase. We recommend the use of the following 2012 International Building Code (IBC) parameters for soil profile type, short period spectral response acceleration ( $S_s$ ), 1-second period spectral response acceleration ( $S_1$ ) and seismic coefficients ( $F_A$  and  $F_V$ ) for the project site.

2012 IBC Parameter	Recommended Value	Recommended Value
Site Class	C	D
Short Period Spectral Response Acceleration, $S_s$ (percent g)	1.250	1.250
1-Second Period Spectral Response Acceleration, $S_1$ (percent g)	0.478	0.478
Seismic Coefficient, $F_A$	1.0	1.0
Seismic Coefficient, $F_V$	1.32	1.52

### **Excavation Support**

Based on early development plans, temporary shoring may be required to allow for grade transitions at the site. If temporary slopes are not feasible, the subsurface conditions favor the use of soil nails with vertical elements, cantilever soldier piles, or soldier piles with tiebacks. GeoEngineers can provide recommendations for these types of systems once the due diligence period is complete and development plans are further along.

### **Shallow Foundations**

Given the shallow competent soils, up to 7 feet, observed in the explorations completed at the site, shallow foundations bearing on native recent deposits, glacially consolidated soils, or on compacted structural fill extending down to native recent deposits or glacially consolidated soils are considered feasible.

### **Preliminary Allowable Bearing Pressure**

For foundations bearing on subgrade soils prepared following the recommendations provided in this report, the foundations may be designed using a preliminary allowable soil bearing pressure between 4,000 and 6,000 pounds per square foot (psf) for isolated spread footings and continuous footings. The allowable soil bearing pressure applies to the total of dead and long-term live loads and may be increased by up to one-third for wind or seismic loads. The bearing pressure should be reevaluated during the design phase of the project.

The condition of the soils at the planned foundation subgrade elevation should be evaluated by GeoEngineers. If loose fill is present at foundation subgrade elevation, a portion of the fill should be removed and replaced with properly compacted structural fill. The extent of removal and replacement will be determined during construction. Where the foundations bear on dense to very dense glacially consolidated soils, no additional subgrade preparation is required. GeoEngineers' field representative can assist with determining the extent of removal and replacement required and evaluation of the degree of compaction of new structural fill materials.

### **Settlement**

Provided all loose soil is removed and the subgrade is prepared as recommended, we estimate the total settlement of shallow foundations will be about 1 inch or less. The settlements will occur rapidly, essentially as loads are applied. Differential settlements between footings could be half of the total settlement. Note that smaller settlements will result from lower applied loads.

Lateral foundation loads may be resisted by passive resistance on the sides of footings and by friction on the base of the shallow foundations. For shallow foundations supported on native soils, the allowable frictional resistance may be computed using a coefficient of friction of 0.35 applied to vertical dead-load forces.

The allowable passive resistance may be computed using an equivalent fluid density between 250 and 400 pounds per cubic foot (pcf) (triangular distribution). These values are appropriate for foundation elements that are poured directly against undisturbed glacially consolidated soils or surrounded by structural fill.

The above coefficient of friction and passive equivalent fluid density values incorporate a factor of safety of about 1.5.

### **Construction Considerations**

If soft or loose areas are present at the foundation subgrade elevation, the soft or loose areas should be removed and replaced with compacted structural fill. Structural fill placed to support foundations should meet the criteria for common borrow as described in Section 9-03.14(3) of the Washington State Department of Transportation (WSDOT) Standard Specifications. The structural fill should be compacted to at least 95 percent of the maximum dry density (MDD) per ASTM D 1557.

All loose soil and other debris should be removed from the foundation excavations prior to placing reinforcement steel and concrete. Loose or otherwise soft soils not removed from foundation subgrade areas can result in increased foundation settlement.

The condition of all subgrade areas should be observed by GeoEngineers to evaluate if the work is completed in accordance with our recommendations and to confirm that the subsurface conditions are as anticipated.



## Slab-On-Grade Support

### **Design Parameters**

For slabs designed as a beam on an elastic foundation, a modulus of subgrade reaction of 150 pounds per cubic inch (pci) may be used for slabs supported on site soils. We recommend that the slab-on-grade for the proposed structure be supported on a minimum 6-inch layer of capillary break material over the subgrade. Capillary break material should consist of material meeting the requirements of Mineral Aggregate Type 22 ( $\frac{3}{4}$ -inch crushed gravel), City of Seattle Standard Specification 9-03.16.

### **Below-Slab Drainage**

In areas where slabs-on-grade will be situated at an elevation lower than the ground surface elevation outside the footprint of the building, we recommend installing below grade drainage measures. The appropriate type and extent of below grade drainage measures will be determined once the building depth and extent has been determined.

### **Below Grade Walls**

Conventional cast-in-place walls may be necessary for small retaining structures located on site. The lateral soil pressures acting on conventional cast-in-place subsurface walls will depend on the nature, density and configuration of the soil behind the wall and the amount of lateral wall movement that can occur as backfill is placed.

For walls that are free to yield at the top at least 0.1 percent of the height of the wall, soil pressures will be less than if movement is limited by such factors as wall stiffness or bracing. Assuming that the walls are backfilled, and drainage is provided as outlined in the following paragraphs, we recommend that yielding walls supporting horizontal backfill be designed using an equivalent fluid density of 35 pcf (triangular distribution), and that non-yielding walls supporting horizontal backfill be designed using an equivalent fluid density of 55 pcf (triangular distribution). For seismic loading conditions, a rectangular earth pressure equal to 8H psf, where H is the height of the wall, should be added to the active/at-rest pressures. Other surcharge loading should be applied as appropriate. Lateral resistance for conventional cast-in-place walls can be provided by frictional resistance along the base of the wall and passive resistance in front of the wall in accordance with the "Lateral Resistance" discussion earlier in this report.

The above soil pressures assume that wall drains will be installed to prevent the buildup of hydrostatic pressure behind the walls, as discussed in the following paragraphs.

### **Drainage**

Positive drainage should also be provided behind cast-in-place retaining walls by placing a minimum 2-foot-wide zone of City of Seattle Standard Specification Mineral Aggregate Type 17 (bank run gravel), with the exception that the percent passing the U.S. No. 200 sieve should be less than 3 percent. A perforated or slotted drainpipe should be placed near the base of the retaining wall to provide drainage. The drainpipe should be surrounded by a minimum of 6 inches of Mineral Aggregate Type 22 or Type 5 (1-inch washed gravel), or an alternative approved by GeoEngineers. The Type 22 or Type 5 material should be wrapped with a geotextile filter fabric meeting the requirements of construction geotextile for underground drainage, WSDOT Standard Specification 9-33. The wall drainpipe should be connected to a header pipe and routed to a sump or gravity drain. Appropriate cleanouts for drainpipe maintenance should be installed. A larger diameter pipe will allow for easier maintenance of drainage systems.



### Excavation Considerations

The site soils may be excavated with conventional excavation equipment, such as trackhoes or dozers. It may be necessary to rip the glacially consolidated soils locally to facilitate excavation. The contractor should be prepared to deal with occasional cobbles and boulders in the site soils. Likewise, the surficial fill may contain foundation elements and/or utilities from previous site development, debris, rubble and/or cobbles and boulders. We recommend that procedures be identified in the project specifications for measurement and payment of work associated with obstructions.

### Temporary Cut Slopes

The stability of open-cut slopes is a function of soil type, groundwater seepage, slope inclination, slope height and nearby surface loads. The use of inadequately designed open cuts could impact the stability of adjacent work areas, could affect existing utilities and could endanger personnel.

For planning purposes, temporary unsupported cut slopes more than 4 feet high may be inclined at 1½H:1V (horizontal to vertical) maximum steepness within the fill soils and no steeper than 1H:1V in the glacially consolidated deposits. If significant seepage is present on the cut face, then the cut slopes may need to be flattened.

The above guidelines assume that surface loads such as traffic, construction equipment, stockpiles or building supplies will be kept away from the top of the cut slopes a sufficient distance so that the stability of the excavation is not affected. We recommend that this distance be at least 5 feet from the top of the cut for temporary cuts made at 1H:1V or flatter.

Temporary cut slopes should be planned such that they do not encroach on a 1H:1V influence line projected down from the edges of nearby or planned foundation elements.

Water that enters the excavation must be collected and routed away from prepared subgrade areas. We expect that this may be accomplished by installing a system of drainage ditches and sumps along the toe of the cut slopes. Some sloughing and raveling of the cut slopes should be expected. Temporary covering, such as heavy plastic sheeting with appropriate ballast, should be used to protect these slopes during periods of wet weather. Surface water runoff from above cut slopes should be prevented from flowing over the slope face by using berms, drainage ditches, swales or other appropriate methods.

### Permanent Cut and Fill Slopes

We recommend that permanent cut and fill slopes be constructed at inclinations of 2H:1V or flatter, and be blended into existing slopes with smooth transitions. Permanent fill slopes constructed in materials compacted to 85 percent of the MDD estimated in general accordance with ASTM D 1557 should be no steeper than 3H:1V. To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill.

To reduce erosion, newly constructed slopes should be planted or hydroseeded shortly after completion of grading. Until the vegetation is established, some sloughing and raveling of the slopes should be expected. This may necessitate localized repairs and reseeded. Temporary covering, such as clear heavy plastic sheeting, jute fabric or erosion control blankets (such as American Excelsior Curlex 1 or North American Green S150) could be used to protect the slopes during periods of rainfall.



## Recommended Additional Geotechnical Services

GeoEngineers shall complete a design-level geotechnical engineering evaluation for the project, which is anticipated to confirm or modify as appropriate the preliminary design recommendations presented in this report. Additionally, GeoEngineers recommends completing additional explorations at the site to better understand the subsurface soil and groundwater conditions.

## REFERENCES

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- United States Geological Service Seismic Design Maps. Available online at <http://earthquake.usgs.gov/designmaps/us/application.php>
- Washington State Department of Transportation. "2012 Standard Specifications for Road, Bridge and Municipal Construction," Publication No, M 41-10.
- Washington State Department of Transportation. "Geotechnical Design Manual," Publication M 46-03, April 2012.

## LIMITATIONS

We have prepared this preliminary geotechnical evaluation letter for the exclusive use of Wolff Enterprises II, LLC and their authorized agents for the project site. The data and report should be provided to prospective contractors for their bidding or estimating purposes, but our report, conclusions 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 fields 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.



We trust that this letter provides the information required at this time. If you have any questions regarding this report, please contact us.

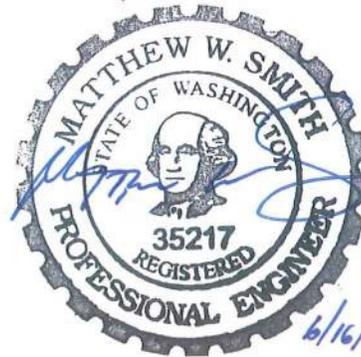
Sincerely,  
GeoEngineers, Inc.



Daniel P. Ciani, PE  
Senior Geotechnical Engineer



Matthew W. Smith, PE  
Principal



DTM:DPC:MWS:nld

Attachments:

Figure 1. Vicinity Map

Figure 2. Site Plan

Appendix A. Field Explorations

Figure A-1 – Key to Exploration Logs

Figures A-2 through A-5 – Log of Borings

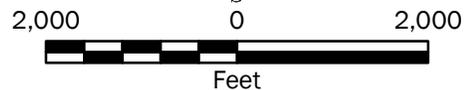
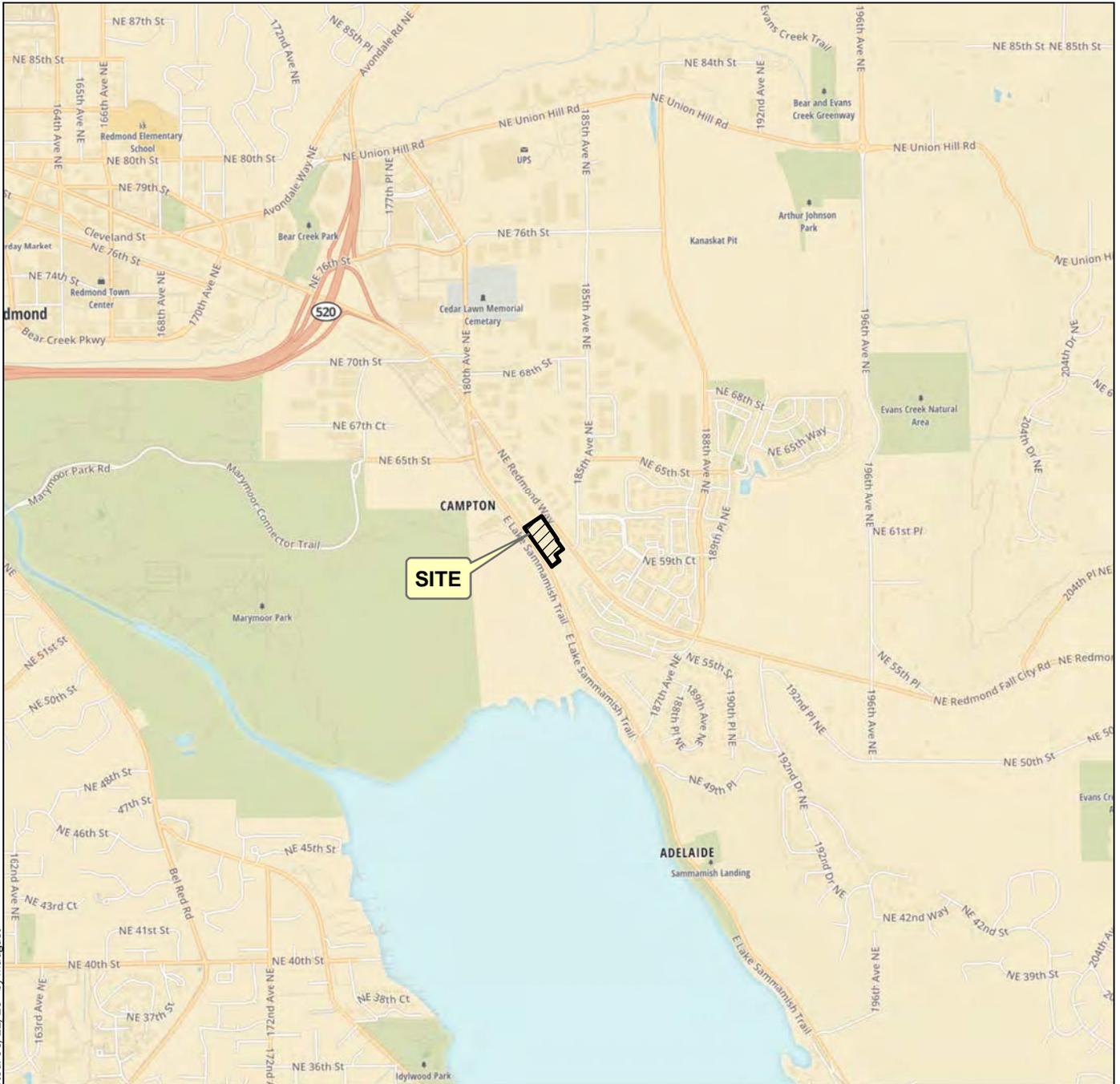
Appendix B. Laboratory Testing

Figure B-1 – Sieve Analysis Results

Appendix C. Previous Explorations

Appendix D. Report Limitations and Guidelines for Use

Disclaimer: 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.



Feet

**Vicinity Map**

**Proposed East Lake Sammamish Development  
Redmond, Washington**



**Figure 1**

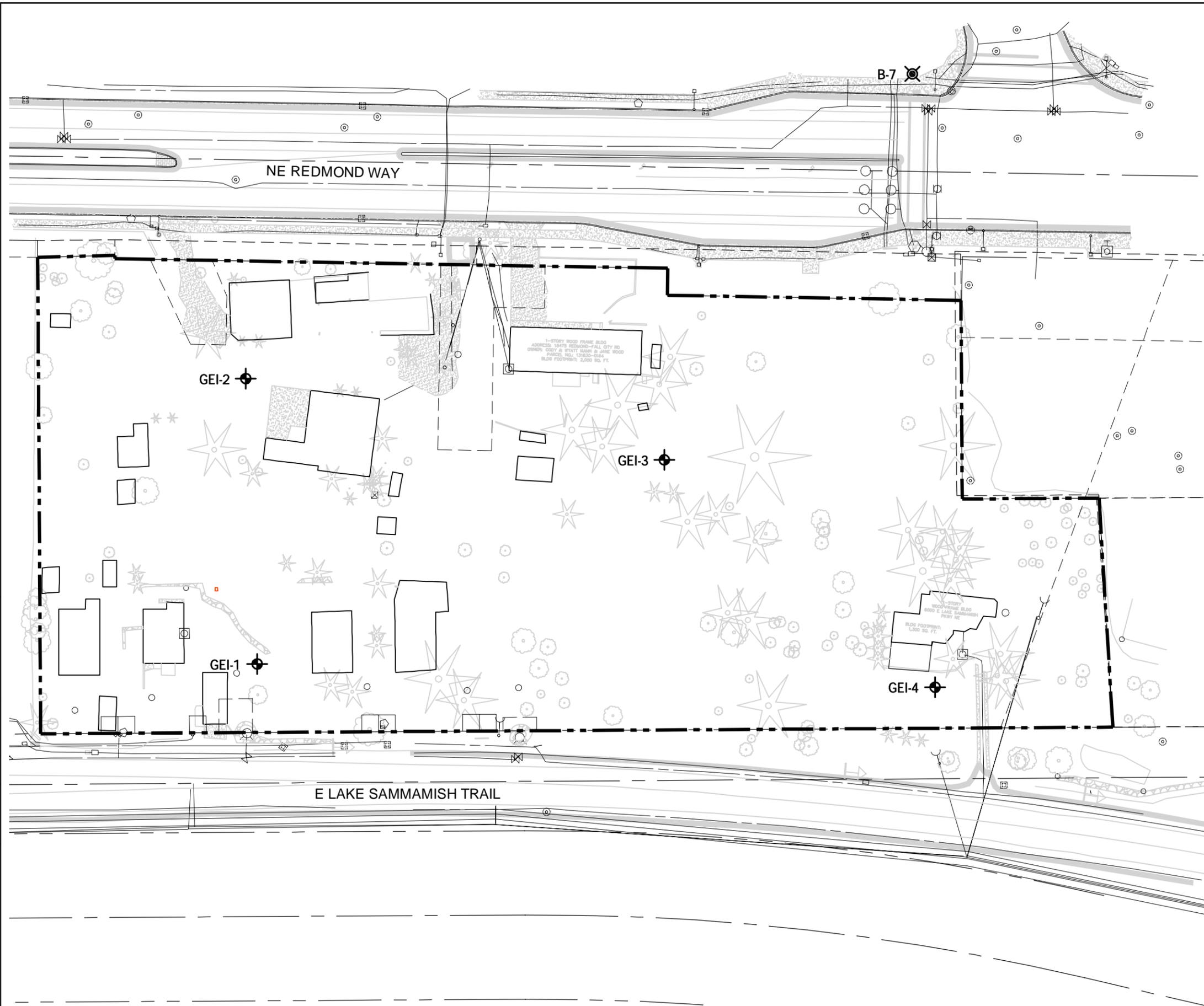
**Notes:**

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. cannot 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.

Data Source: Mapbox Open Street Map, 2015

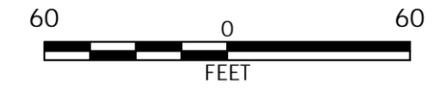
Projection: NAD 1983 UTM Zone 10N

P:\12\124\06\12\00\CAD\12406012.00 Fig 2 Site Plan.dwg TAB:Layout2 Date Exported: 06/12/15 - 13:12 by tmchaud



### Legend

-  Project Site
-  Boring by GeoEngineers, 2015
-  Boring by CH2M Hill, 1992



**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. cannot 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.

Data Source:  
 Base survey by Bush Roed & Hitchings, Inc. dated 6/15.

Site Plan	
Redmond Senior Living Community Redmond, Washington	
	Figure 2

**APPENDIX A**  
**Field Explorations**

## APPENDIX A FIELD EXPLORATIONS

Subsurface conditions at the site were explored on May 28, 2015 by advancing four borings (GEI-1 through GEI-4) at the approximate locations shown on the Site Plan, Figure 2. The borings were advanced to depths ranging from about 21½ to 41½ feet below the existing ground surface. The borings were completed using a track-mounted Dietrich D-50 drill rig owned and operated by Geologic Drill Exploration, Inc. of Spokane, Washington.

The borings were continuously monitored by a geotechnical engineer from our firm who examined and classified the soils encountered, obtained representative soil samples, and observed groundwater conditions. Our representative maintained a detailed log of each boring. Disturbed samples of the representative soil types were obtained from the borings using standard penetration test (SPT) sampling procedures. SPT sampling was performed using a 2-inch outside diameter split-spoon sampler driven with a standard 140-pound hammer attached to an autohammer in accordance with ASTM D 1586.

The soils encountered in the borings were typically sampled at 2½- to 5-foot vertical intervals with the SPT split spoon sampler. Samples were obtained by driving the sampler 18 inches into the soil with a hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration is recorded. The Standard Penetration Resistance ("N-value") of the soil is calculated as the number of blows required for the final 12 inches of penetration (blows/foot). This value is shown on the boring logs. This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils. If the high penetration resistance encountered in the very dense soils precluded driving the total 18-inch sample interval, the penetration resistance for the partial penetration is entered on logs as follows: if the penetration is greater than 6 inches and less than 18 inches, then the number of blows is recorded over the number of inches driven; 30 blows for 6 inches and 50 for 3 inches, for instance, would be recorded as 80/9". The blow counts are shown on the boring logs at the respective sample depths. The Standard Penetration Test is a useful quantitative tool from which soil density/consistency was evaluated.

Soils encountered in the borings were classified in the field in general accordance with ASTM D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure, which is summarized in Figure A-1. Logs of the borings are provided as Figures A-2 through A-5.

Boring locations were determined in the field using the ARC-GIS app on a GPS-enabled iPad. The locations on the site plan are therefore accurate to about 20 feet. It is our understanding that the surveyors will include the flagged boring locations in their site survey.

## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
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)		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		CLEAN SANDS  (LITTLE OR NO FINES)		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GC</b>	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)		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS  MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY		<b>ML</b>	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
		INORGANIC CLAYS OF HIGH PLASTICITY		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY
		ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY		<b>OH</b>	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

### Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

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.

## ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
	<b>AC</b>	Asphalt Concrete
	<b>CC</b>	Cement Concrete
	<b>CR</b>	Crushed Rock/ Quarry Spalls
	<b>TS</b>	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

### 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.

## KEY TO EXPLORATION LOGS

Drilled	Start 5/28/2015	End 5/28/2015	Total Depth (ft)	21.5	Logged By DTM/SJB	Checked By DPC	Driller Geologic Drill, Inc.	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) Vertical Datum	61 NAVD88			Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment	Diedrich D-50	
Latitude Longitude				System Datum	N/A		Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:							See remarks		

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
60	0						GP SP-SM			Sod and crushed gravel driveway Brown fine sand with silt (loose, moist) (recent deposits)
	13	6		1 %F				5	5	Slight sheen; no petroleum odor
	12	8		2						No sheen
55	18	16		3						No sheen
	16	31		4			SM			Grades fine to medium and moist to wet Grayish brown silty fine to medium sand with gravel (medium dense, moist) (glacially consolidated soils)
	16	31		4						Gravel encountered; weathered glacial till
	16	31		4						Becomes dense with increased gravel content
50	15	29		5						
	14	44		6			ML			Brownish gray to gray silt with sand and occasional gravel (hard, moist)
40										Groundwater encountered at approximately 19 feet during drilling Glaciolacustrine

Note: See Figure A-1 for explanation of symbols.

### Log of Boring GEI-1



Project: Redmond Senior Living Community  
 Project Location: Redmond, Washington  
 Project Number: 12406-012-00

Figure A-2  
 Sheet 1 of 1

Drilled	Start 5/28/2015	End 5/28/2015	Total Depth (ft)	28	Logged By DTM/SJB	Checked By DPC	Driller Geologic Drill, Inc.	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) Vertical Datum	87 NAVD88			Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50
Latitude Longitude				System Datum	N/A			Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes:								See remarks	

Elevation (feet)	FIELD DATA						Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0							GP SM	Crushed gravel surfacing Dark brown silty fine to medium sand with gravel and plastic debris (loose, moist) (fill)			
2.5		12	7		1		SM	Orange-brown silty fine to medium sand with occasional gravel (loose, moist) (glacially consolidated soils)			No sheen; weathered glacial till
5		14	15		2		SM	Becomes medium dense with gravel			
7.5		8	33		3		SP-SM ML	Orange-brown coarse sand with silt (medium dense, moist) Gray-brown sandy silt with gravel (stiff, moist)			No sheen
10		15	26		4 SA			Becomes very stiff	15	53	
12.5							SM	Orange-brown to gray silty fine to medium sand with gravel and occasional cobbles (dense to very dense, moist)			Light oxidation staining Large cobbles encountered
15		10	40		5						
17.5							SM	Becomes very dense, moist to wet			
20		7	53		6						
22.5							GM	Brown silty fine to coarse gravel with sand (dense, wet) (advance outwash)			Groundwater encountered at approximately 25 feet during drilling
25		8	87		7						
27.5		5	50/6"		8						

Note: See Figure A-1 for explanation of symbols.

### Log of Boring GEI-2



Project: Redmond Senior Living Community  
 Project Location: Redmond, Washington  
 Project Number: 12406-012-00

Figure A-3  
 Sheet 1 of 1

Redmond: Date: 6/16/15 Path: C:\USERS\KJANCI\DESKTOP\1240601200.GPJ DB: Template\LIB\Template: GEOENGINEERS8.GDT\GEIB\_GEOTECH\_STANDARD

Drilled	Start 5/28/2015	End 5/28/2015	Total Depth (ft)	41.5	Logged By DTM/SJB	Checked By DPC	Driller Geologic Drill, Inc.	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) Vertical Datum	95 NAVD88			Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50
Latitude Longitude				System Datum	N/A			Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes:								Not encountered	

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0						SOD	Sod			
						SM	Dark brown grading to light brown silty fine to medium sand with occasional gravel and grass roots (medium dense, moist) (glacially consolidated soils)			No sheen; weathered glacial till
5	14	12	1				Becomes grayish-brown and moist	12	41	No sheen
	18	27	2							
	18	25	3							
10	14	48	4				Becomes dense			
15	3	50/5**	5			GM	Grayish brown silty gravel with sand (very dense, moist) (advance outwash)			*Blow count overstated
20	1	86/11"	6							Poor recovery due to rock in sampler shoe
25	9	50/6"	7	SA				6	13	
30						SM	Gray silty fine to coarse sand with gravel (very dense, wet)			Groundwater encountered during drilling

Note: See Figure A-1 for explanation of symbols.

### Log of Boring GEI-3



Project: Redmond Senior Living Community  
 Project Location: Redmond, Washington  
 Project Number: 12406-012-00

Figure A-4  
 Sheet 1 of 2

Elevation (feet)	FIELD DATA						MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
30	16	84		8						
35	18	90		9						
40		76		10			ML	Gray silt (hard, moist)		Fissured glaciolacustrine

Note: See Figure A-1 for explanation of symbols.

**Log of Boring GEI-3 (continued)**



Project: Redmond Senior Living Community  
 Project Location: Redmond, Washington  
 Project Number: 12406-012-00

Drilled	Start 5/28/2015	End 5/28/2015	Total Depth (ft)	21.5	Logged By DTM/SJB	Checked By DPC	Driller Geologic Drill, Inc.	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) Vertical Datum	74 NAVD88			Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment	Diedrich D-50	
Latitude Longitude				System Datum	N/A		Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:							See remarks		

Elevation (feet)	FIELD DATA						Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing								
0								SOD	Sod				
								SM	Brown silty fine to medium sand with occasional gravel and roots (medium dense, moist) (fill)				No sheen
5	6	25		1					Becomes dense				No sheen
	8	38		2									
10	16	33		3A 3B %F				SM	Grayish brown with oxidation staining silty fine sand with gravel (dense, moist) (glacially consolidated soils)	8	22		Weathered glacial till
	12	40		4									
15	9	38		5A 5B					Becomes wet				
									Grades to gray				Groundwater encountered at approximately 15 feet during drilling
20	0	50/4" 100/6"		6					Grades to with cobbles; clasts of sandy silt and clay with occasional oxidation staining; very dense				No recovery, resampled with California sampler
	14												

Note: See Figure A-1 for explanation of symbols.

### Log of Boring GEI-4



Project: Redmond Senior Living Community  
 Project Location: Redmond, Washington  
 Project Number: 12406-012-00

Figure A-5  
 Sheet 1 of 1

## **APPENDIX B**

### **Laboratory Testing**

## **APPENDIX B LABORATORY TESTING**

### **General**

Soil samples obtained from the borings were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate engineering properties of the soil. Representative samples were selected for laboratory testing that consisted of moisture content, percent fines, and sieve analysis. The tests were performed in general accordance with test methods of the American Society for Testing and Materials (ASTM) or other applicable procedures.

### **Soil Classifications**

All soil samples obtained from the borings were visually classified in the field and/or in our laboratory using a system based on the Unified Soil Classification System (USCS) and ASTM classification methods. ASTM test method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. These classification procedures are incorporated in the boring logs shown in Figures A-2 through A-5 in Appendix A.

### **Moisture Content Determinations**

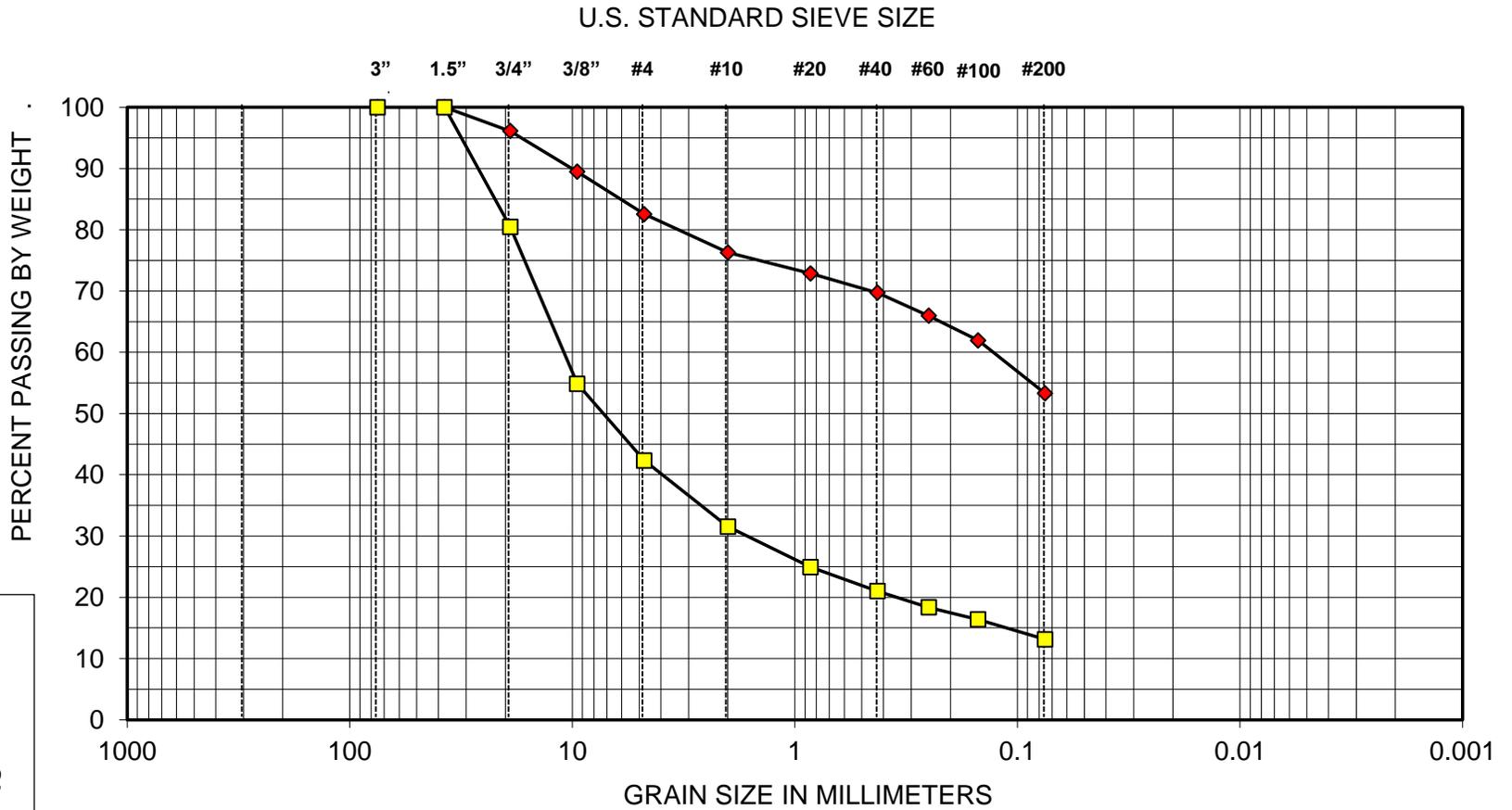
Moisture contents were determined in general accordance with ASTM D 2216 for nine samples obtained from the borings. The results of these tests are presented on the boring logs at the respective sample depth in Appendix A.

### **Percent Fines Determinations**

Percent fines were determined in general accordance with ASTM D 1140 for two samples obtained from the borings. The results of these tests are presented on the boring logs at the respective sample depth in Appendix A.

### **Sieve Analysis**

Sieve analyses were performed on two samples obtained from the borings. The analyses were conducted in general accordance with ASTM D 422. The wet sieve analysis method was used to determine the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the USCS, and presented on Figure B-1.



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	SOIL CLASSIFICATION
◆	GEI-2	10	Sandy silt with gravel (ML)
■	GEI-4	25	Silty gravel with sand (GM)

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

The grain size analysis results were obtained in general accordance with ASTM D 6913.

**APPENDIX C**  
**Previous Explorations**

## **APPENDIX C PREVIOUS EXPLORATIONS**

Previous explorations by GeoEngineers and others, completed in the project vicinity, were reviewed as part of this study. The following exploration log has been included on the site plan and are presented in the following figures

- B-7 from CH2M Hill. “Final Soils Report, SR 202, East Lake Sammamish Parkway to Sahalee Way NE.” dated November 1992.



PROJECT NUMBER SEA30738.G1	BORING NUMBER B-7 (673)	SHEET 1 OF 2
SOIL BORING LOG		

*Qurd*  
*As Not Entered*  
*Missing*

PROJECT SR 202 LOCATION STA 158+25, 65' LEFT  
 ELEVATION APPROXIMATELY 125 DRILLING CONTRACTOR D.A.KENNER, SHERWOOD, OR  
 DRILLING METHOD AND EQUIPMENT MUD ROTARY CME 75  
 WATER LEVELS NOT AVAILABLE START 1-20-92 FINISH 1-20-92 LOGGER J.C.

DEPTH BELOW SURFACE (FT)	SAMPLE			STANOARO PENETRATION TEST RESULTS 6" - 6" - 6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	INTERVAL (FT)	TYPE AND NUMBER	RECOVERY (FT)			
5.0	5.0					Sand, silt and gravel to 5'.
6.5	6.5	S-1	1.3	9-13-17 (30)	SILTY GRAVEL (GM), brown, moist, medium dense, approximately 40% silt, 2" minus poorly graded gravel.	Large rock from 3-4'.
10.0	10.0			112		
11.0	11.0	S-2	1.0	48-56/6"	Top 4": SILTY SAND (SM) brown, moist, very dense. Bottom 8": Weathered Quartz, white and brown, moist, very dense, breaks into 0.75" minus pieces. <i>22% Fines</i>	
15.0	15.0					
16.5	16.5	S-3	0.5	13-18-23 (41)	SILTY GRAVEL WITH SAND (GM) brown, moist, dense, approximately 30% silt, 2" minus, poorly graded gravel, with approximately 15% fine and coarse grained sand.	
20.0	20.0			110		Driller notes that the stratum is layered - gravel layer, silty gravel and cobbles, and then silt and sand.
21.4	21.4	S-4	1.1	36-38-60/5	WELL GRADED GRAVEL WITH SILT (GW-GM), brown, moist, very dense, 2" minus gravel (broken by sampler), with approximately 10% silt.	
25.0	25.0			144		
25.9	25.9	S-5	?	43-60/5"	WELL GRADED GRAVEL WITH SAND AND SILT (GW-GM), brown, moist very dense, 1.5" minus gravel, approximately 15% sand, approximately 10% silt.	
30.0	30.0					Driller notes that hit cobbles at 29'. Lost about 20 gallons of mud.

*SM-(20)*  
*SPT=83*  
*Bottom of Hole near 30'* *No gw encountered*

**APPENDIX D**  
**Report Limitations and Guidelines for Use**

## **APPENDIX D REPORT LIMITATIONS AND GUIDELINES FOR USE<sup>1</sup>**

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 Wolff Enterprises II, LLC and other project team members for the 6006 East Lake Sammamish development project in Redmond, Washington. 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 for the 6006 East Lake Sammamish Development 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.

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.

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<sup>1</sup> Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; [www.asfe.org](http://www.asfe.org).

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.

### **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.

### **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.

### **Environmental Regulations Are Always Evolving**

Some substances may be present in the vicinity of the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substances, change or if more stringent environmental standards are developed in the future.

### **Uncertainty May Remain Even After This Environmental Soil Sampling Is Completed**

Performance of environmental soil sampling is intended to reduce uncertainty regarding the potential for contamination in connection with a property, but no environmental sampling can wholly eliminate that uncertainty. Our interpretation of subsurface conditions in this study is based on field observations and chemical analytical data from widely spaced sampling locations. It is always possible that contamination exists in areas that were not explored, sampled or analyzed.

### **Soil and Groundwater End Use**

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other properties or for other on-site uses of the affected soil and/or groundwater. Note that hazardous substances may be present in some of the on-site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or groundwater from the subject property or reuse of the affected soil or groundwater on-site to evaluate the potential for associated environmental liabilities. We are unable to assume responsibility for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject property to another location or its reuse on-site in instances that we did not know or could not control.

**CRITICAL AREA STUDY**

**AND**

**MITIGATION PLAN**

**FOR**

***EAST LAKE SAMMAMISH APARTMENTS***  
***REDMOND, WA***

*Wetland Resources, Inc. Project #16010*

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March 10, 2016

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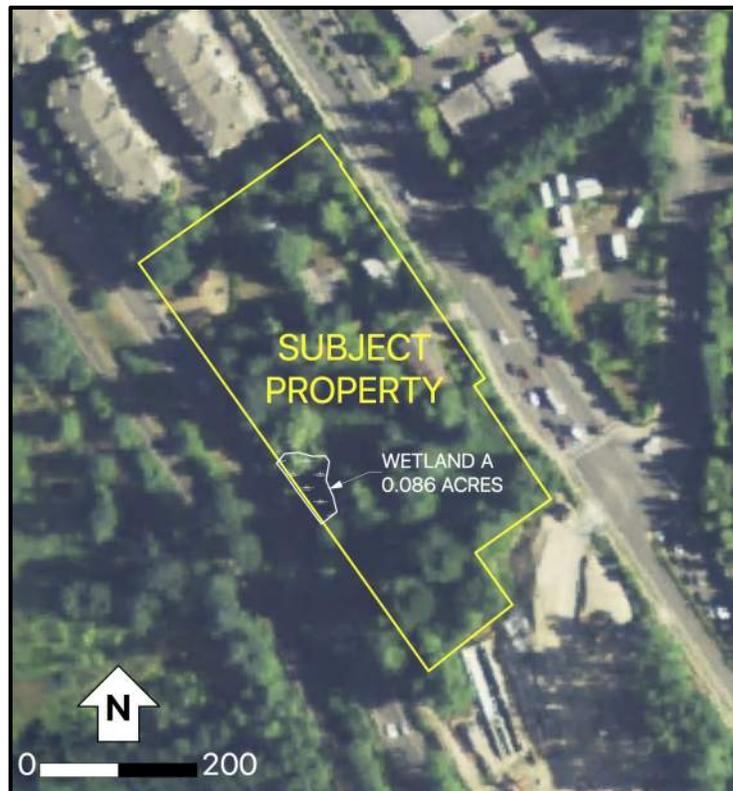
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## 1.0 INTRODUCTION

The subject site comprised of multiple parcels located at 18269 and 18475 Redmond-Fall City Road, as well as 6006, 6032, and 6038 E Lake Sammamish Parkway NE, in the City of Redmond, Washington (parcel #s: 1318300164, 1318300125, 1318300142, 1318300144, 1318300156, and 1825069025) within a portion of Section 7, Township 25N, Range 6E, W.M. The site has a total area of approximately 3.39 acres, and is located between to major roads; E Lake Sammamish Parkway NE to the southwest, and Redmond-Fall City Road to the northeast.

Land use surrounding the project area is primarily dense multi-family residential complexes. To the west and southwest, the site is adjacent to a forest/scrub-shrub environment located within Marymoor Park. The site is comprised of six legal lots, with several single-family residences currently present. The topography of the site has a western aspect, sloping towards E Lake Sammamish Parkway NE.



**Figure 1: Aerial view of the subject property.**

*Wetland Resources, Inc.* (WRI) visited the subject site on February 4, 2016, to locate jurisdictional wetlands and streams on the subject parcels. The site investigation verified the location and extent of a wetland, which had been previously delineated and rated by *Altman Oliver Associates, LLC* (corresponding report: “*Wetland Delineation and Rating for Parcel 131830-0164*”). The Wetland was rated using the Department of Ecology’s 2014 Washington State Wetland Rating System for Western Washington. The previous report rated the on-site wetland using the previous 2004 version of the rating system. One wetland (Wetland A) is located on the subject site, and is

located along the center of the southwest property boundary running parallel with E Lake Sammamish Parkway NE.

The *Altman Oliver Associates, LLC* report rates Wetland A as Category IV. Additionally, the wetland is described as requiring a 50-foot buffer per Redmond Code if it will be adjacent to a high-intensity impact. The on-site buffer areas surrounding these sensitive areas are comprised primarily of invasive Himalayan blackberry (*Rubus armeniacus*), with an overstory of Douglas fir (*Pseudotsuga menziesii*) and big-leaf maple (*Acer macrophyllum*).

Wetland Resources Inc. concurs with the on-site wetland boundary described by *Altman Oliver Associates, LLC*. A new rating was performed to account for the change in current rating system, however the rating for the on-site critical area was consistent with that determined by the *Altman Oliver Associates, LLC* report. Redmond Zoning Code (RZC) 21.64.030(B)(2) requires 50-foot buffers for Category IV wetlands, which coincides with that recommended within the previous report as well.

## **1.1 PROJECT DESCRIPTION**

The applicant is proposing to develop multifamily housing on the subject site, which is consistent with surrounding land use. Two primary residential buildings will be constructed.

In order to install required frontage improvements, as well as properly grade the site as necessary for construction of the multifamily units, the majority of Wetland A will be filled. Given the degree of impact to the functions and values associated with these required activities, the entire wetland will be considered to be filled/impacted.

The applicant proposes to mitigate for the impacts to Wetland A through use of King County's Mitigation Reserves program to pay an "in-lieu fee." This fee will be used to establish similarly vegetated areas that will provide functions and values that are at least the equivalent to those associated with Wetland A. The subject site is located within the Sammamish River Service Area, and the mitigation that will be undertaken by King County using the provided fee will be in the same service area. This meets the fundamental requirement that the mitigation will provide functions and values to the same sub-basin that will be impacted.

Quantifying the relative importance of the functions and values associated with Wetland A was done using the Washington Department of Ecology (DOE) Credit-Debit System, which is made up of several components including the scoring form, the "debit" worksheet, and the "credit" worksheet. The scoring form is essentially the same as the 2014 version of the (DOE) Washington Wetland Ration System for Western Washington. The form calculates a score for each of the primary functions provided by the Wetland; water-quality functions, hydrology functions, and habitat functions.

The "debit" worksheet uses these scores to determine a functional "debit" (loss of function based on the amount of impact to the subject wetland). King County's Mitigation Reserves program provides mitigation actions after collecting the "in-lieu fee," and therefore after impact to the subject wetland has occurred. However, the "debit" worksheet is designed to take into account

temporal functional losses associated with the different wetland vegetative communities impacted, and consequently quantifies a higher relative importance to the lost functions.

The “credit” worksheet is designed for use by applicants providing their own on-site or off-site compensatory mitigation. This worksheet calculates the relative functional “credit” (level of functions provided by the mitigation area) in order to ensure that functional loss is not greater than the functional gain provided by proposed mitigation. However, the “credit” worksheet component is not calculated when using King County’s Mitigation Reserves Program. This is because the applicant is not providing compensatory mitigation directly, but rather funding the County to do so with their program.

Through the *King County Mitigation Reserves Program In-lieu Fee Instrument (Appendix C)*, which is an agreement between King County, DOE, and the United States Army Corps of Engineers (USACOE), mitigation within management service areas has been determined to sufficiently compensate for functional wetland losses, when “acre-points” quantified with the “debit” worksheet are used to calculate the “in-lieu fee” necessary to fund the mitigation actions. Specific “debit” calculation data is provided within the functions and values assessment below, and the scoring form and “debit” worksheet are provided in *Appendix B* of this report.

Mitigation standards and criteria in RZC 21.64.010.L.2.b requires that on-site or off-site compensatory mitigation under control of the applicant must be attempted prior to use of mitigation banking or “in-lieu fee” programs. On-site mitigation through wetland creation is not functionally appropriate given the steep aspect of the site. Wetlands artificially created within topographically steep areas are prone to failure due to the inability to effectively impound adequate hydrology. Additionally, after discussions with City of Redmond staff, as well as multiple attempts by the applicant to acquire an off-site mitigation area, it appears that no suitable mitigation site within the same sub-basin is available within the city limits. However, efforts to find a suitable off-site mitigation area continue. In the event that the search is successful, off-site compensatory mitigation will be performed as detailed in an approved mitigation plan with the city. As stated above, mitigation standards required by RZC 21.64.010.L.2.b set a higher preference for off-site compensatory mitigation under control of the applicant than for mitigation banking or “in-lieu fee” programs.

Given the lack of mitigation site alternatives, the applicant is currently proposing to mitigate impacts to Wetland A using the King County Mitigation Reserves Program. Using this “in-lieu fee” program will adequately mitigate on-site wetland impacts, account for temporal functional losses, and will apply the highest preference of mitigation sequencing available (thus complying with RZC 21.64.010.L.2.b).

## **1.2 CRITICAL AREAS CLASSIFICATIONS**

### **1.2.1 Cowardin System Classifications**

According to the Cowardin System, as described in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin 1979), the classification for the on-site critical areas are as follows:

**Wetland A:** Palustrine, Forested Wetland, Needle-leaved Deciduous, Saturated (PFO2B).

### **1.2.2 City of Redmond Classifications**

Under Chapter 21.64 of the RZC the on-site critical areas are classified as follows:

#### *Wetland A*

Category IV wetland: This wetland scores a total of 13 points on the Wetland Rating Form (2014) for Western Washington, which equates to a Category IV rating. Wetland A has a multi-stratum vegetation structure comprising its forested vegetation class. However, vegetation species diversity is minimal, and comprised primarily of invasive blackberry. This wetland scores 4 points (low) for habitat functions, which Redmond Zoning Code equates to providing low habitat value for wildlife (RZC Table 21.64.030A). In the City of Redmond, Category IV wetlands adjacent to current or planned high-intensity land use typically receive a standard buffer of 50 feet.

## **2.0 STATEMENT OF QUALIFICATIONS**

The work for this Critical Areas Study and Mitigation Plan was conducted by Scott Walters.

Scott Walters holds a Bachelor of Science degree in Wildlife Conservation Biology and Applied Vertebrate Ecology. Additional training includes an advanced certificate in Aquarium and Aquatic Sciences, and a post-Baccalaureate certificate in Wetland Science and Management from the University of Washington. Scott has worked as an ecologist on projects across the country for over 7 years, including scientific study of wetlands, environmental restoration monitoring, endangered species monitoring, and shorebird population research.

## **3.0 CRITICAL AREAS DETERMINATION REPORT**

### **3.1 PUBLICLY AVAILABLE DATA**

Prior to conducting the site investigation, public resource information was reviewed to gather background information on the subject property and the surrounding area in regards to wetlands, streams, and other critical areas. These sources included the following:

#### *USDA/NRCS Web Soil Survey*

The northeastern portion of the site is predicted to have Indianola Loamy Sand, 5 to 15 percent slopes; the northwestern portion is predicted as Indiana Loamy Sand, 0 to 5 percent slopes; and the southern extent of the site is predicted to be Seattle Muck. A more detailed soil map unit description is provided in the “3.2 Field Determination Methodology” section below.

*DNR FPAMT Mapping Application*

A Type-F stream is mapped 0.15 miles west of the site, and a second Type-F is 0.65 miles to the east. However, no hydrologic connection is identified to the subject site, which is physically separated from these features by major roadways on either side.

*King County iMap*

Across E Lake Sammamish Parkway, *iMap* identifies an extensive wetland complex associated with the northern end of Lake Sammamish, which is drained by the Sammamish River. The subject site is primarily upslope of this wetland, and the separation by the road disallows a direct hydrologic connection between the off-site wetland and the subject site. The presence of the stream identified by *DNR* to the northeast of the site is confirmed, and further identified as Evans Creek. A second wetland complex is associated with Evans Creek. Due to both distance, as well as development, there is no connection between the subject site and this second wetland system.

*WDFW SalmonScape Interactive Mapping System*

Identifies presence of salmonids within the stream to the northeast (~0.65 miles NE of the site; see *DNR* above), as well as the Sammamish River (~0.8 miles SW of the site). *SalmonScape* does not identify any recorded salmonid distributions in the nearby stream to the southwest (~0.15 mile) identified by *DNR*.

*WDFW Priority Habitat and Species (PHS) Interactive Map*

Confirms the presence of both wetland complexes identified by *King County iMap*. Additionally, the wetland system associated with Lake Sammamish is designated as a Biodiversity Corridor.



**Figure 2: Aerial view of wetland areas near the subject site.**

**(Source: WDFW PHS interactive map; subject parcel is in dark purple)**

*USFWS National Wetlands Inventory (NWI)*

Confirms the presence of the wetlands identified by the *WDFW PHS Interactive Map* and *King County iMap*.

*City of Redmond 64.4 Wetlands Map*

As the majority of the wetland area associated with Lake Sammamish is located in Marymoor Park (outside of the City of Redmond), only those portions within the city are depicted. The Evans Creek Wetlands complex is mapped as well. No wetlands are mapped on the subject site.

### **3.2 FIELD DETERMINATION METHODOLOGY**

Wetland Resources' staff conducted a site visit on February 4, 2016, to locate wetlands and streams occurring within and near the project site. As part of this site visit, the routine delineation previously conducted by *Altman Oliver Associates, LLC* was reviewed. Wetland conditions were evaluated using routine methodology described in the *2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, (referred to as the 2010 Regional Supplement). The methodology in the 2010 Regional Supplement coincides with the methodology described in the *Washington State Wetlands Identification and Delineation Manual* (Washington State Department of Ecology Publication #96-94, March 1997). Our findings are consistent with both manuals.

The following criteria descriptions were used in the boundary determination:

- 1.) Examination of the site for hydrophytic vegetation (species present and percent cover);
- 2.) Examination of the site for hydric soils;
- 3.) Determining the presence of wetland hydrology

The Washington State Department of Ecology document *Determining the Ordinary High Water Mark on Streams in Washington State (Second Review Draft)* (Olson and Stockdale 2010) was used to determine the presence of any streams on the subject site.

#### **3.2.1 Hydrophytic Vegetation Criteria**

The 2010 Regional Supplement defines hydrophytic vegetation as “the community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to exert a controlling influence of the plant species present.” Field indicators were used to determine whether the vegetation meets the definition for hydrophytic vegetation. One of the most common indicators for hydrophytic vegetation is when more than 50 percent of a plant community consists of species rated “Facultative” and wetter on lists of plant species that occur in wetlands.

### **3.2.2 Soils Criteria and Mapped Description**

The manuals define hydric soils as those that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Field indicators are used for determining whether a given soil meets the definition for hydric soils.

According to the NRCS Web Soil Survey, the soil map units Indianola Loamy Sand, 5 to 15 percent slopes and 0 to 5 percent slopes, as well as Seattle Muck, are predicted to occur on the subject property.

Indianola loamy sand is a very deep, somewhat excessively drained soil on terraces and outwash plains. It formed in sandy glacial outwash, and occurs into areas that are 5 to 30 acres in size. The native vegetation is mainly conifers, and elevation is 50 to 500 feet. Typically, the surface is covered with a mat of needles, leaves, and twigs about 2 inches thick. The surface layer is very dark grayish brown loamy sand about 4 inches thick. The subsoil is dark yellowish brown loamy sand about 20 inches thick. The substratum to a depth of 60 inches or more is light olive gray and grayish brown sand. Also included are areas of Everett, Indianola, Pastik, and Ragnar soils and Custer soils in basins. Included areas make up about 15 percent of the total acreage. Permeability of this Indianola soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. Cut-banks on the soil in this unit are subject to caving in.

Seattle Muck is made up of very poorly drained organic soils that formed in material derived primarily from sedges. These soils are in depressions and valleys on the glacial till plain and also in the river and stream valleys. Slopes are 0 to 1 percent. In a representative profile, the surface layer is black muck about 11 inches thick. It is underlain by dark reddish-brown, black, very dark brown, and dark-brown muck and mucky peat that extends to a depth of 60 inches or more. The subsurface layers are stratified mucky peat, muck, and peat that formed mostly from sedges. Where these soils adjoin mineral soils, some layers are 25 percent wood fragments. Some areas are up to 30 percent inclusions of Tukwilla soils, which are deep mucks, and Shalcar soils, which are shallow over a mineral substratum; and some areas are up to 15 percent inclusions of the wet Bellingham and Norma soils. Total inclusions do not exceed 30 percent. Permeability is moderate. There is a seasonal high water table at or near the surface. Available water capacity is high.

### **3.2.3 Hydrology Criteria**

As stated in the 2010 Regional Supplement, the “term wetland hydrology encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for a sufficient duration during the growing season.” It also explains “areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and chemically reducing conditions, respectively.”

The results of the site investigation verified the findings of *Altman Oliver Associates, LLC*. There is one wetland (A) was identified on the subject site. The wetland was rated pursuant to the

Washington State Wetland Rating System for Western Washington 2014 update (Hruby 2014). No streams were identified on the subject site.

### **3.3 WETLAND BOUNDARY DETERMINATION FINDINGS**

#### **3.3.1 Wetland A**

This wetland extends off-site to the southwest, terminating at the edge of E Lake Sammamish Parkway NE. The on-site portion of Wetland A is present along the center of the southwestern property boundary, and is a relatively small in size. Wetland A spans approximately 100 feet in length northeast to southwest, and is approximately a 0.086-acre in size.

Dominant vegetation in the on-site portion of Wetland A is represented by Pacific willow (*Salix lasiandra*; FACW), Himalayan blackberry (*Rubus armeniacus*; FACU), and lady fern (*Athyrium filix-femina*; FACW). The majority of the dominant species rate “facultative” or wetter, indicating that a hydrophytic vegetative community is present in the areas mapped as wetland. It is important to note that while vegetation data presented in the USACOE wetland determination data forms (*Appendix D*) do not specifically support the presence of Pacific willow within the wetland data plot (data point S1), this is because data was taken near the wetland boundary (where willow was lacking). Presence of lady fern within Wetland A versus absence in the abutting upland areas additionally confirms the presence of a hydrophytic community.

Soils in this wetland from 0 to 10 inches below the surface have a Munsell color of very dark brown (10YR 2/2) with a sandy clay loam texture. From 10 to at least 16 inches below the surface, the soil is dark gray (10YR 4/1) with prominent strong brown (7.5YR 4/6) redoximorphic features, and has a sandy clay loam texture. This soil profile meets the Depleted Below Dark Surface (A11) and Depleted Matrix (F3) hydric soil indicators. Soils saturated to the surface at the time of our February 2016 site visit, and the water table was observed at 10 inches below the surface.

Field observations indicate that the area mapped as wetland is flooded, ponded, or saturated long enough during the growing season to develop anaerobic conditions in the upper part of the soils. Therefore, the vegetation, soil, and hydrologic criteria are all met for Wetland A.

#### **3.3.2 Non-wetland Areas**

In the non-wetland area adjacent to Wetland A, dominant vegetation is represented by big-leaf maple (*Acer macrophyllum*; FACU), western red cedar (*Thuja plicata*; FAC), Douglas fir (*Pseudotsuga menziesii*; FAC), and Himalayan blackberry (*Rubus armeniacus*; FACU). Only half of the dominant species rate “facultative” or wetter, which does not strongly indicate the absence of a hydrophytic vegetative community.

Typical soils in the area adjacent to Wetland A that are mapped as non-wetland have a Munsell color of very dark grayish brown (10YR 3/2), with a sandy clay loam texture, from 0 to 9 inches beneath the soil surface. The underlying soil layer is dark yellowish brown (10YR 4/4) sandy loam, to at least 18 inches beneath the surface. This soil profile does not meet any hydric soil indicators. Soils were slightly moist at the time of our February 2016 site investigation.

Although the dominant vegetative community is possibly hydrophytic, hydric soils are absent in these areas, and direct hydrologic indicators are lacking. Therefore, the areas adjacent to Wetland A do not meet wetland criteria.

### **3.3.3 Wildlife**

Wetland A and its associated edges are isolated from any nearby habitat due to major roadways and high intensity development in all directions. Therefore the site does not function suitably as a wildlife movement corridor. However, this critical area and the associated buffer contain resources such as food, water, thermal cover, and hiding cover in close proximity for avians that may use the blackberry for perches. Mammalian use is likely minimal due to the isolated nature of the site. Given the simple vegetation structure, as well as the disturbance created by nearby development, the wetland provides relatively low quality wildlife habitat.

No mammalian species were detected during our on-site investigation in February 2016, although several species, including gray squirrels (*Sciurus* spp.), may occur within the area. Avian activity was not strongly detected. However, given the habitat available nearby, it is expected that the following avian species use the area: American Crow (*Corvus brachyrhynchos*), American Robin (*Turdus migratorius*), Steller's Jay (*Cyanocitta stelleri*), Black-capped Chickadee (*Poecile atricapilla*), Dark-eyed Junco (*Junco hyemalis*), Song Sparrow (*Melospiza melodia*), and kinglets (*Regulus* spp.)

## **4.0 FUNCTIONS AND VALUES ASSESSMENT**

### **4.1 METHODOLOGY**

The methodology for this functions and values assessment is based on professional opinion developed through past field analyses and interpretation. This assessment pertains specifically to the on-site wetlands, but is typical for assessments of similar systems common to western Washington.

### **4.2 FUNCTIONS AND VALUES COMPONENTS**

Wetlands in western Washington perform a variety of ecosystem functions. Included among the most important functions provided by wetlands are stormwater storage and flood flow attenuation, water quality improvement, and fish and wildlife habitat. An assessment of these functions for the project site is provided below.

### **4.3 EXISTING CONDITIONS**

#### **4.3.1 Wetland A**

The on-site portion of this Category IV wetland is an isolated slope wetland that is unable to sequester a significant volume of hydrology given its size and topography. Wetland A is a forested and scrub-shrub wetland system within a highly developed matrix. The wetland does

not flood, only ever becoming saturated. Thus providing only a single hydrologic environment throughout the year. The vegetation community is comprised primarily of invasive Himalayan blackberry, and lacks much structural complexity. Given the poor quality vegetative community, as well as disturbed habitat connections, Wetland A provides relatively low wildlife habitat functions. As the only hydroperiod present is saturated only, no fish habitat is available.

Slope wetlands are intrinsically unable to provide significant flood storage, except marginally within any small depressions that may exist along the slope. Sloped areas with dense, persistently stemmed vegetation moderate runoff surface flows and rates, and provide water quality functions by capturing sediment as surface flows are transported through the vegetative structure. As in depressional wetland situations, sediment particles are often ionically bonded to chemical nutrients and environmental pollutants. The majority of Wetland A is sloped with persistently stemmed vegetation, thus providing these important functions. However, due to its limited size, and a relatively small contributing basin, Wetland A does not provide significant water quality or hydrologic functions. Nor does Wetland A significantly reduce erosion. Additionally, the primary source of hydrology is from a hillside seep, not stormwater surface flows.

#### **4.4 FUNCTIONAL ASSESSMENT OF PROPOSED “IN-LIEU FEE” MITIGATION)**

The applicant proposes to mitigate for the impacts to Wetland A through use of King County’s Mitigation Reserves program to pay an “in-lieu fee.” Through the *King County Mitigation Reserves Program In-lieu Fee Instrument*, which is an agreement between King County, DOE, and the United States Army Corps of Engineers (USACOE), mitigation within management service areas has been determined to sufficiently compensate for functional wetland losses, when “acre-points” quantified with the “debit” worksheet are used to calculate the “in-lieu fee” necessary to fund the mitigation actions.

Wetland A comprises a surveyed area of 3,763 square feet, or 0.086 acres. In order to calculate the temporal functional losses associated with impacting the entire wetland, different vegetation communities need to be considered separately based on the relative time lags required to achieve a mature, functioning ecosystem. Non-forested areas account for 0.042 acres of Wetland A, deciduous forest 0.032 acres, and evergreen forest 0.014 acres.

**Table A: Relative areas of wetland vegetative communities**

<b>Vegetative Community</b>	<b>Wetland Area</b>	<b>Proportion of Wetland</b>
<b>Non-forest</b>	0.042	0.49
<b>Deciduous forest</b>	0.031	0.36
<b>Evergreen forest</b>	0.013	0.15
<b>All communities</b>	<b>0.086</b>	<b>1.00</b>

The DOE wetland scoring form was used to quantify the relative value of the primary functions provided by Wetland A. These functional scores are used in the “debit” worksheet to calculate the “Acre-points” required to adequately mitigate for the functional loss associated the different vegetation communities proposed to be impacted. The sum total is a required 4.095 Acre-points.

**Table B: “Debit” calculations for impacts to Wetland A**

	<b>Water Quality Functions</b>	<b>Hydrologic Functions</b>	<b>Habitat Functions</b>
<b>Score for Wetland A</b>	5	4	4
<b>Non-forested Acre-points required</b>	0.630	0.504	0.504
<b>Deciduous forest Acre-points required</b>	0.620	0.496	0.496
<b>Evergreen forest Acre-points required</b>	0.325	0.260	0.260
<b>Total Acre-points required for function</b>	<b>1.575</b>	<b>1.26</b>	<b>1.26</b>
<b>Total Acre-points required for all functions</b>	<b>4.095</b>		

The total area of Wetland A, as well as the total required Acre-points are used to calculate the cost of the “in-lieu fee” for using the King County Mitigation Reserves Program. In the Sammamish River Service Area, Acre-points are priced at approximately \$36,000.00 per Acre-point. An additional “land fee” priced at approximately \$0.88 per square foot of wetland impact/fill. Prices are not final until approved by King County program management.

**Table C: Approximate cost of King County “in-lieu fee” for Wetland A**

	<b>Wetland A Area / Acre-point value</b>	<b>Unit Price</b>	<b>Cost</b>
<b>Land Fee</b>	3,763 square feet	\$0.88 per Sq. ft.	<b>\$3,311.<sup>44</sup></b>
<b>Sammamish River Service Acre-point Cost</b>	4.095 Acre-points	\$36,500. <sup>00</sup> per Acre-Point	<b>\$149,467.<sup>50</sup></b>
<b>Total Mitigation Cost</b>	<b>\$152,778.<sup>94</sup></b>		

Management staff of the King County Mitigation Reserves Program shall be responsible for determining the most appropriate mitigation actions to successfully provide functional lifts commiserate with functional losses associated with Wetland A. This will include any ongoing management practices that will protect the critical area in perpetuity. Performance standards as described within RZC 21.64.010.M shall be adequately addressed by the program. Given the “in-lieu fee” nature of the King County Mitigation Reserves Program, a discussion of mitigation planning performance standards is not germane here.

The applicant is proposing to use the King County Mitigation Reserves Program in the absence of alternative off-site mitigation options. Despite the current lack of available appropriate off-site mitigation areas, efforts to find a suitable site continue. In the event that the search is successful, off-site compensatory mitigation will be performed as detailed in an approved mitigation plan with the city. As stated previously, mitigation sequencing required by RZC 21.64.010.L.2.b sets a higher preference for off-site compensatory mitigation than for mitigation banking or “in-lieu fee” programs.

Using the King County Mitigation Reserves Program will adequately mitigate on-site wetland impacts, account for temporal functional losses, and will apply the highest preference of mitigation sequencing available (thus complying with RZC 21.64.010.L.2.b).

## 5.0 COMPLIANCE WITH RZC 21.64.010.I

RZC 21.64.010.I enumerates a mitigation sequence that is required to be followed in order of priority. Portions of the city of Redmond Zoning code are in italics below, with responses provided in normal text underneath:

### *I. General Mitigation Standard.*

1. *All significant adverse impacts to critical areas functions and values shall be mitigated. Mitigation actions by an applicant or property owner shall occur in the following sequence:*

- a. *Avoiding the impact altogether by not taking a certain action or parts of actions;*

In order to make economic use of the property, necessary frontage improvements mandated by City of Redmond code will unavoidably fill the majority of Wetland A. Additionally, appropriate grading that is necessary to construct the residences will impacts remaining areas of the subject wetland. Given the location of Wetland A along the western property boundary, and the requirements of the city, impact to the subject wetland is unavoidable.

- b. *Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps, such as project redesign, relocation, or timing, to avoid or reduce impacts;*

Given the location of Wetland A along the western property boundary, and the frontage improvements required by the city of Redmond, Wetland A will be unavoidably filled. Relocation of the proposed multifamily residential structures will not avoid or minimize the impacts associated with this requirement. Neither will adjustments to the timing of the proposed project minimize impacts to Wetland A.

- c. *Rectifying the impact to the critical area by repairing, rehabilitating, or restoring the affected environment to the conditions existing at the time of the initiation of the project;*

The affected environment is required to be filled in order to provide frontage improvements. Therefore, the impacted condition cannot be reversed.

- d. *Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;*

The affected environment is required to be filled in order to provide frontage improvements. Frontage improvements are maintained in perpetuity, disallowing reduction of impacts over time.

- e. *Compensating for the impact by replacing or providing substitute resources or environments; and/or*

The applicant proposes to compensate for the required impacts to Wetland A through use of the King County Mitigation Reserves program. This program will effectively provide a substitute

environment. Efforts to locate a suitable mitigation site in the vicinity of the development project are ongoing. In the event that the search for a suitable site is successful, the applicant will provide off-site mitigation as detailed in a mitigation plan approved by the City of Redmond. In this way, the applicant will comply with RZC 21.64.010.L.b.

*f. Monitoring the hazard or other required mitigation and taking remedial action when necessary.*

This form of mitigation should not be necessary, as a higher priority within the mitigation sequence (Compensation of wetland impacts off-site) shall be implemented.

## **6.0 COMPLIANCE WITH RZC 21.64.010.L**

RZC 21.64.010.L enumerates a list of performance standards, as well as locational and temporal requirements, associated with critical area mitigation. Portions of the city of Redmond zoning code are in italics below, with responses provided in normal text underneath:

### *L. Mitigation Standards, Criteria, and Plan Requirements.*

1. *Mitigation Performance Standards. Significant adverse impacts to critical area functions and values shall be mitigated. Mitigation actions shall be implemented in the preferred sequence identified in RZC 21.64.010.I. General Mitigation Standard, which include less preferred and/or compensatory mitigation shall demonstrate that:*
  - a. *All feasible and reasonable measures will be taken to reduce impacts and losses to the critical area or to avoid impacts where avoidance is required by these regulations; and*

The proposed impacts to Wetland A are necessary to construct the required frontage improvements and allow for appropriate grading in order to construct the proposed multifamily residential building. The proposed land use is consistent with that of the surrounding area.

- b. *The restored, created or enhanced critical area or buffer will be as viable and persistent as the critical area or buffer area it replaces; and*

Through the *King County Mitigation Reserves Program In-lieu Fee Instrument*, which is an agreement between King County, DOE, and the United States Army Corps of Engineers (USACOE), mitigation within management service areas has been determined to sufficiently compensate for functional wetland losses, when “acre-points” quantified with the “debit” worksheet are used to calculate the “in-lieu fee” necessary to fund the mitigation actions. These quantifications and calculations have been accurately described, and area available in *Appendix B*.

- c. *In the case of wetlands and riparian stream corridors, no overall net loss will occur in wetland or riparian stream corridor functions and values.*

Determination of a temporal loss factor magnifies the required area necessary to provide compensatory mitigation using the King County Mitigation Reserves Program. Therefore, a significantly larger area shall be restored as a result of contributing an “in-lieu fee” to this

program. Per the agreement instrument (*Appendix C*) between USACOE, King County, and DOE; mitigation through use of the King County Mitigation Reserves Program has been determined to provide no overall net loss of wetland functions.

2. *Location and Timing of Mitigation.*

- a. *Mitigation shall be provided on-site, unless on-site mitigation is not scientifically feasible due to physical features of the property. The burden of proof shall be on the applicant to demonstrate that mitigation cannot be provided on-site.*

As depicted in the Critical Area Site Map, topography of the subject site has a relatively steep western aspect. Upland areas with high topographic gradient are unable to support wetland creation efforts. This is due to a lack of hydrologic inputs or an opportunity to sequester hydrology in order to inundate an area, which is necessary to develop wetland conditions.

- b. *When mitigation cannot be provided on-site, mitigation shall be provided in the immediate vicinity of the permitted activity on property owned or controlled by the applicant, such as an easement, provided such mitigation is beneficial to the critical area and associated resources.*

After discussions with City of Redmond staff, as well as multiple attempts by the applicant to acquire an off-site mitigation area, it appears that no suitable mitigation site within the same sub-basin is available within the city limits. Therefore, mitigation through the King County Mitigation Reserves Program is proposed. Efforts to locate a suitable mitigation site in the vicinity of the development project are ongoing. In the event that the search for a suitable site is successful, the applicant will provide off-site mitigation as detailed in a mitigation plan approved by the City of Redmond. In this way, the applicant will comply with this provision of the code.

- c. *In-kind mitigation shall be provided except when the applicant demonstrates and the Department concurs that greater functional and habitat value can be achieved through out-of-kind mitigation.*

Management staff of the King County Mitigation Reserves Program shall be responsible for determining the most appropriate mitigation actions to successfully provide functional lifts commiserate with functional losses associated with Wetland A. In the event that a suitable off-site mitigation site is found, and that an approved alternative mitigation plan is implemented, in-kind mitigation shall take priority as is possible at the mitigation site.

- d. *Only when it is determined by the Department that subsections L.2.a, L.2.b, and L.2.c of this section are inappropriate and impractical, shall off-site, out-of-kind mitigation be considered.*

As it appears that no suitable mitigation site within the same sub-basin is available within the city limits, the applicant is proposing to mitigation for filling Wetland A through use of the King County Mitigation Reserves Program. As stated above, in the event that a suitable off-site mitigation site is found, and that an approved alternative mitigation plan is implemented, out-of-kind mitigation shall occur only when in-kind mitigation is deemed impracticable, or of less ecologic benefit than an out-of-kind alternative. This determination will be made based on conditions of the off-site mitigation area (if successfully acquired).

- e. *When wetland or riparian stream corridor mitigation is permitted by these regulations on-site or off-site, the mitigation project shall occur near an adequate water supply (river, stream, ground water, stormwater facility outfall) with a hydrologic connection to the critical area to ensure successful development or restoration.*

Management staff of the King County Mitigation Reserves Program shall be responsible for determining the most appropriate location within the Sammamish River Service Area to successfully provide an adequate hydrologic connection to the critical area. In the event that a suitable off-site mitigation site is found, and that an approved alternative mitigation plan is implemented, Wetland creation areas on the mitigation site shall be proposed near an adequate water supply.

- f. *Any agreed upon mitigation proposal shall be completed concurrently with project construction, unless a phased schedule that assures completion prior to occupancy has been approved by the Department.*

Mitigation actions taken as part of the King County Mitigation Reserves Program shall be undertaken at future dates to be determined by management staff of the program. Temporal functional losses have been calculated to account for losses associated with time-lags (*Appendix B*).

- g. *Wetland acreage replacement ratios shall be as specified in RZC 21.64.030.C.8.b, Wetland Replacement Ratios.*

Management staff of the King County Mitigation Reserves Program shall be responsible for implementing the appropriate replacement acreage as determined using the Acre-points calculated with the “debit” worksheet (4.095 Acre-points). In the event that a suitable off-site mitigation site is found, and that an approved alternative mitigation plan is implemented, mitigation replacement shall be consistent with the required ratios specified in Table 21.64.030B.

- h. *Restored or created riparian stream corridors, where permitted by these regulations, shall be an equivalent or higher riparian stream corridor value or function than the altered riparian stream corridor.*

Management staff of the King County Mitigation Reserves Program shall be responsible for determining the most appropriate location within the Sammamish River Service Area to incorporate any riparian stream corridor restoration or creation. In the event that a suitable off-site mitigation site is found, and that an approved alternative mitigation plan is implemented, out-of-kind mitigation shall occur only when in-kind mitigation is deemed impracticable, or of less ecologic benefit than an out-of-kind alternative. Therefore, it is unlikely that restoration or creation of a riparian stream corridor will occur on such a site, as only the proposed wetland impacts require mitigation.

- i. *All off-site mitigation shall be provided within the Redmond city limits.*

Management staff of the King County Mitigation Reserves Program shall be responsible for determining the most appropriate location within the Sammamish River Service Area to

implement the mitigation actions. However, in the event that a suitable off-site mitigation site is found, it will only be considered if located within the Redmond city limits.

## **7.0 USE OF THIS REPORT**

This Critical Area Study and Mitigation Plan is supplied to MSPT XVIII LLC as a means of determining on-site critical area conditions, and mitigating for activities within critical areas and associated buffers, as required by The City of Redmond during the permitting process. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to wetlands are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect.

The work for this report has conformed to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report, and any implied representation or warranty is disclaimed.

*Wetland Resources, Inc.*

A handwritten signature in black ink that reads "Scott Walters". The signature is written in a cursive style with a long horizontal stroke at the end.

Scott Walters  
*Associate Ecologist*

## 8.0 REFERENCES

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# **APPENDIX A**

DEPARTMENT OF ECOLOGY WETLAND RATING FORM



Wetland name or number A

## RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: Feb 4, 2016  
 Rated by S. Walters Trained by Ecology?  Yes  No Date of training 3/2014  
 HGM Class used for rating SLOPE Wetland has multiple HGM classes?  Y  N

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

**OVERALL WETLAND CATEGORY IV** (based on functions  or special characteristics )

### 1. Category of wetland based on FUNCTIONS

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

FUNCTION	Improving Water Quality		Hydrologic		Habitat				
<i>Circle the appropriate ratings</i>									
Site Potential	H	M	<input type="checkbox"/> L	H	M	<input type="checkbox"/> L	H	M	<input type="checkbox"/> L
Landscape Potential	H	<input type="checkbox"/> M	L	H	M	<input type="checkbox"/> L	H	M	<input type="checkbox"/> L
Value	H	<input type="checkbox"/> M	L	H	<input type="checkbox"/> M	L	H	<input type="checkbox"/> M	L
<b>Score Based on Ratings</b>	<b>5</b>		<b>4</b>		<b>4</b>		<b>13</b>		

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

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

### 2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	<b>I</b> <b>II</b>
Wetland of High Conservation Value	<b>I</b>
Bog	<b>I</b>
Mature Forest	<b>I</b>
Old Growth Forest	<b>I</b>
Coastal Lagoon	<b>I</b> <b>II</b>
Interdunal	<b>I</b> <b>II</b> <b>III</b> <b>IV</b>
None of the above	<input checked="" type="checkbox"/>

Wetland name or number A

## Maps and figures required to answer questions correctly for Western Washington

### Depressional Wetlands

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

### Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland ( <i>can be added to another figure</i> )	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream ( <i>can be added to another figure</i> )	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

### Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland ( <i>can be added to another figure</i> )	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

### Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	A1
Hydroperiods	H 1.2	A1
Plant cover of <b>dense</b> trees, shrubs, and herbaceous plants	S 1.3	A5
Plant cover of <b>dense, rigid</b> trees, shrubs, and herbaceous plants ( <i>can be added to figure above</i> )	S 4.1	A5
Boundary of 150 ft buffer ( <i>can be added to another figure</i> )	S 2.1, S 5.1	A1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	A2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	A3
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	A4

## HGM Classification of Wetlands in Western Washington

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

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

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

- NO - go to 2**                       **YES - the wetland class is Tidal Fringe - go to 1.1**

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

**NO - Saltwater Tidal Fringe (Estuarine)**

**YES - Freshwater Tidal Fringe**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

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

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

3. Does the entire wetland unit **meet all** of the following criteria?

The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;  
At least 30% of the open water area is deeper than 6.6 ft (2 m).

- NO - go to 4**                       **YES - The wetland class is Lake Fringe (Lacustrine Fringe)**

4. Does the entire wetland unit **meet all** of the following criteria?

- ✓ The wetland is on a slope (*slope can be very gradual*),
- ✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
- ✓ The water leaves the wetland **without being impounded**.

- NO - go to 5**                       **YES - The wetland class is Slope**

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

5. Does the entire wetland unit **meet all** of the following criteria?

- \_\_\_ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
- \_\_\_ The overbank flooding occurs at least once every 2 years.

Wetland name or number A

NO – go to 6

**YES** – The wetland class is **Riverine**

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

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

NO – go to 7

**YES** – The wetland class is **Depressional**

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

NO – go to 8

**YES** – The wetland class is **Depressional**

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

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

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

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

Wetland name or number A

### SLOPE WETLANDS

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

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

**Rating of Site Potential** If score is: 12 = H 6-11 = M  0-5 = L

*Record the rating on the first page*

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

**Rating of Landscape Potential** If score is:  1-2 = M 0 = L

*Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?		
S 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? <input type="checkbox"/> Yes = 1 <input checked="" type="checkbox"/> No = 0		0
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? <i>At least one aquatic resource in the basin is on the 303(d) list.</i> <input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0		1
S 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? <i>Answer YES if there is a TMDL for the basin in which unit is found.</i> <input type="checkbox"/> Yes = 2 <input checked="" type="checkbox"/> No = 0		0
Total for S 3 <span style="float: right;">Add the points in the boxes above</span>		1

**Rating of Value** If score is: 2-4 = H  1 = M 0 = L

*Record the rating on the first page*

The wetland is within 1 mile down-gradient of a 303d listed aquatic area. However, the wetland is not within the basin contributing to the 303d condition of that area.

Wetland name or number A

**SLOPE WETLANDS**

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

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

S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. <i>Stems of plants should be thick enough (usually &gt; 1/8 in), or dense enough, to remain erect during surface flows.</i>	<b>0</b>
<input type="checkbox"/> Dense, uncut, <b>rigid</b> plants cover > 90% of the area of the wetland	points = 1
<input checked="" type="checkbox"/> All other conditions	points = 0

**Rating of Site Potential** If score is: 1 = M  0 = L

Record the rating on the first page

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

S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff?	<b>0</b>
<input type="checkbox"/> Yes = 1	<input checked="" type="checkbox"/> No = 0

**Rating of Landscape Potential** If score is: 1 = M  0 = L

Record the rating on the first page

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

S 6.1. Distance to the nearest areas downstream that have flooding problems:	<b>1</b>
<input type="checkbox"/> The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds)	points = 2
<input checked="" type="checkbox"/> Surface flooding problems are in a sub-basin farther down-gradient	points = 1
<input type="checkbox"/> No flooding problems anywhere downstream	points = 0

S 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	<b>0</b>
<input type="checkbox"/> Yes = 2	<input checked="" type="checkbox"/> No = 0

Total for S 6	Add the points in the boxes above	<b>1</b>
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**Rating of Value** If score is: 2-4 = H  1 = M 0 = L

Record the rating on the first page

**NOTES and FIELD OBSERVATIONS:**

Wetland name or number A

**These questions apply to wetlands of all HGM classes.**

**HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat

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

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

- Aquatic bed  4 structures or more: points = 4
  - Emergent  3 structures: points = 2
  - Scrub-shrub (areas where shrubs have > 30% cover)  2 structures: points = 1
  - Forested (areas where trees have > 30% cover)  1 structure: points = 0
- If the unit has a Forested class, check if:*
- The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

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

- Permanently flooded or inundated  4 or more types present: points = 3
- Seasonally flooded or inundated  3 types present: points = 2
- Occasionally flooded or inundated  2 types present: points = 1
- Saturated only  1 type present: points = 0
- Permanently flowing stream or river in, or adjacent to, the wetland
- Seasonally flowing stream in, or adjacent to, the wetland
- Lake Fringe wetland**  2 points
- Freshwater tidal wetland**  2 points

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft<sup>2</sup>.

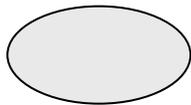
*Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*

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

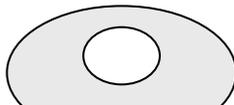
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H 1.4. Interspersion of habitats

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



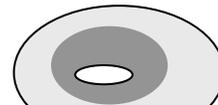
None = 0 points



Low = 1 point

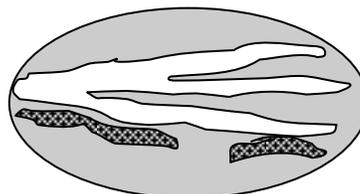
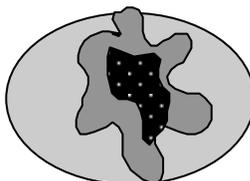
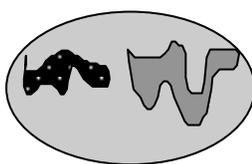


Moderate = 2 points



1

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



Wetland name or number A

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

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

<p>H 2.0. Does the landscape have the potential to support the habitat functions of the site?</p>		
<p>H 2.1. Accessible habitat (include <i>only habitat that directly abuts wetland unit</i>).</p> <p>Calculate: % undisturbed habitat <u>0</u> + [(% moderate and low intensity land uses)/2] <u>0</u> = <u>0</u> %</p> <p>If total accessible habitat is:</p> <p><input type="checkbox"/> &gt; 1/3 (33.3%) of 1 km Polygon points = 3</p> <p><input type="checkbox"/> 20-33% of 1 km Polygon points = 2</p> <p><input type="checkbox"/> 10-19% of 1 km Polygon points = 1</p> <p><input checked="" type="checkbox"/> &lt; 10% of 1 km Polygon points = 0</p>		0
<p>H 2.2. Undisturbed habitat in 1 km Polygon around the wetland.</p> <p>Calculate: % undisturbed habitat <u>17</u> + [(% moderate and low intensity land uses)/2] <u>11</u> = <u>28</u> %</p> <p><input type="checkbox"/> Undisturbed habitat &gt; 50% of Polygon points = 3</p> <p><input checked="" type="checkbox"/> Undisturbed habitat 10-50% and in 1-3 patches points = 2</p> <p><input type="checkbox"/> Undisturbed habitat 10-50% and &gt; 3 patches points = 1</p> <p><input type="checkbox"/> Undisturbed habitat &lt; 10% of 1 km Polygon points = 0</p>		2
<p>H 2.3. Land use intensity in 1 km Polygon: If</p> <p><input checked="" type="checkbox"/> &gt; 50% of 1 km Polygon is high intensity land use points = (- 2)</p> <p><input type="checkbox"/> ≤ 50% of 1 km Polygon is high intensity points = 0</p>		-2
Total for H 2	Add the points in the boxes above	0

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

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

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

Wetland name or number A

## WDFW Priority Habitats

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

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

- Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (full descriptions in WDFW PHS report).
- Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.
- Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha ) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.
- Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (full descriptions in WDFW PHS report p. 158 – see web link above).
- Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (full descriptions in WDFW PHS report p. 161 – see web link above).
- Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).
- Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

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

Wetland name or number A

**CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS**

Wetland Type	Category
<p><i>Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.</i></p>	
<p><b>SC 1.0. Estuarine wetlands</b>            Does the wetland meet the following criteria for Estuarine wetlands?  <input type="checkbox"/> The dominant water regime is tidal,  <input type="checkbox"/> Vegetated, and  <input type="checkbox"/> With a salinity greater than 0.5 ppt      <input type="checkbox"/> Yes – Go to <b>SC 1.1</b>   <input checked="" type="checkbox"/> No = <b>Not an estuarine wetland</b></p>	
<p>SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151?  <input type="checkbox"/> <input type="checkbox"/> Yes = <b>Category I</b>   <input type="checkbox"/> No - Go to <b>SC 1.2</b></p>	<p><b>Cat. I</b></p>
<p>SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions?  <input type="checkbox"/> The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are <i>Spartina</i>, see page 25)  <input type="checkbox"/> At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or unmowed grassland.  <input type="checkbox"/> The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.  <input type="checkbox"/> <input type="checkbox"/> Yes = <b>Category I</b>   <input type="checkbox"/> No = <b>Category II</b></p>	<p><b>Cat. I</b>  <b>Cat. II</b></p>
<p><b>SC 2.0. Wetlands of High Conservation Value (WHCV)</b>            SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value?  <input type="checkbox"/> Yes – Go to <b>SC 2.2</b>   <input checked="" type="checkbox"/> No – Go to <b>SC 2.3</b>            SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value?  <input checked="" type="checkbox"/> <input type="checkbox"/> Yes = <b>Category I</b>   <input type="checkbox"/> No = <b>Not a WHCV</b>            SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland?  <a href="http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf">http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf</a>  <input type="checkbox"/> <input type="checkbox"/> Yes – <b>Contact WNHP/WDNR and go to SC 2.4</b>   <input type="checkbox"/> No = <b>Not a WHCV</b>            SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website?  <input type="checkbox"/> <input type="checkbox"/> Yes = <b>Category I</b>   <input type="checkbox"/> No = <b>Not a WHCV</b></p>	<p><b>Cat. I</b></p>
<p><b>SC 3.0. Bogs</b>            Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? <i>Use the key below. If you answer YES you will still need to rate the wetland based on its functions.</i>            SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile?  <input type="checkbox"/> Yes – Go to <b>SC 3.3</b>   <input checked="" type="checkbox"/> No – Go to <b>SC 3.2</b>            SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?  <input type="checkbox"/> <input type="checkbox"/> Yes – Go to <b>SC 3.3</b>   <input checked="" type="checkbox"/> No = <b>Is not a bog</b>            SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4?  <input type="checkbox"/> <input type="checkbox"/> Yes = <b>Is a Category I bog</b>   <input type="checkbox"/> No – Go to <b>SC 3.4</b>  <b>NOTE:</b> If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog.            SC 3.4. Is an area with peats or mucks forested (&gt; 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy?  <input type="checkbox"/> <input type="checkbox"/> Yes = <b>Is a Category I bog</b>   <input type="checkbox"/> No = <b>Is not a bog</b></p>	<p><b>Cat. I</b></p>



Wetland name or number A

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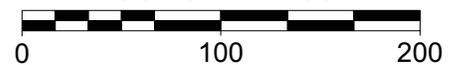
16010 MSPT XVIII LLC - REDMOND-FALL CITY ROAD  
 WETLAND RATING FIGURE A1 - WETLAND A



Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Scale 1" = 100'



**LEGEND**

-  SCRUB-SHRUB
-  FORESTED VEGETATION
-  SATURATED ONLY
-  150' FROM WL BOUNDARY

*Wetland Resources, Inc.*  
 Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance  
 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
 Phone: (425) 337-3174  
 Fax: (425) 337-3045  
 Email: mailbox@wetlandresources.com

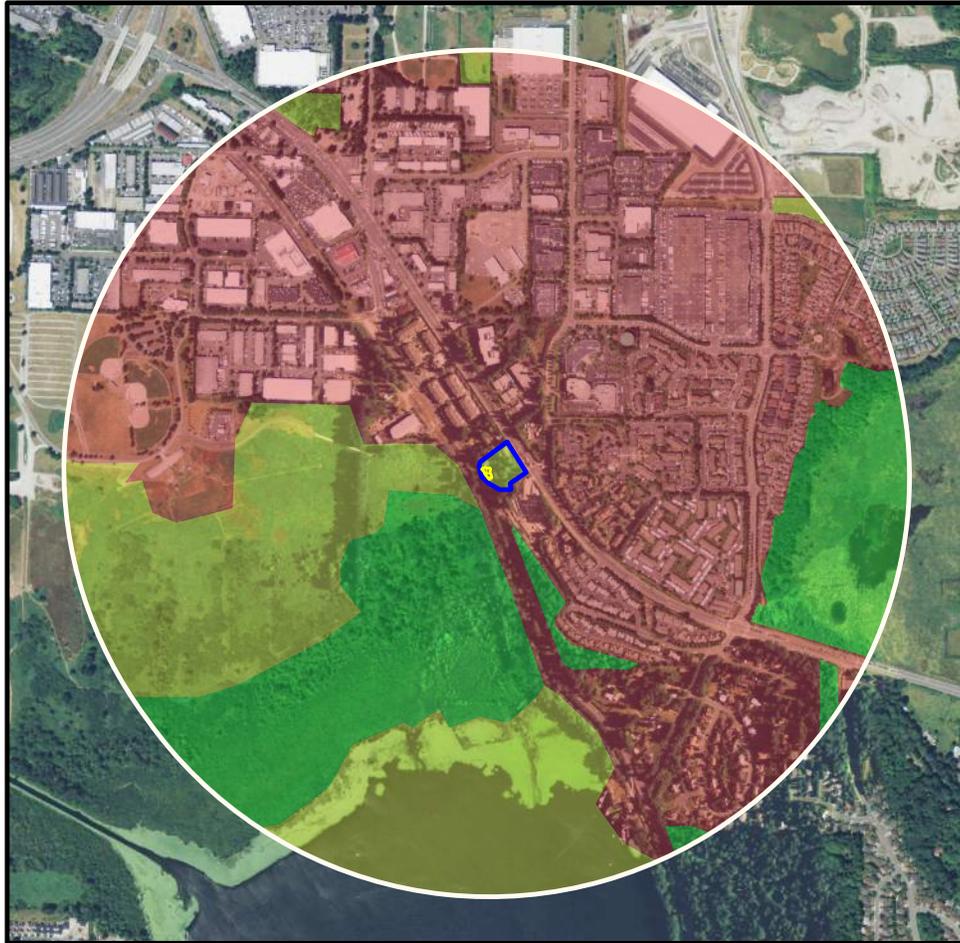
**WETLAND RATING**  
**Wetland A**

MSPT XVIII LLC  
 ATTN: Marc Boettcher  
 12332 NE 115th Place  
 Kirkland, WA 98033

Figure A1  
 WRI Job # 16010  
 Drawn by: SW



16010 MSPT XVIII LLC - REDMOND-FALL CITY ROAD  
 WETLAND RATING FIGURE A2 - WETLAND A



LEGEND	
	RELATIVELY UNDISTURBED
	LOW/MOD. INTENSITY
	HIGH INTENSITY
	ACCESSIBLE HABITAT
	WETLAND
	1 KM FROM WETLAND



Scale 1" = 1,500'



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 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
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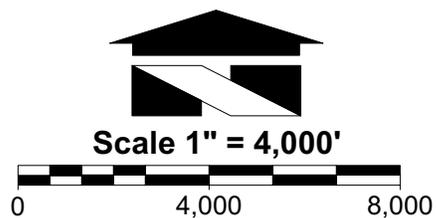
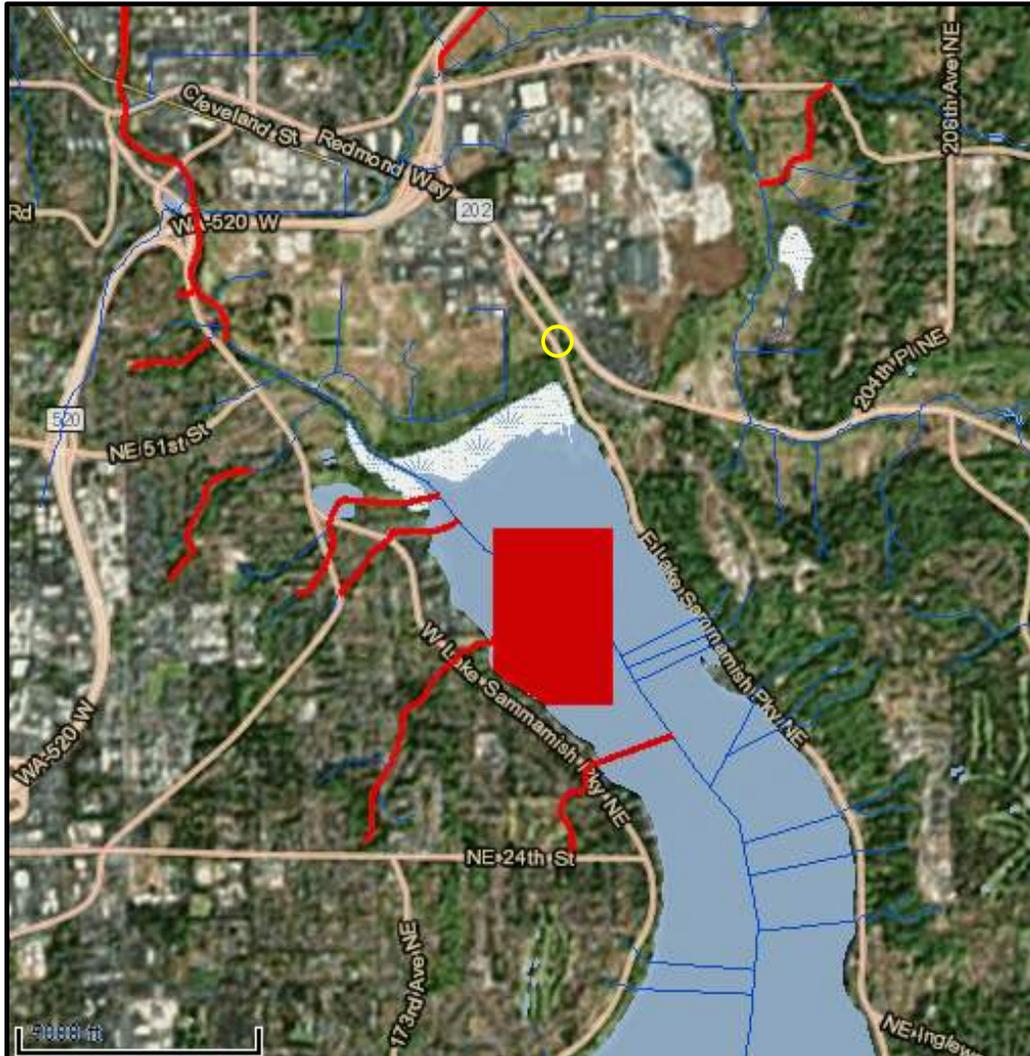
WETLAND RATING  
 Wetland A

MSPT XVIII LLC  
 ATTN: Marc Boettcher  
 12332 NE 115th Place  
 Kirkland, WA 98033

Figure A2  
 WRI Job # 16010  
 Drawn by: SW



16010 MSPT XVIII LLC - REDMOND-FALL CITY ROAD  
 WETLAND RATING FIGURE A3 - WETLAND A



**LEGEND**

-  WETLAND LOCATION
-  AQUATIC RESOURCES ON THE 303(d) LIST

*Wetland Resources, Inc.*  
 Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance  
 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
 Phone: (425) 337-3174  
 Fax: (425) 337-3045  
 Email: mailbox@wetlandresources.com

**WETLAND RATING**  
**Wetland A**

MSPT XVIII LLC  
 ATTN: Marc Boettcher  
 12332 NE 115th Place  
 Kirkland, WA 98033

Figure A3  
 WRI Job # 16010  
 Drawn by: SW



16010 MSPT XVIII LLC - REDMOND-FALL CITY ROAD  
WETLAND RATING FIGURE A4 - WETLAND A

**WRIA 8: Cedar-Sammamish**

The following table lists overview information for water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.



**Counties**

- [King](#)
- [Snohomish](#)

Waterbody Name	Pollutants	Status**	TMDL Lead
<a href="#">Ballinger Lake</a>	Total Phosphorus	Approved by EPA	<a href="#">Tricia Shoblom</a> 425-649-7288
<a href="#">Bear-Evans Creek Basin</a>	Fecal Coliform	Approved by EPA	<a href="#">Joan Nolan</a> 425-649-4425
	Dissolved Oxygen Temperature	Approved by EPA	
<a href="#">Cottage Lake</a>	Total Phosphorus	Approved by EPA Has an implementation plan	<a href="#">Tricia Shoblom</a> 425-649-7288
<a href="#">Issaquah Creek Basin</a>	Fecal Coliform	Approved by EPA	<a href="#">Joan Nolan</a> 425-649-4425
<a href="#">Little Bear Creek</a> Tributaries:  Trout Stream Great Dane Creek Cutthroat Creek	Fecal Coliform	Approved by EPA	<a href="#">Ralph Svrcek</a> 425-649-7036
<a href="#">North Creek</a>	Fecal Coliform	Approved by EPA Has an implementation plan	<a href="#">Ralph Svrcek</a> 425-649-7036
<a href="#">Pipers Creek</a>	Fecal Coliform	Approved by EPA	<a href="#">Joan Nolan</a> 425-649-4425
<a href="#">Sammamish River</a>	Dissolved Oxygen Temperature	Field work starts summer 2015	<a href="#">Ralph Svrcek</a> 425-649-7036
<a href="#">Swamp Creek</a>	Fecal Coliform	Approved by EPA Has an implementation plan	<a href="#">Ralph Svrcek</a> 425-649-7036

\*\* Status will be listed as one of the following: Approved by EPA, Under Development or Implementation

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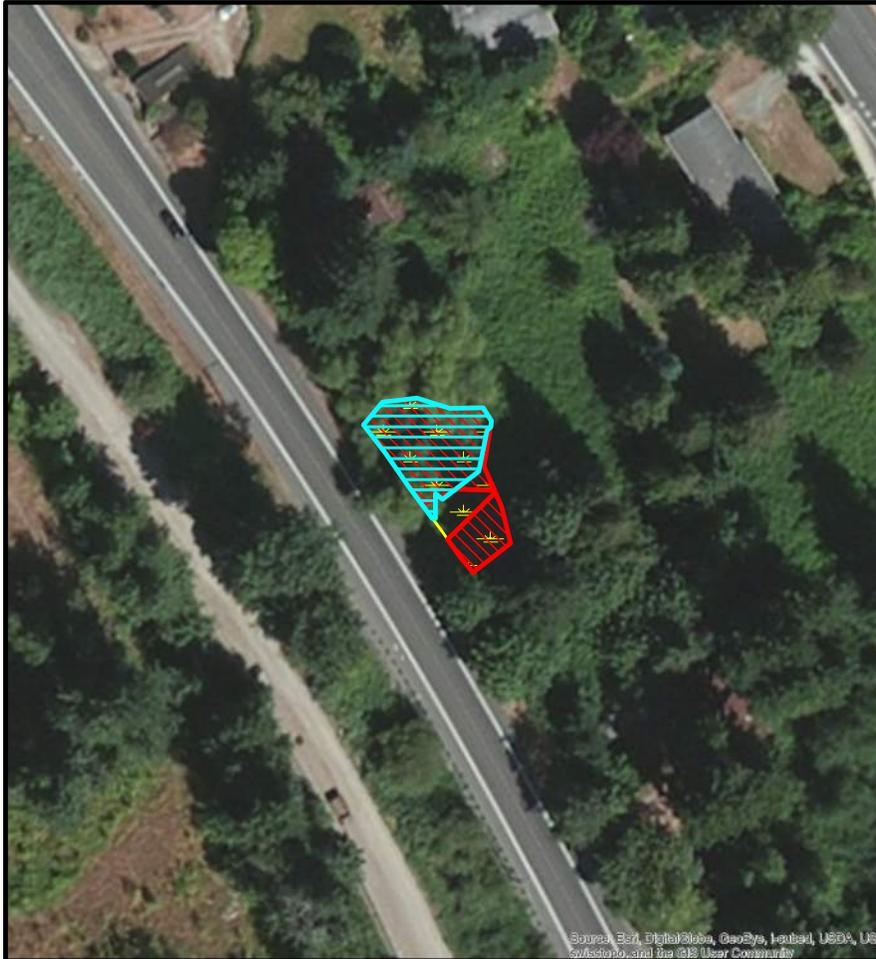
**WETLAND RATING  
Wetland A**

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Figure A4  
WRI Job # 16010  
Drawn by: SW



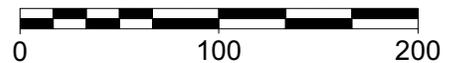
16010 MSPT XVIII LLC - REDMOND-FALL CITY ROAD  
 WETLAND RATING FIGURE A5 - WETLAND A



Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Scale 1" = 100'



**LEGEND**

-  WETLAND
-  DENSE WOODY
-  DENSE UNCUT HERBACIOUS
-  DENSE UNCUT RIDGID

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**Wetland A**

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Figure A5  
 WRI Job # 16010  
 Drawn by: SW



# 16010 Rating Figures Analysis Worksheets

## Cowardin/Plant Cover Analysis

<b>Wetland A</b>						
Total Aquatic Bed	Total Forested	Total Scrub-Shrub	Total Emergent	Total Open Water	TOTAL	
0	0.045	0.042	0	0	0.086	<--ACRES
0.00%	51.77%	48.23%	0.00%	0.00%	<-- Percentages	
Permanently Flooded	Seasonally Flooded	Occasionally Flooded	Saturated Only	Permanently Flowing Stream	Seasonally Flowing Stream	TOTAL
0	0	0	0.086	0	0	0.086
0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	<-- Percentages
					1	

## Habitat Analysis (H 2.0)

<b>Wetland A</b>				
<b>H 2.1 Accessible Habitat</b>				
Relatively Undisturbed	Low/Moderate	High Intensity	1km Circle	
0	1.88	0	796.2	<--ACRES
% Relatively Undisturbed	(% Low.Mod intensity)/2			
0.000%	0.118%			
% Relatively Undisturbed+(% Mod.Low intensity/2)				
0.118%				
<b>H 2.2 Undisturbed Habitat in 1km Around Wetland</b>				
Relatively Undisturbed	Low/Moderate	High Intensity	SUM	
135.679	170.693	489.829	796.2	<--ACRES
% Relatively Undisturbed	(% Low.Mod intensity)/2			
17.041%	10.719%			
% Relatively Undisturbed+(% Mod.Low intensity/2)				
27.760%				
<b>H 2.3 Land Use Intensity in 1km Circle</b>				
<i>(High Intensity/1km)</i>				
61.521%				
<b>D 4.3 Contribution of the Wetland to Storage in the Watershed</b>				
Contributing Basin	Wetland			
10.874	0.086	<--ACRES		
<i>(Contributing Basin Area/Wetland Area)</i>				
125.889				

## Slope WL Worksheet

<b>Wetland A</b>			
<b>S 1.3 Characteristics of the plants in the wetland that trap sediments and pollutants:</b>			
Dense Uncut Herbaceous Plants	Dense Woody Plants	Total Wetland	
0	0.056	0.086	<--ACRES
% Dense Uncut Herbaceous Plants	% Dense Woody Plants		
0.000%	64.572%		
<b>S 4.1 Characteristics of plants that reduce the velocity of surface flows during storms:</b>			
Dense Uncut Ridgid Plants	Total Wetland		
0.075	0.086	<--ACRES	
% Dense Uncut Ridgid Plants			
86.94%			



# **APPENDIX B**

DEPARTMENT OF ECOLOGY “CREDIT-DEBIT” SYSTEM

DEPARTMENT OF ECOLOGY WETLAND SCORING FORM

DEPARTMENT OF ECOLOGY WETLAND “DEBIT” WORKSHEET



Wetland name or number A

# SCORING FORM

## Scoring functions to calculate mitigation credits and debits in Western Washington

Name of wetland (if known): Wetland A Date of site visit: 2/4/2016

Scored by John Laufenberg

SEC: 7 TOWNSHIP: 25N RANGE: 6E Estimated size: <1 acre Aerial photo included? YES

These scores are for:

- Wetland being altered
- Mitigation site before mitigation takes place
- Mitigation site after goals and objectives are met

### SUMMARY OF SCORING

FUNCTION	Improving Water Quality	Hydrologic	Habitat
Rating of Site Potential	L	L	L
Rating of Landscape Potential	M	L	L
Rating of Value	M	M	M
<b>Score Based on Ratings</b> (see table below)	5	4	4

Wetland HGM Class Used for Rating	
Depressional	
Riverine	
Lake-fringe	
Slope	<input checked="" type="checkbox"/>
Flats	
Freshwater Tidal	
Check if unit has multiple HGM classes present	<input type="checkbox"/>

Scores
(Order of ratings is not important)
9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

**NOTE:** Form is not complete without the figures requested.

Put only the highest score for a question in each box of the form, even if more than one indicator applies to the unit. Do NOT add the scores within a question.

## HGM Classification of Wetlands in Western Washington

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

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

1. Are the water levels in the entire unit usually controlled by tides (i.e., except during floods)?

NO - go to 2                       YES - the wetland class is **Tidal Fringe** - go to 1.1

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

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 an **Estuarine** wetland and not scored. This method cannot be used for estuarine wetlands.*

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

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

3. Does the entire wetland unit **meet all** of the following criteria?

\_\_\_ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface) at 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 <3 ft diameter and less than 1 ft 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.

Wetland name or number A

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

**NOTE:** Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the 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	<input type="checkbox"/>	Riverine	<input type="checkbox"/>
Slope + Depressional	<input type="checkbox"/>	Depressional	<input type="checkbox"/>
Slope + Lake-fringe	<input type="checkbox"/>	Lake-fringe	<input type="checkbox"/>
Depressional + Riverine along stream within boundary of depression	<input type="checkbox"/>	Depressional	<input type="checkbox"/>
Depressional + Lake-fringe	<input type="checkbox"/>	Depressional	<input type="checkbox"/>
Riverine + Lake-fringe	<input type="checkbox"/>	Riverine	<input type="checkbox"/>
Salt Water Tidal Fringe and any other class of freshwater wetland	<input type="checkbox"/>	Treat as ESTUARINE	<input type="checkbox"/>

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



Wetland name or number A

S 3.0 Is the water quality improvement provided by the site valuable to society?		
S 3.1 Does the unit discharge directly to a stream, river, or lake that is on the 303(d) list?	<input type="checkbox"/> Yes = 1 <input checked="" type="checkbox"/> No = 0	0
S 3.2 Is the unit in a sub-basin where water quality is an issue? (at least one aquatic resource in the basin is on the 303(d) list)	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0	1
S 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?	<input type="checkbox"/> Yes = 2 <input checked="" type="checkbox"/> No = 0	0
Total for D 3	Add the points in the boxes above	1
<b>Rating of Value: If score is</b> 2 - 4 = H 1 = M 0 = L		M

*Record the rating on the first page*

<b><u>Slope Wetlands</u></b> <b>HYDROLOGIC FUNCTIONS</b> - Indicators that the site functions to reduce flooding and stream erosion Questions S 4.1 - S 4.2 are from Wetland Rating System (Hruby 2004b).		
S 4.0 Does the wetland unit have the <u>potential</u> to reduce flooding and stream erosion?		
S 4.1 Characteristics of plants that reduce the velocity of surface flows during storms. Choose the points appropriate for the description that best fit conditions in the wetland. <i>(Stems of plants should be thick enough (usually &gt; 1/8 in), or dense enough, to remain erect during surface flows)</i> Dense, uncut, <b>rigid</b> plants covers > 90% of the area of the wetland. YES = 1 <input type="checkbox"/> All other conditions = 0 <input checked="" type="checkbox"/>		0
<b>Rating of Site Potential: If score is</b> 1 = M 0 = L		L

*Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number A

S 5.0 Does the landscape have the potential to support the hydrologic functions at the site?		
S 5.1 Is more than 25% of the buffer area within 150 ft upslope of wetland unit in agricultural, pasture, residential, commercial, or urban ? <input type="checkbox"/> Yes = 1 <input checked="" type="checkbox"/> No = 0		0
<b>Rating of Landscape Potential: If score is 1 = M</b> <b>0 = L</b>		L

*Record the rating on the first page*

S 6.0 Are the hydrologic functions provided by the site valuable to society?		
S 6.1 Distance to the nearest areas downstream that have flooding problems? <input type="checkbox"/> Immediate sub-basin down-gradient of site has surface flooding problems that results in \$\$ loss or loss of natural resources points = 2 <input checked="" type="checkbox"/> Surface flooding problems are in a sub-basin further down-gradient points = 1 <input type="checkbox"/> No flooding problems anywhere downstream points = 0		1
S 6.2 Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? <input type="checkbox"/> Yes = 2 <input checked="" type="checkbox"/> No = 0		0
Total for R 6 Add the points in the boxes above		1
<b>Rating of Value: If score is 2 - 4 = H</b> <b>1 = M</b> <b>0 = L</b>		M

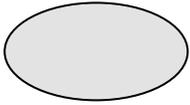
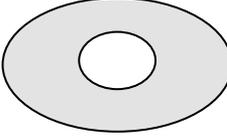
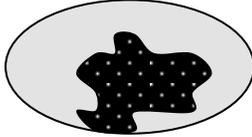
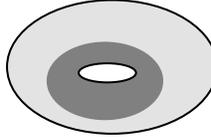
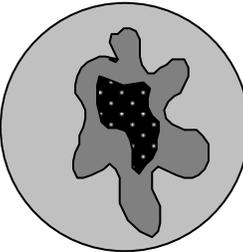
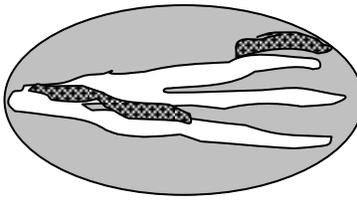
*Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number A

<b>These questions apply to wetlands of all HGM classes.</b> <b>HABITAT FUNCTIONS</b> - Indicators that site functions to provide important habitat. Questions H 1.1 – H 1.5 are from Wetland Rating System (Hruby 2004b).	
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 Structure of plant community – <i>indicators are Cowardin classes and layers in forest</i> Check the Cowardin plant classes in unit – <i>Polygons for each class must total ¼ acre, or more than 10% of the unit if it is smaller than 2.5 acres.</i> <p style="text-align: center;"><i>Provide map of Cowardin plant classes</i></p> <input type="checkbox"/> Aquatic bed <input type="checkbox"/> Emergent plants <input checked="" type="checkbox"/> Scrub/shrub (areas where shrubs have > 30% cover) <input checked="" type="checkbox"/> Forested (areas where trees have > 30% cover) If the unit has a forested class check if: <input type="checkbox"/> 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 structures checked. If you have:	Figure__  A1        1
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count ( <i>see text for descriptions of hydroperiods</i> ). <p style="text-align: center;"><i>Provide map of polygons with different hydroperiods</i></p> <input type="checkbox"/> Permanently flooded or inundated <input type="checkbox"/> 4 or more types present      points = 3 <input type="checkbox"/> Seasonally flooded or inundated <input type="checkbox"/> 3 types present      points = 2 <input type="checkbox"/> Occasionally flooded or inundated <input type="checkbox"/> 2 types present      points = 1 <input checked="" type="checkbox"/> Saturated only <input checked="" type="checkbox"/> 1 type present      points = 0 <input type="checkbox"/> Permanently flowing stream or river in, or adjacent to, the wetland <input type="checkbox"/> Seasonally flowing stream in, or adjacent to, the wetland <input type="checkbox"/> <b>Lake-fringe wetland = 2 points</b> <input type="checkbox"/> <b>Freshwater tidal wetland = 2 points</b>	Figure__  A1        0
H 1.3. Richness of Plant Species Count the number of plant species in the wetland unit that cover at least 10 ft <sup>2</sup> . <i>Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.</i> Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle  If you counted:	1
List species below if you want to:	<input type="checkbox"/> > 19 species      points = 2 <input checked="" type="checkbox"/> 5 - 19 species      points = 1 <input type="checkbox"/> < 5 species      points = 0

Wetland name or number A

<p>H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion between Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.</p> <p style="text-align: center;"><i>Provide map of Cowardin plant classes (same as H1.1)</i></p> <div style="display: flex; justify-content: space-around;">     </div> <p><input type="checkbox"/> None = 0 points    <input checked="" type="checkbox"/> Low = 1 point    <input type="checkbox"/> Moderate = 2 points</p> <div style="display: flex; justify-content: space-around; margin-top: 20px;">    </div> <p style="text-align: right;">[riparian braided channels with 2 classes]</p> <p><input type="checkbox"/> High = 3 points</p> <p>NOTE: If you have four or more classes or three plants classes and open water the rating is always "high."</p>	<p>Figure_</p> <p>A1</p> <p>1</p>
<p>H 1.5. Special Habitat Features: Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Large, downed, woody debris within the unit (&gt;4 inches diameter and 6 ft long).</li> <li><input type="checkbox"/> Standing snags (diameter at the bottom &gt; 4 inches) within the unit</li> <li><input type="checkbox"/> Undercut banks are present for at least 6.6 ft (2m) <b>and/or</b> overhanging plants extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m)</li> <li><input type="checkbox"/> Stable steep banks of fine material that might be used by beaver or muskrat for denning (&gt;30degree slope) OR signs of recent beaver activity are present (<i>cut shrubs or trees that have not yet weathered where wood is exposed</i>)</li> <li><input type="checkbox"/> At least ¼ acre of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated. (<i>structures for egg-laying by amphibians</i>)</li> <li><input type="checkbox"/> Invasive plants cover less than 25% of the wetland area in every stratum of plants (<i>see H 1.1 for list of strata</i>)</li> </ul>	<p>1</p>
<p><b>H 1. TOTAL</b> Score - potential for providing habitat</p> <p style="text-align: center;">Add the scores from H 1.1, H 1.2, H 1.3, H 1.4, and H 1.5</p>	<p>4</p>

**Rating of Site Potential: If score is**

15 - 18 = H

7 - 14 = M

0 - 6 = L

L

*Record the rating on the first page*

Wetland name or number A

H 2.0 Does the landscape have the potential to support habitat at the site?		
H 2.1 Accessible habitat (include <i>only habitat that directly abuts wetland unit</i> ). Calculate: % undisturbed habitat + [(% moderate and low intensity land uses)/2] = <u>53</u> <i>Provide map of land use within 1 km of unit edge</i> If total accessible habitat is:		Figure__ A2
<input type="checkbox"/>	> 1/3 (33.3%) of 1 km circle (~100 hectares or 250 acres)	points = 3
<input type="checkbox"/>	20 - 33% of 1 km circle	points = 2
<input type="checkbox"/>	10 - 19% of 1 km circle	points = 1
<input checked="" type="checkbox"/>	<10% of 1 km circle	points = 0
H 2.2 Undisturbed habitat in 1 km circle around unit. If:		
<input type="checkbox"/>	Undisturbed habitat > 50% of circle	points = 3
<input checked="" type="checkbox"/>	Undisturbed habitat 10 - 50% and in 1-3 patches	points = 2
<input type="checkbox"/>	Undisturbed habitat 10 - 50% and > 3 patches	points = 1
<input type="checkbox"/>	Undisturbed habitat < 10% of circle	points = 0
H 2.3 Land use intensity in 1 km circle. If:		
<input checked="" type="checkbox"/>	> 50% of circle is high intensity land use	points = (- 2)
<input type="checkbox"/>	Does not meet criterion above	points = 0
Total for H 2 Add the points in the boxes above		0

**Rating of Landscape Potential: If score is**  
 4- 6 = H  
 1-3 = M  
 < 1 = L

L

*Record the rating on the first page*

H 3.0 Is the Habitat provided by the site valuable to society?		
H3.1 Does the site provides habitat for species valued in laws, regulations or policies? (choose <i>only the highest score</i> ) Site meets ANY of the following criteria:		
<input type="checkbox"/>	It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists)	points = 2
<input type="checkbox"/>	It is a "priority area" for an individual WDFW species	
<input type="checkbox"/>	It is a Natural Heritage Site as determined by the Department of Natural Resources	
<input type="checkbox"/>	It scores 4 on question H2.3 of the wetland rating system	
<input type="checkbox"/>	It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan	
<input checked="" type="checkbox"/>	Site scores 1-3 on question H2.3 of the wetland rating system	points = 1
<input type="checkbox"/>	Site does not meet any of the criteria above	points = 0

2

**Rating of Value: If score is**  
 2 = H  
 1 = M  
 0 = L

M

*Record the rating on the first page*



# “DEBIT” WORKSHEET

Wetland unit to be altered: Wetland A Date 2/29/2016

Use the following tables to calculate the Debits for the impact site. Use a separate worksheet for each wetland unit being altered. In addition, you will need to calculate the debits separately for forested areas and for emergent/shrub areas. Use the map of Cowardin plant types from question H 1.1 on the Scoring Form to determine the boundaries between forested areas and non-forested areas.

FUNCTION <i>From Scoring Form</i>	Improving Water Quality	Hydrologic	Habitat
Rating of Site Potential	L	L	L
Rating of Landscape Potential	M	L	L
Rating of Value	M	M	M
<b>Score for Wetland</b>	<b>5</b>	<b>4</b>	<b>4</b>

CALCULATIONS <b>emergent or shrub areas</b>	Improving Water Quality	Hydrologic	Habitat
Score for wetland unit (see above)	5	4	4
Impact - Acres of <b>non-forested</b> areas <i>(same for all functions)</i>	0.042		
Basic mitigation requirement (BMR) = <i>Score for function x acres impacted</i>	0.21	0.168	0.168
Temporal loss factor (TLF) <i>(See table below)</i>	3	3	3
Mitigation required DEBITS = BMR x TLF	0.63	0.504	0.504
CALCULATIONS <b>forested areas</b>	Improving Water Quality	Hydrologic	Habitat
Score for wetland unit (see above)	5	4	4
Impact - Acres of <b>forest</b> <i>(Create a separate column for each type of forest )</i> Deciduous (D), Evergreen (E), Cat. 1 deciduous (>50%cover) (CD) Cat. 1 evergreen (>50% cover)(CE)	D E CD CE	D E CD CE	D E CD CE
	0.031 0.013 0 0	0.031 0.013	0.031 0.013
Basic mitigation requirement (BMR) = <i>Score x acres impacted</i>	0.155 0.065 0 0	0.124 0.052 0 0	0.124 0.052 0 0
Temporal loss factor (TLF) <i>(See table below)</i>	4 5	4 5	4 5
Mitigation required DEBITS = BMR x TLF	0.62 0.325 0 0	0.496 0.26 0 0	0.496 0.26 0 0
<b>TOTAL for forested areas (D+E+CD+CE)</b>	<b>0.945</b>	<b>0.756</b>	<b>0.756</b>

## Temporal Loss Factors:

Timing of Mitigation	Temporal Loss Factor
<b>Advance</b> – At least two years has passed since plantings were completed or one year since “as-built” plans were submitted to regulatory agencies	1.25
<b>Concurrent</b> – Physical alterations at mitigation site are completed within a year of the impacts, but planting may be delayed by up to 2 years if needed to optimize conditions for success. For impacts to an emergent or shrub community	1.5
For impacts to a deciduous forested wetland community	2.0
For impacts to an evergreen forested wetland community	2.5
For impacts to a deciduous Category I forested wetland community	3
For impacts to an evergreen Category I forested wetland community	3.5
<b>Delayed</b> - Construction is not completed within one year of impact, but is completed (including plantings if required) within 5 growing seasons of impact. For impacts to an emergent or shrub community	3
For impacts to a deciduous forested wetland community	4
For impacts to an evergreen forested wetland community	5
For impacts to a deciduous Category I forested wetland community	6
For impacts to an evergreen Category I forested wetland community	7

**NOTE:** The ratings, scoring and calculations are valid for only five years because wetlands and their functions will change with time. If delays in the construction of the site are more than 5 years, the mitigation plan will probably have to be re-negotiated and the calculation re-done. This time limit was chosen to be consistent with the validity of wetland delineations as established by the U.S. Army Corps of Engineers.

### TOTALS

	Improving Water Quality	Hydrologic	Habitat
DEBITS - Emergent or shrub areas	0.63 Acre-points	0.504 Acre-points	0.504 Acre-points
DEBITS - Forested areas	0.945 Acre-points	0.756 Acre-points	0.756 Acre-points
<b>TOTAL</b>	<b>1.575</b> Acre-points	<b>1.26</b> Acre-points	<b>1.26</b> Acre-points

**TOTAL ACRE-POINTS: 4.095**

# **APPENDIX C**

## **KING COUNTY MITIGATION RESERVES PROGRAM IN-LIEU FEE INSTRUMENT**



1                   **King County Mitigation Reserves Program**  
2                                   **In-Lieu Fee Instrument**

3  
4           **AN AGREEMENT REGARDING THE OPERATION OF THE KING COUNTY IN-**  
5           **LIEU FEE PROGRAM PURSUANT TO 33 CFR PARTS 325 AND 332 AS REVISED**  
6           **EFFECTIVE JUNE 9, 2008 (FEDERAL MITIGATION RULE)**

7  
8  
9           In consideration of the mutual promises and covenants contained herein, King County a political  
10           subdivision of the state of Washington (the "Sponsor"), the U.S. Army Corps of Engineers  
11           ("Corps"), and the Washington State Department of Ecology ("Ecology") as Parties to this  
12           Instrument hereby agree as follows:

13  
14                                   **INTRODUCTION**

15           A.     Purpose:     The purpose of this Mitigation Reserves Program In-Lieu Fee  
16           Instrument (hereinafter, "Instrument") is to set forth the agreed upon terms specifying  
17           responsibilities for the establishment, use, operation, and management of the Sponsor's  
18           Mitigation Reserves In-Lieu Fee Program ("Mitigation Reserves Program" or sometimes  
19           "MRP"). The King County Department of Natural Resources and Parks is the King County  
20           agency responsible for meeting these responsibilities on behalf of the Sponsor. This Instrument  
21           consists of two sets of documents: the instant document setting forth the general terms of  
22           agreement and establishing the central obligations assumed and consideration provided by each  
23           party ("Basic Agreement"), and the Appendices and Exhibits ("Appendices") that establish  
24           detailed provisions for operation of the Mitigation Reserves Program, including the  
25           Compensation Planning Framework, mitigation planning requirements, and standards and  
26           procedural requirements applicable to the Mitigation Reserves Program pursuant to 33 CFR 332.  
27           The terms and provisions of the Appendices are hereby incorporated into this Instrument and  
28           made a part hereof.

29           The Mitigation Reserves Program will provide compensatory mitigation for unavoidable  
30           adverse impacts to waters of the United States and waters of the State, including wetlands,  
31           aquatic areas and aquatic resources as defined by Appendix B that result from activities  
32           authorized by Federal, State, and local authorities. Use of the Mitigation Reserves Program as a  
33           means of satisfying mitigation obligations associated with unavoidable impacts must be  
34           specifically approved by the permit reviewers from the applicable regulatory agencies for each  
35           permitted impact project. This program may also be used as a remedy to mitigate for  
36           unauthorized activities when such use of the program is approved by appropriate regulatory  
37           agencies.

38           B.     Mitigation Reserves Program Mission and Objectives: The primary mission of  
39           the Mitigation Reserves Program is to provide a comprehensive natural resource program that  
40           addresses ecosystem needs at the local watershed level, and that provides mitigation for

1 degradation or destruction to aquatic resources as a result of unavoidable activities conducted in  
2 compliance with Federal, State or local regulations. The program is intended to uphold the goal  
3 of no net loss through the preservation, enhancement, establishment, and restoration of  
4 ecological functions within target watersheds through the establishment and management of  
5 mitigation sites. It is the intent of the parties that this program be operated in a collaborative  
6 manner, including collaboration of the IRT members, as further described below, in the decision  
7 making process. The specific objectives of the Mitigation Reserves Program include:

- 8 1. Provide high quality, successful long term mitigation for unavoidable impacts to  
9 aquatic resources and to procedurally decouple permitted development projects  
10 from mitigation projects.
- 11 2. Utilize scale efficiencies by combining the required mitigation for impacts from  
12 individual smaller projects within a service area into collective mitigation at  
13 larger sites with greater ecological value.
- 14 3. Efficiently meet regulatory requirements by streamlining the compensatory  
15 mitigation process, thereby reducing conflict between conservation objectives  
16 and development interests and putting more funds into ecological restoration  
17 and less into administrative processes.
- 18 4. Utilize a watershed approach as defined in 33 CFR 332 to identify the most  
19 appropriate off-site mitigation options available, thereby obtaining greater  
20 ecological benefits than would otherwise be achieved through on-site mitigation  
21 options that are impracticable or of low ecological value.
- 22 5. Operate in a financially self-sustaining manner: collect sufficient mitigation fees  
23 to complete mitigation projects and meet "no net loss" requirements over the  
24 long term operation of the Mitigation Reserves Program.
- 25 6. Provide public benefit by applying mitigation resources toward the  
26 improvement of ecologically-impaired publicly-owned natural areas and of  
27 privately-owned lands that have important ecological value to the watershed.

28 C. Mitigation Reserves Program Interagency Review Team: The Mitigation  
29 Reserves Program Interagency Review Team ("IRT") is the group of representatives from  
30 Federal, State, tribal and local regulatory and resource agencies that have reviewed this  
31 Instrument and will advise the Corps and Ecology, regarding the establishment and management  
32 of the Mitigation Reserves Program pursuant to the provisions of this Instrument. The IRT  
33 consists of:

- 34 1. Co-Chair: District Engineer, U.S. Army Corps of Engineers, Seattle District  
35 (District Engineer) or his designee,
- 36 2. Co-Chair: Washington Department of Ecology,
- 37 3. U.S. Environmental Protection Agency, Region 10,
- 38 4. National Oceanographic and Atmospheric Administration, National Marine  
39 Fisheries Service,
- 40 5. United States Fish and Wildlife Service,
- 41 6. Washington Department of Fish and Wildlife,
- 42 7. Muckleshoot Indian Tribe,

- 1 8. Tulalip Tribes,
- 2 9. Snoqualmie Indian Tribe,
- 3 10. Other pertinent interested parties as invited by the Co-Chairs.

4 D. The Role of the IRT: The primary role of the IRT is to assist the Corps and  
5 Ecology, in their role as co-chairs of the IRT, in the review of monitoring reports, the evaluation  
6 of mitigation plans, the recommendation of remedial measures, the approval of credit releases,  
7 and the approval of modifications to this Instrument. The IRT's role and responsibilities are  
8 more fully set forth in Section 332.8 of the Federal Mitigation Rule (33 CFR Part 332), and  
9 Appendices A and K of this Instrument. IRT members are invited to sign, but need not sign, this  
10 Instrument as an expression of their agreement with its terms. IRT members do not become a  
11 Party to this Instrument by signing and expressing such agreement. Signing this Instrument does  
12 not override or nullify the independent permitting authority of a Federal, State or local permitting  
13 entity to enforce their permit requirements at Mitigation Sites.

- 14 1. The IRT will work to reach consensus in its actions. This consensus also  
15 includes giving the Sponsor the opportunity to provide information and input for  
16 the IRT members during IRT decision making processes. The IRT will seek to  
17 reach such a consensus within a reasonable period of time and with minimal  
18 delays; and
- 19 2. The members of the IRT will review such documents and mitigation sites as  
20 each considers necessary to provide meaningful input to the Co-Chairs, and  
21 express any recommendations, concerns, or potential improvements concerning  
22 the implementation of the Mitigation Reserves Program to The Sponsor.

## 23 **BASIC TERMS OF AGREEMENT**

### 24 **I. TRANSFER OF PERMIT MITIGATION RESPONSIBILITY**

25 A. Transfer of Permit Mitigation Responsibility: The Sponsor agrees to accept full  
26 legal responsibility for satisfying the mitigation requirements for all Corps, State, and local  
27 permits for which mitigation fees from a permittee have been accepted under the terms of this  
28 Instrument. This responsibility includes compliance with 33 CFR Part 332, 40 CFR Part 230,  
29 Chapter 90.48 RCW, King County Code Chapter 21A.24, and any other applicable federal, state  
30 and local jurisdiction laws. In satisfaction of the compensatory mitigation requirements, the  
31 Sponsor shall provide compensatory mitigation of the type and in the amount necessary to meet  
32 applicable Federal, State, and local regulation requirements. Any transfer of mitigation  
33 responsibility is contingent upon the prior approval of this Instrument by the Sponsor, the Corps  
34 and Ecology.

- 36 1. Mitigation responsibility includes, but is not limited to: the identification and  
37 selection of mitigation sites, property rights acquisition, water rights acquisition,  
38 mitigation plan design and development, construction, monitoring, preservation,  
39 and long term management of the required mitigation.

- 1                   2. The transfer of mitigation responsibility from the permittee to the Sponsor for  
2 each impact site shall be effective upon (a) the permittee purchasing from the  
3 Sponsor the appropriate number and resource type of credits, and (b) the Corps'  
4 and Ecology's receipt of the Statement of Sale found in Exhibit 17, which  
5 expressly specifies that the Sponsor, and its successors and assigns, assume  
6 responsibility for accomplishment and maintenance of the transferee's  
7 compensatory mitigation requirements associated with the impacting project, as  
8 required by the permit conditions, upon completion of the credit sale.

9  
10  
11 **II. LEGAL AUTHORITIES**

12                   The establishment, use, operation, and management of the Mitigation Reserves Program  
13 shall be carried out in accordance with the following principal authorities.

14                   A. Federal:

- 15                   1. Clean Water Act (33 USC §§ 1251 et seq.)  
16                   2. Rivers and Harbors Act of 1899 (33 USC § 403)  
17                   3. Regulatory Programs of the Corps of Engineers, Final Rule (33 CFR Parts 320-  
18 332)  
19                   4. Memorandum of Agreement between the Environmental Protection Agency and  
20 the Department of the Army concerning the Determination of Mitigation Under  
21 the Clean Water Act, Section 404(b)(1) Guidelines (February 6, 1990)  
22                   5. U.S. Army Corps of Engineers Regulatory Guidance Letter 05-1, Guidance on  
23 Use of Financial Assurances, and Suggested Language for Special Conditions  
24 for Department of the Army Permits Requiring Performance Bonds, U.S. Army  
25 Corps of Engineers, February 14, 2005  
26                   6. Guidelines for the Specification of Disposal Sites for Dredged and Fill Material  
27 (40 CFR Part 230, Section 404(b)(1))  
28                   7. National Environmental Policy Act (42 USC §§ 4321 et seq.)  
29                   8. Council on Environmental Quality Procedures for Implementing the National  
30 Environmental Policy Act (40 CFR Parts 1500-1508)  
31                   9. Executive Order 11990 (Protection of Wetlands)  
32                   10. Executive Order 11988 (Floodplains Management)  
33                   11. Executive Order 13112 (Invasive Species)  
34                   12. Fish and Wildlife Coordination Act (16 USC §§ 661 et seq.)  
35                   13. Fish and Wildlife Service Mitigation Policy (46 FR 7644-7663, 1981)  
36                   14. Endangered Species Act (16 USC §§ 1531 et seq.)

1 15. Magnuson-Stevens Fishery Conservation and Management Act (16 USC §§  
2 1801 et seq.)

3 16. National Historic Preservation Act, as amended (16 USC § 470)

4 B. State of Washington:

5 1. Water Pollution Control Act, Chapter 90.48 RCW and Chapter 173 -225 WAC)

6 2. Environmental Policy Act (Chapter 43.21C RCW and Chapter 197-11 WAC)

7 3. Growth Management Act (Chapter 36.70A RCW and Chapter 365-195 WAC)

8 4. Construction Projects in State Waters (Chapter 77.55 RCW)

9 5. Shoreline Management Act of 1971 (Chapter 90.58 RCW and Chapter 173-20  
10 RCW)

11 6. Salmon Recovery Act (Chapter 75.46 RCW)

12 7. Aquatic Resources Mitigation Act (Chapter 90.74 RCW)

13 8. Aquatic Lands (Chapters 79.105 - 79.140 RCW)

14 9. Alternative Mitigation Policy Guidance For Aquatic Permitting Requirements  
15 from the Departments of Ecology and Fish and Wildlife, February 10, 2000.

16 C. King County Code ("KCC") and other Local Authorities:

17 1. KCC Chapter 2.16. Administrative Offices and Executive Departments

18 2. KCC Chapter 2.98. Rules of County Agencies

19 3. KCC Chapter 21A.06 Technical Terms and Land Use Definitions

20 4. KCC Chapter 21A.24 Critical Areas and Mitigation Fees and Requirements

21 5. KCC Chapter 21A.50 Enforcement

22 6. KCC Title 23. Code Compliance

23 7. Other King County Codes and codes from other local jurisdictions as  
24 applicable

25  
26 **III. FUNDING PROVISIONS**

27 A. Fee Collection: Upon permit approval from appropriate regulatory agencies,  
28 mitigation fees will be collected from permittees and deposited into the King County Mitigation  
29 Reserves Program Account.

30 B. Spending Authority and Disbursement: Disbursement of funds to the Sponsor for  
31 mitigation projects subject to the terms of this Instrument will be made upon authorization from  
32 the Corps and Ecology as follows:

33 1. Administrative Costs: Upon receipt of payment from a permittee for an impact  
34 site, the Corps and Ecology hereby authorize the Sponsor to use funds from the

1 Program Administrative Account in the percentage amount specified in  
2 Appendix F.

3 2. Spending Agreement: the disbursement of any additional funds shall be made  
4 only pursuant to written authorization from the Corps and Ecology after the  
5 Corps and Ecology have consulted with the IRT, pursuant to 332.8(i)(2) and  
6 pursuant to Appendix F, Section 4.0 (see also, Article III.D). Written  
7 authorization will be in the form of the Spending Agreement found in Exhibit  
8 18. The Spending Agreement shall include:

9 i. Statement of current account balances for the Service Area

10 ii. Statement of anticipated mitigation site project cost

11 iii. Allocation of percentages for project operation

12 iv. Signature of the District Engineer or his designee and of Ecology.

13 C. Mitigation Fees: Mitigation Fees will comprise two fees: a Credit Fee and a Land  
14 Fee. The Credit Fee price will reflect average costs for implementing all components of a  
15 mitigation project, based on cost analyses of recent projects completed by the King County  
16 Department of Natural Resources and Parks. Credit Fees will be used to implement all aspects of  
17 mitigation projects undertaken by the Mitigation Reserves Program.

18 The Land Fee prices will be based on an analysis of average cost of recent King County natural  
19 lands acquisitions within different areas and zoning categories. Land Fees will be used for  
20 acquisition of lands as described in Appendix J, Section 2.0.

21 The Mitigation Fee prices will be formulated to reflect full-cost accounting for establishment and  
22 management of mitigation sites, which includes: costs associated with site selection, permitting  
23 and design, construction, monitoring and maintenance, long-term management, program  
24 administration, contingencies, and property rights acquisition. Mitigation Fees are further  
25 discussed in Appendix F, Section 2.

26 D. Program Account: Mitigation fees, once collected, will be allocated under King  
27 County's Mitigation Reserves Program Fund. The Program Fund will be established within King  
28 County's Financial Accounting System, which is run through an association with U.S. Bank, a  
29 member of the Federal Deposit Insurance Corporation. Upon the sale of the first advance credit  
30 the following accounts below will be established under the Mitigation Reserves Program Fund.  
31 Land Fee Account, Program Administration Account, Contingency Fee Account, Long Term  
32 Management Account, and Individual Mitigation Project Accounts. The allocation of  
33 percentages for each account will be determined by the Sponsor, Ecology and the Corps in  
34 accordance with the process outlined in Appendix F. The Sponsor must allocate and deposit  
35 funds to the appropriate accounts within 30 days of the receipt of mitigation funds from a  
36 permittee. Collectively, the following accounts for all Service Areas constitute the Mitigation  
37 Reserves Program Fund:

- 1           1. Land Fee Account: Each service area will have a Land Fee Account containing  
2           100% of the Land Fee portion of the Mitigation Fees collected in the service  
3           area. These funds will be used for payment of land acquisition costs and for the  
4           acquisition of property to include as potential mitigation sites or used to secure  
5           Preservation Credits (see Appendix K, Section 5.0). In the event an account in  
6           the Service Area is insufficient to meet the needs of the required action, moneys  
7           in the Land Fee Account may be used as Financial Assurances, provided such  
8           use does not violate any legal requirements of the funding source utilized for the  
9           acquisition of the lands serving as mitigation sites.
  
- 10          2. Program Administration Account: Each Service Area will have a Program  
11          Administration Account fund. The Administrative Accounts will be funded by a  
12          percentage of Credit Fees collected in the Service Area. These funds will pay  
13          for program administration duties, including but not limited to:
  - 14           a. Site selection and concept design,
  - 15           b. Fee and Credit accounting,
  - 16           c. Legal services,
  - 17           d. Data management (e.g., maintaining MRP Database; see Appendix G,  
18           Section 6.0),
  - 19           e. Reporting,
  - 20           f. Correspondence and meetings with the IRT and other regulatory agencies,
  - 21           g. Program development, and
  - 22           h. Other program administration duties as necessary.
  
- 23          3. Contingency Fee Account: Each Service Area will have a Contingency Fee  
24          Account. The Contingency Fee Account is funded by deposits of a percentage  
25          of Credit Fees collected in the Service Area. Moneys in the Contingency  
26          Accounts will be held in reserve to fund adaptive management during the  
27          establishment phase for mitigation sites. These funds are to be used only in their  
28          respective Service Areas for contingencies prior to a site entering Long Term  
29          Management, e.g., contingencies related to project implementation,  
30          implementation of adaptive management plans (see Appendix O). When a site  
31          enters Long Term Management, the remaining portion of the Contingency Fee  
32          Account related to that site will be rolled into the Long Term Management  
33          Fund. (see Appendix F).
  
- 34          4. Long Term Management Fund: Each Service Area will have a Long Term  
35          Management Fund. This account will be funded by a percentage of the Credit  
36          Fees collected in the Service Area. The account is to be funded when Credit  
37          Fees are collected. Moneys in the Long Term Management Accounts will be  
38          held in reserve to fund long-term management, including adaptive management  
39          and remediation, at mitigation sites after completion of the establishment phase  
40          and the project enters the Long Term Management phase. Additionally, when a  
41          project enters the long-term management phase, its portion of the Contingency

1 Fee Account will be rolled into the Long Term Management Fund. Moneys in  
2 the Long Term Management Fund will be available solely for use in long term  
3 management (i.e. for implementing long-term management plans included in  
4 IRT-approved Mitigation Plans; see Appendix K, Section 2.0 and Appendix P).  
5 Long Term Management funds are not available for use on a project until the  
6 project enters the Long Term Management phase (i.e. after the establishment  
7 phase is complete, and all credit associated with a project is released.) (See  
8 Credit Release Schedule, Appendix K, Section 6.0 and Long Term  
9 Management, Appendix P).

- 10 5. Individual Mitigation Project Accounts: Each Mitigation Project in each Service  
11 Area will have an Individual Mitigation Project Account. These accounts will  
12 be funded by an allocation of the percentage of Credit Fees that are not  
13 allocated to the other accounts, i.e. Contingency Account, Program  
14 Administration Account, and Long Term Management Fund. The fees in this  
15 account are used for development of Mitigation Plans, mitigation project  
16 implementation, and establishment period monitoring and maintenance  
17 activities.
- 18 6. Accrual of interest earnings: Interest earnings from the entire Program Account  
19 will be directed to Contingency Accounts and Long Term Management  
20 Accounts (see Appendix F).

21 E. Ability to Direct Funds: The Corps and/or Ecology, acting independently or in  
22 concert, and after consultation with each other and the Sponsor, have the authority to direct the  
23 Sponsor to disburse funds to alternative compensatory mitigation projects in cases where the  
24 Sponsor does not provide compensatory mitigation as agreed to by the parties or in cases of  
25 default, per Appendix S. The provisions of Appendix S call for collaboration with the Sponsor  
26 including providing the Sponsor an opportunity to suggest solutions to avoid default. In cases  
27 where default is determined per Appendix S, the Corps and Ecology shall consult with each other  
28 and other members of the IRT prior to making any decisions regarding direction of disbursement  
29 of MRP Account funds. Termination of any Program Account shall only occur upon receipt of  
30 written instructions signed by the Sponsor, Ecology and the Corps; all funds shall be disbursed  
31 pursuant to the instructions of the Corps and Ecology (see Appendix R, Section 1.0).

32 The Corps and/or Ecology shall direct the use of funds through the issuance of a signed  
33 Corrective Action Directive Letter to the Sponsor. The letter will specify what financial and  
34 responsive action the Sponsor must take. The letter will also specify a timeframe in which the  
35 Sponsor must complete the actions. By signing this Instrument the Sponsor has agreed to abide  
36 by the direction of the Corps and Ecology in authorization, release, and use of MRP funds. The  
37 Sponsor acknowledges that failure to abide by the Spending Agreement or written requests, as  
38 provided for herein, of the Corps and/or Ecology may constitute a violation of the program  
39 Instrument and may result in penalties including, in the most severe case, program termination.

40 F. Financial Assurance Requirements: The Sponsor intends to satisfy its obligations  
41 under this Instrument by obtaining sufficient funding to carry out all design, development,  
42 monitoring, remediation and site management responsibilities. The following financial

1 assurances are provided for the work described in this Instrument. Funding for all responsibilities  
2 and obligations arising under this Instrument has been included in the credit price estimation  
3 calculations, and mitigation fees collected are based on full cost accounting (see Appendix F,  
4 Section 2.0). Project approval by the IRT, Ecology and the Corps is contingent upon each  
5 project being fully funded at the time of its approval to cover the Sponsor's obligations under  
6 this Instrument.

7 To the extent, if any, that these funds are insufficient to fully and timely fund the  
8 Sponsor's obligations as delineated in this Instrument, the Department of Natural Resources and  
9 Parks shall include in its budget request appropriations sufficient to cover the balance of the  
10 Sponsor's obligations under this Instrument, and will use all reasonable and lawful means to  
11 fulfill its obligations hereunder. In the event the King County Council does not appropriate  
12 funds in sufficient amounts to discharge these obligations, Department of Natural Resources and  
13 Parks shall use its best efforts to procure funding in order to satisfy its obligations under this  
14 Instrument from any other source of funds legally available for this purpose. Nothing herein  
15 shall constitute, nor be deemed to constitute, an obligation of future appropriations by the  
16 Council.

17  
18  
19 **IV. OPERATION OF THE MITIGATION RESERVES PROGRAM**

20 The Mitigation Reserves Program is approved to provide compensatory mitigation for impacts to  
21 the waters of the United States and waters of the State, including wetlands, aquatic areas and  
22 aquatic resources as defined in Appendix B. Mitigation credits will be sold to impact site  
23 permittees. The funds received from permittees will be consolidated and used to implement  
24 various Mitigation Projects. Once a Mitigation Project reaches functioning capacity in the  
25 watershed, additional mitigation credits will be released to the Sponsor to sell.

26 A. Service Areas: To accomplish the goal of watershed focused mitigation, the  
27 Sponsor has proposed the watershed Service Areas described in Appendix I. The fees for various  
28 impacts in a Service Area will be collected and combined to fund mitigation projects in that  
29 Service Area. In exceptional situations, the Mitigation Reserves Program may be used to  
30 compensate for an impact that occurs outside of the Service Area if specifically approved by the  
31 Corps and/ or Ecology, pursuant to the procedures and criteria prescribed in Appendices H, I and  
32 J. If the Corps and Ecology determine that the Sponsor has sold, used, or transferred credits at  
33 any time to provide compensatory mitigation for loss of aquatic resources outside of the Service  
34 Area where the impact occurred without prior approval under the terms of this instrument, the  
35 Corps and Ecology, in consultation with other applicable members of the IRT, may direct that  
36 the sale, use, or other transfer of credits immediately cease. The Corps and Ecology will  
37 determine, in consultation with the IRT, the Sponsor and the appropriate regulatory authority,  
38 what remedial actions are necessary to correct the situation and will direct the Sponsor's  
39 performance prior to the award of any additional mitigation credits. Notwithstanding the fact  
40 that ceasing sale, use, or other transfer of credits may have been required, unless this Instrument  
41 is terminated pursuant to Article VI.C., the Sponsor shall remain responsible for the timely and  
42 effective achievement of all the Objectives and Performance Standards mandated in Appendix  
43 M.

1           B.     Advanced Credit Allocation to Sponsor: The Sponsor requests, and the Corps and  
2 Ecology agree to initially grant advance credits to be made available for sale to applicants  
3 undertaking permitted actions with unavoidable impacts. Appendices E and I detail the rationale,  
4 amount, and type of advance credits requested. The Sponsor may need to request additional  
5 advance credits, in which case approval must be granted by the Corps and Ecology, in  
6 consultation with the IRT. Requests for additional advance credit must also comply with Article  
7 VI.C.

8           C.     Credit Deficit or Fraudulent Transactions: If the Corps and/or Ecology  
9 determines at any point that the Mitigation Reserves Program is operating without prior written  
10 approval, at a deficit, or has engaged in fraudulent transactions in the sale, use, or other transfer  
11 of credits, the Corps and/or Ecology shall direct the Sponsor to immediately cease award and  
12 sale, use, or other transfer of credits, and shall determine in consultation with each other, the IRT  
13 and the Sponsor, what remedial actions are necessary to correct the situation and will direct the  
14 Sponsor's performance prior to the award of any additional mitigation credits.

15           D.     Permits: Except for the advance credits provided for in Article IV.B. above, the  
16 Sponsor shall obtain all appropriate environmental documentation, permits and other  
17 authorizations needed to establish and maintain Mitigation Sites, prior to the release of any  
18 mitigation credits to the Sponsor. Compliance with this Instrument does not fulfill the  
19 requirement, or substitute, for such authorization.

20           E.     Permittee Use of Program: an applicant seeking to use the Mitigation Reserves  
21 Program must meet the requirements in Appendix C, and receive a permit approval from the  
22 appropriate permitting authority. Permit approval should require the permittee to calculate the  
23 amount of impacts to the watershed and the credits required to mitigate for the impacts. The  
24 permitting authority will determine whether use of the Mitigation Reserves Program is  
25 acceptable mitigation for the proposed impact, and whether the correct amount of mitigation  
26 credits have been required. If the permitting authority agrees to the use of the Mitigation  
27 Reserves Program by the permittee, the Sponsor shall collect fees for the mitigation credits  
28 required by the applicable permitting agencies to mitigate for the impact activity. The Sponsor  
29 must receive a copy of the permit approval prior to collecting mitigation fees from a permittee.  
30 Upon the Sponsor's receipt of mitigation fees from a permittee the Sponsor shall sign and issue  
31 to the permittee a copy of the Statement of Sale, as found in Exhibit 17. The permittee shall be  
32 responsible for providing copies of the signed Statement of Sale to the applicable permitting  
33 agencies. The permittee may transfer or sell its credits to a third party provided that such action  
34 is approved by the IRT, applicable regulatory agencies, and reflected in a transfer agreement.

35           F.     Approval of Mitigation Sites: By the end of the third full growing season after  
36 any impact in a Service Area the Sponsor agrees to complete land acquisition and initial physical  
37 and biological improvements at a Mitigation Site using mitigation fees collected from the sale of  
38 mitigation credits in that Service Area. To establish a Mitigation Site, the Sponsor agrees to  
39 follow the requirements of Appendix K. The Sponsor shall submit for IRT approval a proposed  
40 Mitigation Site, including a preliminary concept plan for mitigation at the site, as described in  
41 Appendix J. The Sponsor will also submit a proposed Spending Agreement for approval and  
42 signature by the Corps and Ecology, using the template in Exhibit 18. Upon approval of a

1 Mitigation Site by the IRT, and the Sponsor's receipt of a signed corresponding Spending  
2 Agreement, the Sponsor shall prepare and submit a Mitigation Plan as described in Appendix K,  
3 Section 2.0. Upon the approval by the IRT of a Mitigation Plan, the sponsor will proceed to  
4 implement the mitigation project in accordance with the terms of the approved Mitigation Plan  
5 and approved Spending Agreement (see Article III, Funding Provisions). For each approved  
6 Mitigation Plan, Appendix W will be amended in this Instrument to reflect the Mitigation Site  
7 and the Site's Mitigation Plan.

8 G. Compensation Planning Framework: All mitigation projects provided by the  
9 Sponsor under the terms of this Instrument will comply with the Compensation Planning  
10 Framework presented in Appendices H through Appendix Q. The Compensation Planning  
11 Framework will be used to select, secure, and implement aquatic resource restoration,  
12 enhancement, and/or preservation activities.

13 H. Mitigation Site Operational Phases: Mitigation Sites have two operational phases:  
14 the Establishment Phase in which the Site is developed, constructed and actively managed, and  
15 the Long Term Management Phase in which the Site is sufficiently mature to require only  
16 minimal active management.

- 17 1. The Establishment Phase of a particular Mitigation Site will commence upon  
18 the Sponsor's receiving both the IRT-approved Mitigation Plan (see Appendix  
19 K, Section 2.0) and a copy of a recorded Site Protection Instrument pursuant to  
20 Article IV.AA. Prior to termination of the Establishment Phase of a Mitigation  
21 Site, the IRT will perform a final compliance inspection to evaluate whether all  
22 performance standards have been achieved. Upon termination of the  
23 Establishment Phase the Corps and Ecology after consultation with the IRT,  
24 shall release all available credits for the Mitigation Site to the Sponsor.  
25 Termination of the Establishment Phase is conditioned upon the Mitigation Site  
26 meeting the requirements to enter Long Term Management.
- 27 2. The Long Term Management Phase of a particular Mitigation Site will  
28 commence upon the Co-Chair's determining, in consultation with the other  
29 members of the IRT, and the Sponsor, that:
  - 30 a. All applicable performance standards for the Site prescribed in the IRT-  
31 approved Mitigation Plan have been achieved;
  - 32 b. All available credits for that phase have been awarded, or the Corps has  
33 approved the Sponsor's request to permanently cease Mitigation Reserves  
34 Program activities;
  - 35 c. The Sponsor has prepared a Long Term Management Plan that has been  
36 approved by the Corps and Ecology in consultation with the IRT, pursuant  
37 to Appendices K and P;
  - 38 d. The Sponsor has either: (1) assumed responsibilities for accomplishing the  
39 Long Term Management Plan, in which case the Sponsor will fulfill the role

1 of Long Term Steward, or (2) has assigned those responsibilities to another  
2 Long-Term Steward pursuant to Article VI.D;

3 e. The Long Term Management Account has been funded as described in this  
4 Instrument;

5 f. Appropriate moneys from the Long Term Management Account have been  
6 transferred to the Long Term Steward, if applicable; and

7 g. The Sponsor has complied with the terms of this Instrument.

8 I. Deviation from Mitigation Site Plans: In establishing the Mitigation Sites,  
9 deviations from the approved Mitigation Plans may only be made with the prior approval of the  
10 Corps and Ecology, following consultation with applicable members of the IRT. In the event the  
11 Sponsor determines that modifications to an approved Mitigation Plan are necessary, the Sponsor  
12 shall submit a written request for such modification to the IRT, through the Co-Chairs, for  
13 approval. Documentation of implemented modifications shall be made consistent with Article  
14 VI.C.

15 J. Credit Release Schedule: Subject to the documentation and scheduling provisions  
16 of Appendix K, Section 6.0, the Sponsor may submit to the IRT written evidence that particular  
17 performance standards have been achieved. If the Co-Chairs, after consulting with the other  
18 members of the IRT and the Sponsor, concur that the required performance standards have been  
19 achieved in full, they will notify the IRT and respond in writing to the Sponsor that the credits  
20 associated with those performance standards are released. Mitigation credits will be released to  
21 the Sponsor in accordance with the procedures and schedules prescribed in the Appendices; see  
22 especially Appendices K, M, and Q.

23 K. Modification of Credits: If the aquatic resource restoration, establishment,  
24 enhancement, and/or preservation activities cannot be implemented in accordance with an  
25 approved mitigation plan, the Corps and Ecology must consult with the Sponsor and the IRT to  
26 consider modifications to the site mitigation plan, including adaptive management, revisions to  
27 the credit release schedule, and alternatives for providing compensatory mitigation to satisfy any  
28 credits that have already been sold (see 33 CFR 332.8(l)(2)). Once implemented, if the in-lieu  
29 fee project does not then achieve its performance-based milestones, the Corps and Ecology may  
30 modify the credit release schedule, including reducing the number of credits, according to the  
31 procedures described in the federal rule (see 33 CFR 332.8(o)(8)(iii)). Any such modification to  
32 an approved mitigation plan or credit release schedule shall occur per Article VI.C. of this Basic  
33 Agreement.

34 L. Monitoring Provisions: The Sponsor agrees to perform all necessary work,  
35 pursuant to Appendix N, to monitor the Mitigation Reserves Program during the establishment  
36 period to demonstrate compliance with the performance standards established in Appendix M.

37 M. Maintenance Provisions: Following achievement of the performance standards,  
38 the Sponsor agrees to perform all necessary work to maintain those standards as prescribed in  
39 Appendix L.

1 N. Contingency Plans/Remedial Actions: In the event the Mitigation Reserves  
2 Program fails to achieve by the specified date one or more of the performance standards  
3 identified in an IRT-approved Mitigation plan consistent with provisions in Appendix K, Section  
4 2.0, the Sponsor shall develop necessary contingency plans and implement appropriate remedial  
5 and monitoring actions for the Mitigation Reserves Program as specified in Appendix O, to  
6 attain those project objectives and performance standards. Prior to their execution, proposals for  
7 the contingency plans and remediation and monitoring activities must be approved by the Corps  
8 and Ecology, after consultation with the Sponsor, and the IRT. In the event the Sponsor fails to  
9 implement necessary remedial actions within the prescribed period, the Corps and Ecology, in  
10 their sole discretion, following consultation with the Sponsor and the IRT, will direct remedial,  
11 corrective, and/or sanctioning action in accordance with the procedures specified in Appendix S.  
12 In cases of default as described in Article IV.R and Appendix S, the Corps and/or Ecology may  
13 accomplish such remedial action directly, acting through a third party designee, by directing use  
14 of the financial assurance instrument pursuant to Articles III.E and III.F.

15 O. Availability of Credits in the Event Contingencies or Financial Assurances are  
16 Accessed: In the event the Corps and/or Ecology, acting pursuant to Articles IV.N or IV.Q,  
17 directs the use of the Financial Assurances established pursuant to Article III.E and III.F. and the  
18 use of any Financial Assurances accomplishes any objectives, performance standards, or features  
19 of a Mitigation Site implemented by the Mitigation Reserves Program, the Corps and Ecology, in  
20 consultation with the other members of the IRT, may award credits for sale, use, or transfer by  
21 the Sponsor, in a quantity reflecting the objectives and performance standards achieved as a  
22 result of such remedial action.

23 P. Force Majeure: The Sponsor may request, pursuant to Article VI.C., and the  
24 Corps and Ecology may approve changes to the construction, operation, project objectives,  
25 performance standards, timelines or crediting formula of the Mitigation Reserves Program,  
26 pursuant to the standards and procedures specified in applicable Appendices if all of the  
27 following occur: an act or event causes substantial damage such that it is determined to be a  
28 force majeure; such act or event has a significant adverse impact on the quality of the aquatic  
29 functions, native vegetation, or soils of the mitigation site; and such act or event was beyond the  
30 reasonable control of the Sponsor, its agents, contractors, or consultants to prevent or mitigate.

- 31 1. The evaluation of the damage caused by a force majeure and the resulting  
32 changes to mitigation requirements will necessarily involve communication  
33 among the Parties and the IRT. If the Sponsor asserts a mitigation site has  
34 sustained significant adverse impacts due to an event or act which may be  
35 determined to be a force majeure, the Sponsor shall give written notice to the  
36 Corps, Ecology and the IRT as soon as is reasonably practicable. After  
37 receiving written notice, the Corps and Ecology, in consultation with the  
38 Sponsor and the IRT, shall evaluate whether the event qualifies as force  
39 majeure. The Corps and Ecology, in consultation with the Sponsor and the IRT,  
40 will then evaluate whether significant adverse impacts have occurred to the site.  
41 If a force majeure event is determined to have occurred and significant adverse  
42 impacts are found to have occurred to the site, the Corps and Ecology, in  
43 consultation with the IRT and the Sponsor, will evaluate whether and to what

1 extent changes to the mitigation site will be in the best interest of the site and  
2 the aquatic environment, and may approve such changes as detailed in  
3 paragraph P above. The Corps and Ecology retain sole discretion over the final  
4 determination of whether an act or event constitutes force majeure, whether  
5 significant adverse impacts to a mitigation site have occurred, and to what  
6 extent changes to a mitigation site will be permitted.

7 2. Force majeure events include natural or human-caused catastrophic events or  
8 deliberate and unlawful acts by third parties.

- 9 a. Examples of a natural catastrophic event include, but are not limited to: a  
10 flood equal to or greater in magnitude than the 100-year flood event; an  
11 earthquake of a force projected from an earthquake with a return period of  
12 475 years; drought that is significantly longer than the periodic multi-year  
13 drought cycles that are typical of weather patterns in the Pacific Northwest;  
14 as well as events of the following type when they reach a substantially  
15 damaging nature: disease, wildfire, depredation, regional pest infestation, or  
16 significant fluviogeomorphic change.
- 17 b. Examples of a human-caused catastrophic event include, but are not limited  
18 to substantial damage resulting from the following: war, insurrection, riot or  
19 other civil disorders, spill of a hazardous or toxic substance, or fire.
- 20 c. Examples of a deliberate and unlawful act include, but are not limited to  
21 substantial damage resulting from the following: the dumping of a  
22 hazardous or toxic substance, as well as significant acts of vandalism or  
23 arson.

24 Q. Noncompliance: Noncompliance not rising to the level of default is categorized  
25 for Mitigation Site, Service Area, and the Mitigation Reserves Program. This noncompliance  
26 includes performance failure, and delinquency (see Appendix S). Before a Mitigation Site,  
27 Service Area or the program is found to be in default (see Article IV.R. below), the Corps and  
28 Ecology, in consultation with the IRT and the Sponsor, shall seek to address the causes of  
29 noncompliance following the steps outlined in Appendix S, which describes the categories of  
30 non-compliance.

31 R. Default: Three levels of default exist: Mitigation Site default, Service Area  
32 default, and programmatic default which may result from administrative failures or other actions  
33 or inactions specified in Appendix S (see Appendix S). Should the Corps and Ecology, in  
34 consultation with the IRT, determine that the Sponsor is in Mitigation Site, Service Area, or  
35 programmatic default as defined in Appendix S, the Corps and Ecology may take the measures  
36 as further prescribed in Appendix S. Remedies available in the case of default include:

- 37 1. Suspending credit sales in one or more service areas;
- 38 2. Decreasing available credits at a site or in one or more service areas;
- 39 3. Directing the Sponsor to utilize Financial Assurances to correct identified  
40 deficiencies (i.e. access contingency funds, Long-term Management funds, or  
41 Land Fees. See Appendix R, and Appendix S, Section 4.0);

- 1 4. Directing The Sponsor to use the Mitigation Reserves Program Fund to secure  
2 necessary mitigation credits (see Article III.E and Appendix S);
- 3 5. Terminating the program Instrument (see Article IV.Y and IV.Z., and Appendix  
4 S, Section 5.0); or
- 5 6. Referring the non-compliance with the terms of this Instrument to the  
6 Department of Justice.

7 S. Notification of Credit Suspension or Program Suspension: In the event of default  
8 the Corps and Ecology may suspend credit sales or suspend use of the program (see Appendix  
9 S). Upon written notification by the Corps and Ecology of credit and/or program suspension, the  
10 Sponsor agrees to immediately cease any pending sale or transfer of credit transactions not yet  
11 finally completed and to cease any use of credits as compensatory mitigation for activities within  
12 the affected site or service area deemed to be in noncompliance until informed by the Corps and  
13 Ecology that release, sale, use, or transfer of credits may be resumed.

14 T. Sponsor's Failure to Correct Default: Should the Sponsor fail to correct the  
15 reasons for default according to and within the time period specified in the default notification  
16 letter per Appendix S, the Corps and, Ecology, following consultation with the IRT, may  
17 terminate this Instrument and any subsequent Mitigation Reserves Program operations pursuant  
18 to the closure provisions in Article IV.Y. below.

19 U. Unavoidable Delays: The Sponsor shall not be deemed to be in noncompliance or  
20 default when delays to implementation or action are due to the IRT decision making process  
21 including review and approval of mitigation actions, or to events categorized under the Force  
22 Majeure provision above.

23 V. Site Closure: If the Sponsor or any member of the IRT determines that a  
24 mitigation Site will not be able to meet performance standards specified in an IRT-approved  
25 Mitigation Plan, or that for any reason continued mitigation actions at a Site are impracticable,  
26 the Sponsor, the Corps, Ecology, or any member of the IRT may recommend closure of the  
27 affected Site. Following a recommendation of closure, the Corps and Ecology, after consultation  
28 with the Sponsor and the IRT, shall have the option of closing a Site. The Sponsor, Corps,  
29 Ecology, and members of the IRT shall seek consensus on Site closure decisions. If consensus  
30 cannot be reached, the Corps' and Ecology's determination shall be final.

31 W. Service Area Closure. The Sponsor, or the Corps and Ecology may terminate this  
32 Instrument as to a specific Service Area in cases where the Sponsor fails to abide by the terms of  
33 this Instrument in ways that fundamentally prevent the overall successful operation of the  
34 program in that service area as described in Appendix S. Additionally, at the Sponsor's  
35 discretion, the Sponsor may terminate this Instrument as to a specific Service Area within 60  
36 days of written notification to the other parties. Closing a Service Area does not automatically  
37 trigger Program Closure.

38 X. Program Closure: The Sponsor, the Corps, and/or Ecology, acting independently  
39 or in concert, may terminate this Instrument within 60 days of written notification to the other  
40 parties and to the IRT members. In the event that such termination action is commenced, the

1 Sponsor is responsible for providing to the IRT reports detailing credit and fee ledger balances,  
2 as well as status reports for all mitigation projects.

3 Y. Closure Provisions: In cases of Site, Service Area, or Program closure the  
4 Sponsor remains responsible for fulfilling any outstanding or pre-existing project obligations  
5 including the successful completion of ongoing mitigation projects, relevant maintenance and  
6 monitoring, reporting, and long-term management requirements. The Sponsor shall remain  
7 responsible for fulfilling these obligations so that the obligations are satisfied or the long-term  
8 management and maintenance of all mitigation lands has been transferred to a third party  
9 approved by the Corps and Ecology. In cases of closure, the Corps and Ecology, after  
10 consultation with the Sponsor, and other members of the IRT, will determine the amount of  
11 credits the sponsor must recover through alternative mitigation (see Appendix S).

12 Z. Closure Provisions Regarding Funding: Funds remaining in the Mitigation  
13 Reserves Program accounts after all obligations are satisfied must continue to be used for the  
14 restoration, establishment, enhancement, and /or preservation of wetland areas and resources.  
15 Any expenditure of these remaining funds requires IRT review and approval. If the Sponsor has  
16 outstanding mitigation obligations at the time of closure which it is unable to fulfill, the Corps  
17 and Ecology in consultation with other members of the IRT, shall direct the Sponsor to use  
18 remaining funds to secure credits from a third party source of mitigation as described in  
19 Appendix S.

20 AA. Mitigation Site Protections: All real property to be included in the Roster of  
21 available sites, now or in the future, will be either (1) owned in fee simple by the Sponsor and  
22 subject to a restrictive covenant established by the Sponsor limiting use to wetlands mitigation,  
23 or similarly restricted by a conservation easement granted by the Sponsor to a third party; or (2)  
24 subject to a conservation easement granted to the Sponsor by a landowner that restricts use to  
25 wetlands mitigation consistent with this Program. All restrictive covenants or conservation  
26 easements shall be perpetual in duration, must be approved by the IRT, and must be recorded  
27 with the King County Recorder's Office prior to the release of any Mitigation Reserves Program  
28 credits. (See Appendix J for the existing real property roster of available sites).

29 BB. Mitigation Site Restrictions on Use: The Corps and Ecology may treat the  
30 Sponsor as being in material default of a provision of this Instrument and proceed accordingly  
31 under Article IV.R., should the Corps and Ecology, in consultation with the IRT, determine that  
32 either of the following have occurred:

- 33 1. The Sponsor has granted additional easements, rights of way, or any other  
34 property interests in the project areas without the written approval of the Corps,  
35 in consultation with the IRT.
- 36 2. The Sponsor has used or authorized use of any areas of mitigation sites within  
37 the Mitigation Reserves Program for any purpose that Corps and Ecology, in  
38 consultation with the IRT, concludes is contrary to the provisions of this  
39 Instrument or the restrictive covenant or conservation easement, or that  
40 interferes with the conservation purposes of the Mitigation Reserves Program.

1 CC. Inspection of Mitigation Reserves Program Sites: The Sponsor will allow, or  
2 otherwise provide for, access to the Mitigation Reserves Program site by members of the IRT or  
3 their agents or designees, as reasonably necessary for the purpose of inspection, compliance  
4 monitoring, and remediation consistent with the terms and conditions of this Instrument and the  
5 Appendices, including mitigation site establishment and long-term management phases. This  
6 right shall remain in place even in the event the program or a Service Area closes. Inspecting  
7 parties shall provide the Sponsor reasonable prior notice of a scheduled inspection, and shall not  
8 unreasonably disrupt or disturb activities on the property.

9 DD. Accomplishment of Sponsor Responsibilities; Transfer of Ownership of a  
10 Mitigation Site: The Sponsor shall remain responsible for complying with the provisions of this  
11 Instrument throughout the operational life of the Mitigation Reserves Program, regardless of the  
12 ownership status of the underlying real property where Mitigation Sites are located, unless those  
13 responsibilities have been assigned pursuant to the provisions of Article VI.D. The Sponsor is  
14 not required to but may transfer ownership of all or a portion of the Mitigation Sites' real  
15 property interest to another party, provided the Corps and Ecology, following consultation with  
16 the other members of the IRT expressly approve the transfer in writing. The Sponsor shall  
17 provide no less than 60 days' written notice to the IRT of any transfer of fee title or any portion  
18 of the ownership interest in the Mitigation Reserves Program real property interest to another  
19 party.

20 EE. Transfer of Long Term Management Responsibilities: The Sponsor may assign its  
21 long-term management responsibilities to a third party assignee, which will then serve as Long-  
22 Term Steward in place of the Sponsor. The identity of the assignee and the terms of the long-  
23 term management and maintenance agreement between the Sponsor and the assignee must be  
24 approved by the Corps and Ecology, following consultation with the IRT, in advance of  
25 assignment.

26 Upon execution of a long-term management assignment agreement and the transfer of the  
27 contents of the Long-Term Management Account, and upon satisfaction of the remaining  
28 requirements for termination of the establishment phase of the Mitigation Reserves Program  
29 under Article IV.H., the Sponsor shall be relieved of all further long-term management  
30 responsibilities under this Instrument which are associated with the site for which responsibilities  
31 have been transferred.

32  
33 **V. RESPONSIBILITIES OF THE CORPS AND ECOLOGY AS CO-CHAIRS OF THE IRT**

34 A. The Corps and Ecology agree to provide appropriate oversight in carrying out  
35 their responsibilities under the provisions of this Instrument.

36 B. The Corps and Ecology agree to review and provide comments on project plans,  
37 monitoring reports, contingency and remediation proposals, and similar submittals from the  
38 Sponsor in a timely manner. As Co-Chairs, the Corps and Ecology will coordinate their review  
39 with the other members of the IRT.

1 C. The Corps and Ecology agree to review requests to modify the terms of this  
2 Instrument, to transfer title or interest in any real estate subject to the Mitigation Reserves  
3 Program, to determine achievement of performance standards in order to evaluate the award of  
4 credits for each phase of the Mitigation Reserves Program, or to approve the Long-Term  
5 Management Plans. As Co-Chairs, the Corps and Ecology will coordinate review with the  
6 members of the IRT so that a decision is rendered or comments detailing deficiencies are  
7 provided in a timely manner. The Corps and Ecology agree to not unreasonably withhold or  
8 delay action on such requests.

9 D. The Corps and Ecology agree to act in good faith when rendering decisions about  
10 acceptability of financial assurances, requiring corrective or remedial actions, requiring long-  
11 term management and maintenance actions, and releasing credits. The Corps and Ecology shall  
12 exercise good judgment in accessing financial assurances, and will utilize those monies only to  
13 the extent they reasonably and in good faith conclude that such remedial or corrective actions are  
14 an effective and efficient expenditure of resources. In implementing the process delineated in  
15 Article III.E., the Corps and Ecology will act in good faith in determining the scope and nature  
16 of corrective actions to be undertaken, shall act in good faith in conducting monitoring,  
17 developing reports, and assessing compliance with performance standards; and will not  
18 unreasonably limit options available as corrective action activities or otherwise apply their  
19 discretion so as to unduly prejudice the Sponsor regarding the timing or number of credits  
20 released. Approval by the Corps and by Ecology of the identity of any assignee responsible for  
21 executing the Long Term Management Plan, and approval of the terms of any long-term  
22 management assignment agreement, will not be unreasonably withheld.

23 E. The Corps and/or Ecology will periodically inspect the Mitigation Sites as  
24 necessary to evaluate, in consultation with the other members of the IRT, the achievement of  
25 performance standards, to assess the results of any corrective measures taken, to monitor  
26 implementation of Long Term Management Plans, and, in general, to verify the Sponsor's  
27 compliance with the provisions of this Instrument.

28 F. Upon satisfaction of the requirements of Article IV.J. for any mitigation site phase  
29 under this Instrument, the Corps and Ecology will certify, following consultation with the  
30 Sponsor and the other members of the IRT, that the establishment period of a mitigation site has  
31 terminated, all credits associated with the site have been released, and that the site has entered  
32 the long-term management phase. Certification will occur upon the Sponsor's receipt of a letter  
33 issued by the Corps and Ecology to the Sponsor confirming that all credits are released.

34  
35 **VI. GENERAL PROVISIONS**

36 A. Effect of the Mitigation Reserves Program on Federal, State, and Local Permitting  
37 Requirements: Decisions on the use of the Mitigation Reserves Program to provide  
38 compensatory mitigation will be made by the applicable permitting agencies during the  
39 permitting process for each permit. The parties to this Instrument recognize that permit decision  
40 regarding the need for, type, quantity, and appropriateness of compensatory mitigation are to be  
41 made by the appropriate permit reviewers for the applicably permitting agencies. The Corps and  
42 Ecology each have independent authority for permitting actions under their respective  
43 jurisdictions. The Corps holds the responsibility and authority under Section 404 of the Clean

1 Water Act, and Ecology holds independent responsibility and authority under Section 401 of the  
2 Clean Water Act and Chapter 90.48 RCW. This independent authority applies to both impact  
3 sites and mitigation receiving sites. Nothing in this Instrument shall be construed to override the  
4 permitting authority of the Corps, Ecology, or any local permitting entity to regulate applicable  
5 permit requirements on either impact or mitigation sites.

6 B. Decision Making by Consensus: The Corps and Ecology will strive to achieve  
7 consensus regarding issues that arise pertaining to the establishment, operation, management,  
8 and maintenance of the Mitigation Reserves Program and mitigation receiving sites. As Co-  
9 Chairs, the Corps and Ecology will coordinate the review and oversight activities of the IRT so  
10 as to best facilitate opportunity to reach the desired consensus. Review and oversight decisions  
11 will take into account the views of the Sponsor to the maximum extent practicable.

- 12 1. Where consensus cannot otherwise be reached within a reasonable timeframe,  
13 following full consideration of the comments of the members of the IRT and  
14 following consultation with the Sponsor, the Corps holds the responsibility and  
15 authority under Section 404 of the Clean Water Act, and Ecology holds  
16 independent responsibility and authority under Section 401 of the Clean Water  
17 Act and RCW 90.48, to make final decisions regarding the application of the  
18 terms of this Instrument.

19 C. Entry into Effect, Modification or Amendment, and Termination of the  
20 Instrument:

- 21 1. This Instrument, consisting of both this Basic Agreement and the Appendices,  
22 will enter into effect upon the signature by authorized representatives of the  
23 Corps, the Sponsor, and Ecology as of the date of the last of these signatures.
- 24 2. This Basic Agreement portion of this Instrument may be amended or modified  
25 only with the written approval of the Sponsor, Ecology, and the Seattle District  
26 Engineer on behalf of the Corps, or their designees, following consultation with  
27 the other members of the IRT, and following the modification procedures  
28 outlined in 33 CFR 332.8(g).
- 29 3. Amendment of the provisions of the Appendices, including amendments to  
30 include Mitigation Plans or to modify existing Mitigation Plans must be  
31 accomplished according to the procedures outlined in 33 CFR 332.8(g).
- 32 4. This Instrument may be terminated by the mutual agreement of the Sponsor,  
33 Ecology and the Corps, following consultation with the IRT, or may be  
34 terminated under the terms of Article IV.R., X., and Y. of this Instrument in the  
35 case of default by the Sponsor. In the event any termination action is  
36 commenced, the Sponsor agrees to fulfill its pre-existing obligations to perform  
37 all establishment, monitoring, management, maintenance, and remediation  
38 responsibilities that arise directly from credits that have already been awarded,  
39 sold, used, or transferred at the time of termination.
- 40 5. Upon termination of the Mitigation Reserves Program pursuant to Article IV.Y.  
41 this Instrument shall terminate without further action by any Party. Thereafter,

1 the Long-Term Management Plan developed, approved, and instituted in  
2 accordance with Article IV.H.2. shall govern the continuing obligations of the  
3 Sponsor, or its assignee as applicable.  
4

5 D. Assignment of Obligations under this Instrument: The Sponsor may be permitted  
6 to assign its obligations, responsibilities, and entitlements under this Instrument to a third party  
7 provided that such assignment is consistent with the federal rule and approved by the Corps and  
8 Ecology. The Corps and Ecology following consultation with other members of the IRT must  
9 approve the identity of the assignee in order for any assignment to effectively relieve the Sponsor  
10 of those obligations. In evaluating a prospective assignee, the Corps and Ecology may consider  
11 characteristics such as environmental mitigation expertise, wetlands mitigation project or  
12 analogous experience, and financial strength and stability. Approval of the identity of the  
13 assignee will not be unreasonably withheld. The Sponsor must amend this Instrument  
14 accordingly to reflect third party assignments pursuant to the terms of Article VI.C. In this case  
15 applicable financial assurances must be approved by the Corps and Ecology. The physical  
16 ownership of a mitigation site real property and the obligations, responsibilities, and entitlements  
17 under this Instrument are separate and distinct; thus, ownership of the Mitigation Reserves  
18 Program interest may be transferred independently with the approval of the Corps and Ecology  
19 and pursuant to the provisions of Article IV.DD. Once assignment has been properly  
20 accomplished, the Sponsor will be relieved of all its obligations and responsibilities under this  
21 Instrument associated with the mitigation site(s) for which third party assignments are made.  
22 Specific additional provisions pertaining to the assignment of long-term management obligations  
23 are described at Article IV.EE.

24 E. Specific Language of this Basic Agreement Shall Be Controlling: To the extent  
25 that specific provisions of this Basic Agreement portion of the Instrument are inconsistent with  
26 any terms and conditions contained in the Appendices, or inconsistent with other program  
27 documents that are incorporated into this Instrument by reference, the specific language within  
28 this Basic Agreement shall be controlling, to the extent it is consistent with 33 CFR 332.

29 F. Notice: Any notice required or permitted hereunder shall be deemed to have been  
30 given either (i) when delivered by hand, or (ii) three (3) days following the date deposited in the  
31 United States mail, postage prepaid, by registered or certified mail, return receipt requested, or  
32 (iii) when sent by Federal Express or similar next-day nationwide delivery system, addressed as  
33 follows (or addressed in such other manner as the party being notified shall have requested by  
34 written notice to the other party):  
35

36 U.S. Army Corps of Engineers, Seattle District  
37 Mitigation Manager/Co-chair of the IRT  
38 Regulatory Branch  
39 Seattle District, Corps of Engineers  
40 4735 E. Marginal Way South  
41 P.O. Box 3755  
42 Seattle, WA 98124-3755  
43 206-764-3495

1  
2 Washington State Department of Ecology  
3 Wetland Manager/ Co-chair of the IRT  
4 Shorelands and Environmental Assistance Program  
5 P.O. Box 47600  
6 300 Desmond Drive  
7 Olympia, WA 98504-7600  
8 360-407-7045  
9

10 King County Department of Natural Resources and Parks  
11 Mitigation Reserves Program Director  
12 Water and Land Resources Division  
13 201 south Jackson Street, Suite 600  
14 Seattle, WA 98104-3855  
15 206-296-6519  
16

17 G. Entire Agreement: This Instrument, and its appendices, constitutes the entire  
18 agreement between the parties concerning the subject matter hereof.

19 H. Invalid Provisions: In the event any one or more of the provisions contained in  
20 this Instrument are held to be invalid, illegal or unenforceable in any respect, such invalidity,  
21 illegality or unenforceability will not affect any other provisions hereof, and this Instrument shall  
22 be construed as if such invalid, illegal or unenforceable provision had not been contained herein.

23 I. Effect of Agreement: This Instrument does not in any manner affect statutory  
24 authorities and responsibilities of the signatory Parties. This Instrument is not intended, nor may  
25 it be relied upon, to create any rights in third parties enforceable in litigation with the United  
26 States or the State of Washington. This Instrument does not authorize, nor shall it be construed to  
27 permit, the establishment of any lien, encumbrance, or other claim with respect to the Mitigation  
28 Reserves Program property, with the sole exception of the right on the part of the Corps and/or  
29 Ecology to require the Sponsor to implement the provisions of this Instrument, including  
30 recording conservation easements or similarly restrictive covenants, required as a condition of the  
31 issuance of permits for discharges of dredged and fill material into waters of the United States  
32 associated with construction and operation and maintenance of a Mitigation Site.

33 J. Attorneys' Fees: If any action at law or equity, including any action for  
34 declaratory relief, is brought to enforce or interpret the provisions of this Instrument, each party  
35 to the litigation shall bear its own attorneys' fees and costs of litigation.

36 K. Availability of Funds: Implementation of this Instrument with regards to the  
37 Corps is subject to the requirements of the Anti-Deficiency Act, 31 U.S.C. § 1341, and the  
38 availability of appropriated funds. Nothing in this Instrument may be construed to require by the  
39 Corps the obligation, appropriation, or expenditure of any money from the United States  
40 Treasury, in advance of an appropriation for that purpose.

41 L. Headings and Captions: Any paragraph heading or caption contained in this  
42 Instrument shall be for convenience of reference only and shall not affect the construction or  
43 interpretation of any provision of this Instrument.

1 M. Counterparts: This Instrument may be executed by the Parties in any  
2 combination, in one or more counterparts, all of which together shall constitute one and the same  
3 Instrument.

4 N. Binding: This Instrument, consisting of both this Basic Agreement and the  
5 Appendices, shall be immediately, automatically, and irrevocably binding upon the Sponsor and  
6 its heirs, successors, assigns and legal representatives upon execution by the Sponsor and the  
7 Corps.

8

1 IN WITNESS WHEREOF, the Parties hereto have executed this Instrument on the date herein  
2 below last written.

3  
4 SPONSOR:

5 Dow Constantine  
6

2-23-12

7  
8 DOW CONSTANTINE  
9 King County Executive

Date

10  
11  
12  
13 UNITED STATES ARMY CORPS OF ENGINEERS:

14 Bruce A. Estok  
15

12 MAR 2012

16 BRUCE A. ESTOK  
17 Colonel, Corps of Engineers  
18 District Commander

Date

19  
20  
21  
22 WASHINGTON STATE DEPARTMENT OF ECOLOGY:

23 Gordon White  
24

2/28/12

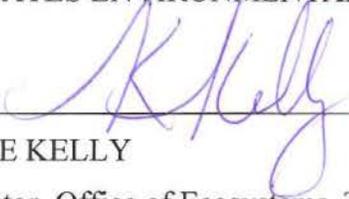
25 GORDON WHITE  
26 Program Manager for Shorelands and Environmental Assistance Program  
27 Washington State Department of Ecology

Date

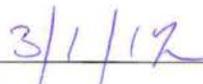
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13

THE INTERAGENCY REVIEW TEAM MEMBERS EXPRESSING AGREEMENT WITH  
THE TERMS OF THIS INSTRUMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

  
\_\_\_\_\_

KATE KELLY  
Director, Office of Ecosystems, Tribal, and Public Affairs  
US EPA

  
\_\_\_\_\_

Date

This instrument is not binding on or does not give rise to any affirmative obligations, express or implied, to other IRT members.

# **APPENDIX D**

CORPS OF ENGINEERS WETLAND  
DETERMINATION DATA FORMS

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

Project/Site: East Lake Sammamish Apartments City/County: Redmond Sampling Date: Feb 4, 2016  
 Applicant/Owner: MSPT XVIII LLC State: WA Sampling Point: S1  
 Investigator(s): Scott Walters and Meryl Kamowski Section, Township, Range: S7, T25, R6  
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): slightly concave Slope (%): >5%  
 Subregion (LRR): LRR A Lat: 47.660451 Long: -122.095998 Datum: WGS 84  
 Soil Map Unit Name: Seattle Muck NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes  No  (If no, explain in Remarks.)  
 Are Vegetation , Soil , or Hydrology  significantly disturbed? Are "Normal Circumstances" present? Yes  No   
 Are Vegetation , Soil , or Hydrology  naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: Greater than normal precipitation in the Winter of 2016.	

### VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status															
<b>Tree Stratum</b> (Plot size: _____)																		
1. <u>Acer macrophyllum</u>	30	NA*	FACU	<b>Dominance Test worksheet:</b> Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A)  Total Number of Dominant Species Across All Strata: <u>2</u> (B)  Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50%</u> (A/B)														
2. <u>Pseudotsuga menziesii</u>	10	NA*	FACU															
3. _____																		
4. _____																		
_____																		
_____ = Total Cover				<b>Prevalence Index worksheet:</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: right;">Total % Cover of:</td> <td style="width: 50%; text-align: left;">Multiply by:</td> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>0</u></td> <td>x 2 = <u>0</u></td> </tr> <tr> <td>FAC species <u>45</u></td> <td>x 3 = <u>135</u></td> </tr> <tr> <td>FACU species <u>83</u></td> <td>x 4 = <u>332</u></td> </tr> <tr> <td>UPL species <u>0%</u></td> <td>x 5 = <u>0</u></td> </tr> <tr> <td>Column Totals: <u>128</u> (A)</td> <td><u>467</u> (B)</td> </tr> </table> Prevalence Index = B/A = _____	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>0</u>	x 2 = <u>0</u>	FAC species <u>45</u>	x 3 = <u>135</u>	FACU species <u>83</u>	x 4 = <u>332</u>	UPL species <u>0%</u>	x 5 = <u>0</u>	Column Totals: <u>128</u> (A)	<u>467</u> (B)
Total % Cover of:	Multiply by:																	
OBL species <u>0</u>	x 1 = <u>0</u>																	
FACW species <u>0</u>	x 2 = <u>0</u>																	
FAC species <u>45</u>	x 3 = <u>135</u>																	
FACU species <u>83</u>	x 4 = <u>332</u>																	
UPL species <u>0%</u>	x 5 = <u>0</u>																	
Column Totals: <u>128</u> (A)	<u>467</u> (B)																	
<b>Sapling/Shrub Stratum</b> (Plot size: _____)																		
1. <u>Rubus armeniacus</u>	83	Y	FACU															
2. _____																		
3. _____																		
4. _____																		
5. _____																		
_____ = Total Cover				<b>Hydrophytic Vegetation Indicators:</b> <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 <sup>1</sup> <input type="checkbox"/> Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants <sup>1</sup> <input type="checkbox"/> Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.														
<b>Herb Stratum</b> (Plot size: _____)																		
1. <u>Athyrium filix-femina</u>	45*	Y	FACU															
2. _____																		
3. _____																		
4. _____																		
5. _____																		
6. _____																		
7. _____																		
8. _____																		
9. _____																		
10. _____																		
11. _____																		
_____ = Total Cover																		
<b>Woody Vine Stratum</b> (Plot size: _____)																		
1. _____																		
2. _____																		
_____ = Total Cover																		
% Bare Ground in Herb Stratum _____																		

Remarks:  
 Pacific Willow was present as a dominant species within the wetland, but was absent in this representative plot. Relative presence/absence of *Athyrium filix-femina* between wetland and upland sampling points indicates a hydrophytic community.  
 \*Species is not rooted within the wetland, and is therefore not included in the dominance test.

**SOIL**

Sampling Point: S1

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

Depth (inches)	Matrix		Redox Features			Loc <sup>2</sup>	Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>			
0-10	10YR 2/2	100	-	-	-	-	Sa Cl Lo	
10-16+	10YR 4/1	85	7.5YR 4/6	15	C	M	Sa Cl Lo	

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.      <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

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

<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<b>Indicators for Problematic Hydric Soils<sup>3</sup>:</b>
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	
<input checked="" type="checkbox"/> Depleted Below Dark Surface (A11)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)	

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

<sup>3</sup>Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if present):**  
 Type: \_\_\_\_\_  
 Depth (inches): \_\_\_\_\_

**Hydric Soil Present?** Yes  No

Remarks:

**HYDROLOGY**

**Wetland Hydrology Indicators:**

<b>Primary Indicators (minimum of one required; check all that apply)</b>	<b>Secondary Indicators (2 or more required)</b>
<input type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A) <input type="checkbox"/> Other (Explain in Remarks)
	<input type="checkbox"/> Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Raised Ant Mounds (D6) (LRR A) <input type="checkbox"/> Frost-Heave Hummocks (D7)

**Field Observations:**

Surface Water Present? Yes  No  Depth (inches): \_\_\_\_\_

Water Table Present? Yes  No  Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes  No  Depth (inches): surface

**Wetland Hydrology Present?** Yes  No

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

Remarks:

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

Project/Site: East Lake Sammamish Apartments City/County: Redmond Sampling Date: Feb 4, 2016  
 Applicant/Owner: MSPT XVIII LLC State: WA Sampling Point: S2  
 Investigator(s): Scott Walters and Meryl Kamowski Section, Township, Range: S7, T25, R6  
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): slightly concave Slope (%): >5%  
 Subregion (LRR): LRR A Lat: 47.660451 Long: -122.095998 Datum: WGS 84  
 Soil Map Unit Name: Seattle Muck NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes  No  (If no, explain in Remarks.)  
 Are Vegetation , Soil , or Hydrology  significantly disturbed? Are "Normal Circumstances" present? Yes  No   
 Are Vegetation , Soil , or Hydrology  naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: Greater than normal precipitation in the Winter of 2016.	

### VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status		
<b>Tree Stratum</b> (Plot size: 15' radius)					
1. <u>Acer macrophyllum</u>	20	Y	FACU	<b>Dominance Test worksheet:</b> Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A)  Total Number of Dominant Species Across All Strata: <u>3</u> (B)  Percent of Dominant Species That Are OBL, FACW, or FAC: <u>33.3%</u> (A/B)	
2. <u>Thuja plicata</u>	8	Y	FAC		
3. <u>Pseudotsuga menziesii</u>	5	N	FACU		
4. _____					
_____ = Total Cover				<b>Prevalence Index worksheet:</b> Total % Cover of: _____ Multiply by: OBL species _____ x 1 = <u>0</u> FACW species _____ x 2 = <u>0</u> FAC species _____ x 3 = <u>0</u> FACU species _____ x 4 = <u>0</u> UPL species _____ x 5 = <u>0</u> Column Totals: <u>0</u> (A) <u>0</u> (B)  Prevalence Index = B/A = _____	
<b>Sapling/Shrub Stratum</b> (Plot size: 10' radius)					
1. <u>Rubus armeniacus</u>	95	Y	FACU		
2. _____					
3. _____					
4. _____					
5. _____					
_____ = Total Cover				<b>Hydrophytic Vegetation Indicators:</b> <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 <sup>1</sup> <input type="checkbox"/> Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants <sup>1</sup> <input type="checkbox"/> Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
<b>Herb Stratum</b> (Plot size: 5' radius)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
_____ = Total Cover				<b>Hydrophytic Vegetation Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
<b>Woody Vine Stratum</b> (Plot size: _____)					
1. _____					
2. _____					
_____ = Total Cover				<b>Hydrophytic Vegetation Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
% Bare Ground in Herb Stratum _____					

Remarks:



# **APPENDIX E**

## REDMOND WETLAND SUMMARY SHEET



# WETLAND SUMMARY SHEET

Wetland Summary		Buffer Summary				Wetland Impacts		Mitigation Summary			
Label <sup>1</sup>	Category <sup>2</sup>	Size <sup>3</sup>	Required <sup>4</sup>	Proposed <sup>5</sup>	Increase <sup>6</sup> Reduce <sup>7</sup>	Averaging <sup>8</sup>	Fill <sup>9</sup>	Paper Fill <sup>10</sup>	Ratio <sup>11</sup>	Area <sup>12</sup>	Location <sup>13</sup>
A	IV	0.086 Ac	50 feet	0 feet	NO	NO	0.086 Ac	None	N/A*	N/A*	Off-Site

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

\*Ratios and Areas are not calculable because mitigation will occur using King County's Mitigation Reserves Program in the Sammamish River Service Area.

# **APPENDIX F**

NWI MAP OF THE SUBJECT SITE



# U.S. Fish and Wildlife Service National Wetlands Inventory

East Lake  
Sammamish  
Apartments

Mar 10, 2016

## Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other



This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

## User Remarks:

Wetland Resources Inc. Project # 16010

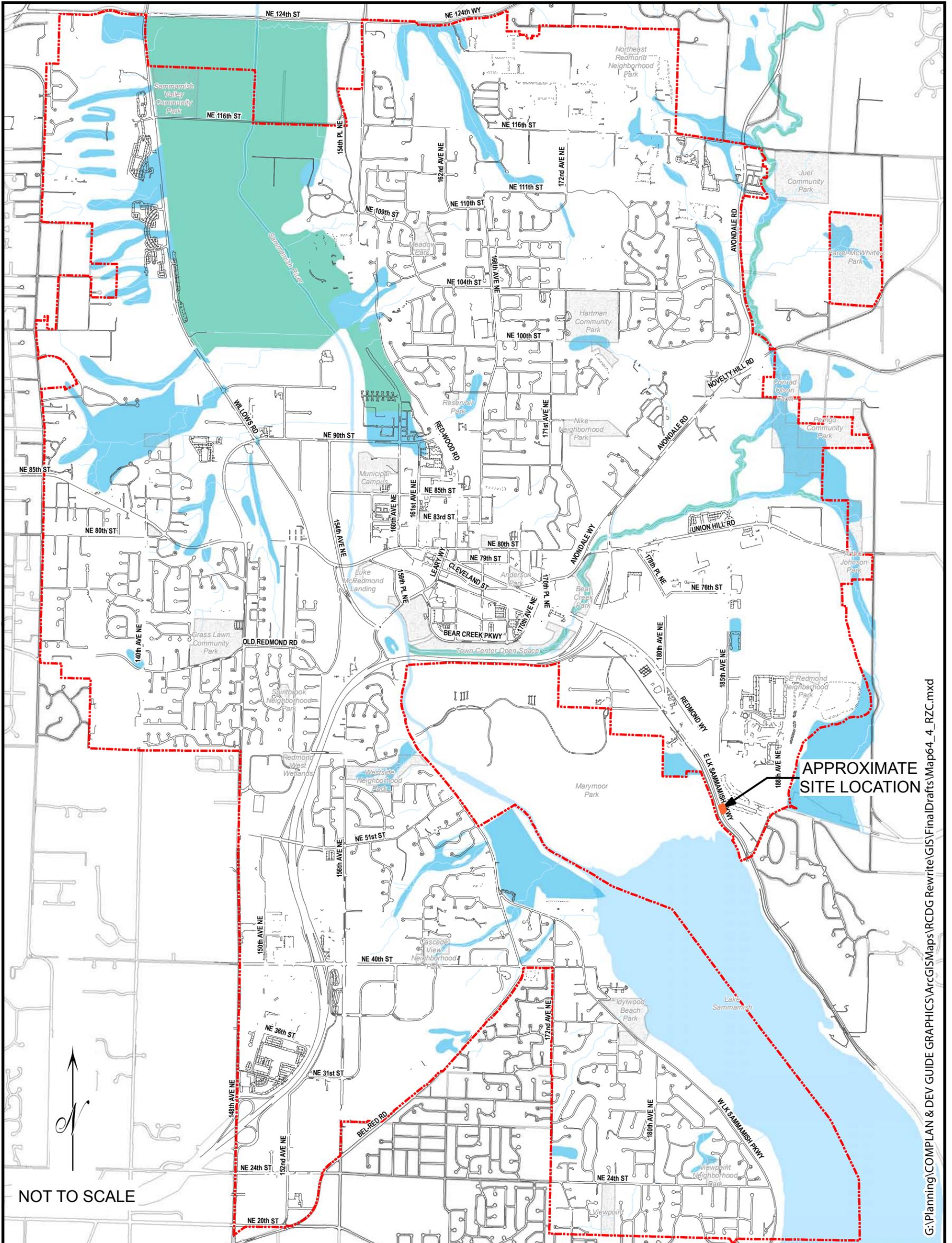
# **APPENDIX G**

## REDMOND WETLAND INVENTORY MAP OF THE SUBJECT SITE

# CITY OF REDMOND CRITICAL AREAS MAP - WETLANDS

## ***EAST LAKE SAMMAMISH APARTMENTS***

### WETLAND RESOURCES, INC #16010



G:\Planning\COMPLAN & DEV GUIDE GRAPHICS\ArcGISMaps\RCDG Rewrite\GIS\Final\Drafts\Map64\_4\_RZC.mxd

**City of Redmond**  
 Critical Areas Map  
 Effective: April 16, 2011  
**Map 64.4 Wetlands**

**Legend:**  
 Mixed Wetland/Upland  
 Wetland  
 Redmond City Limits

Sources:  
 USGS National Wetland Inventory  
 Aerial Photo Interpretation  
 SCS Soil Survey  
 City of Redmond

Note:  
 This map shall be used as a general guide. It represents approximate locations. Consult the Critical Areas Ordinance (CAO) for reporting requirements. In the event there is a conflict between the map and the criteria or standards of the CAO, the criteria shall prevail.

# **APPENDIX H**

## **CRITICAL AREAS MAP SHEETS**

CRITICAL AREAS EXISTING CONDITION MAP (SHEET 1/4)

SITE PLAN & WETLAND IMPACT MAP (SHEET 2/4)

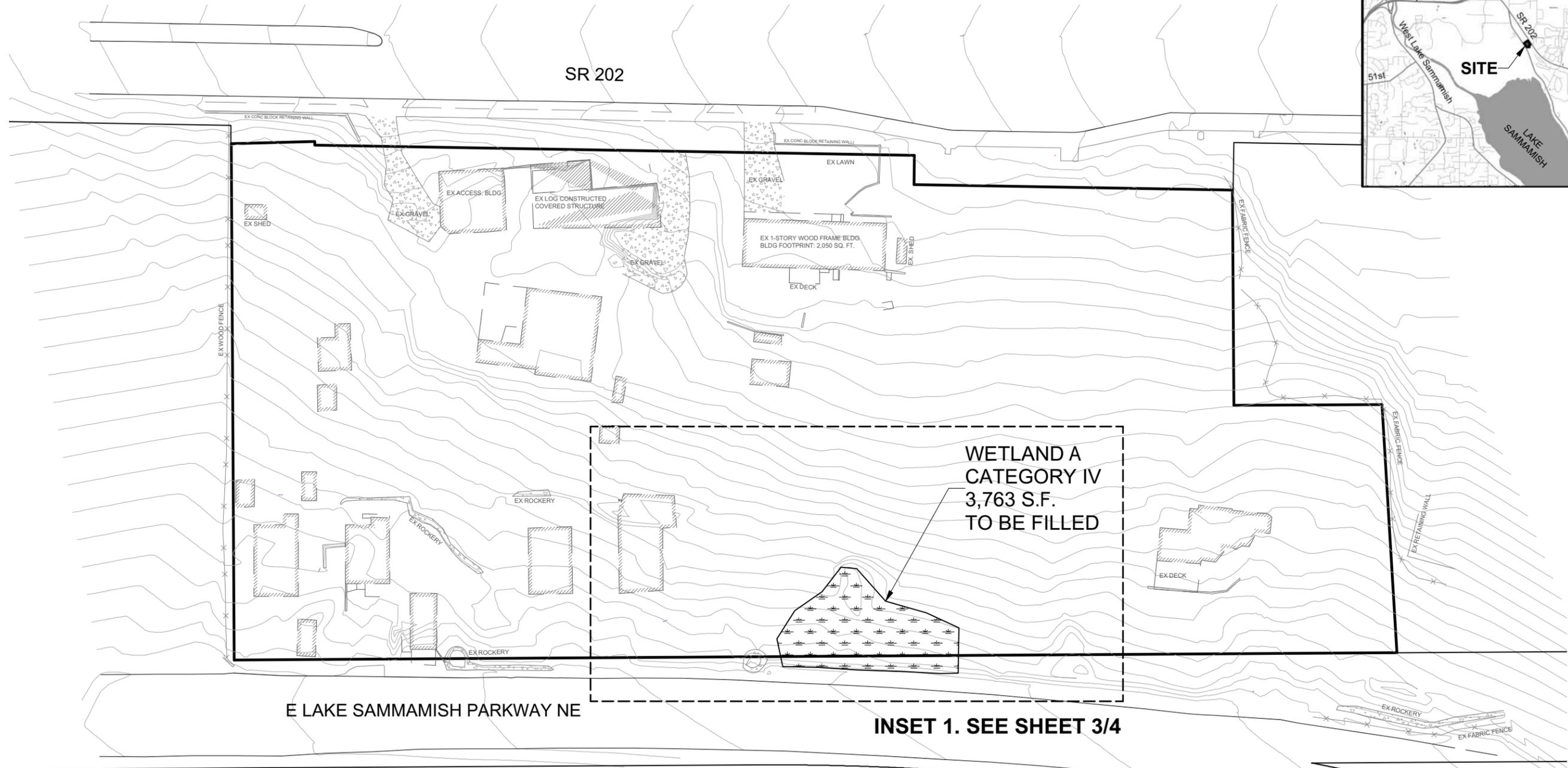
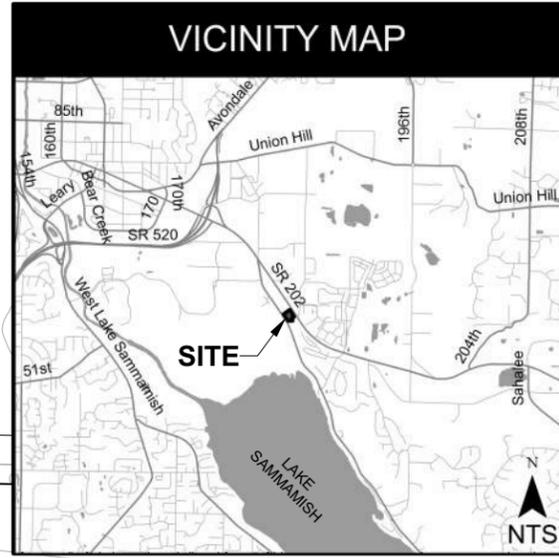
INSET 1 - EXISTING WETLAND CONDITONS (SHEET 3/4)

INSET 2 – WETLAND IMPACTS (SHEET 4/4)

# CRITICAL AREAS EXISTING CONDITIONS MAP

## EAST LAKE SAMMAMISH APARTMENTS

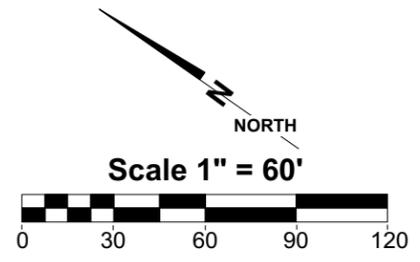
### PORTION OF SECTION 7, TOWNSHIP 25N, RANGE 6E, W.M.



**LEGEND**

WETLANDS

2' EX. CONTOURS



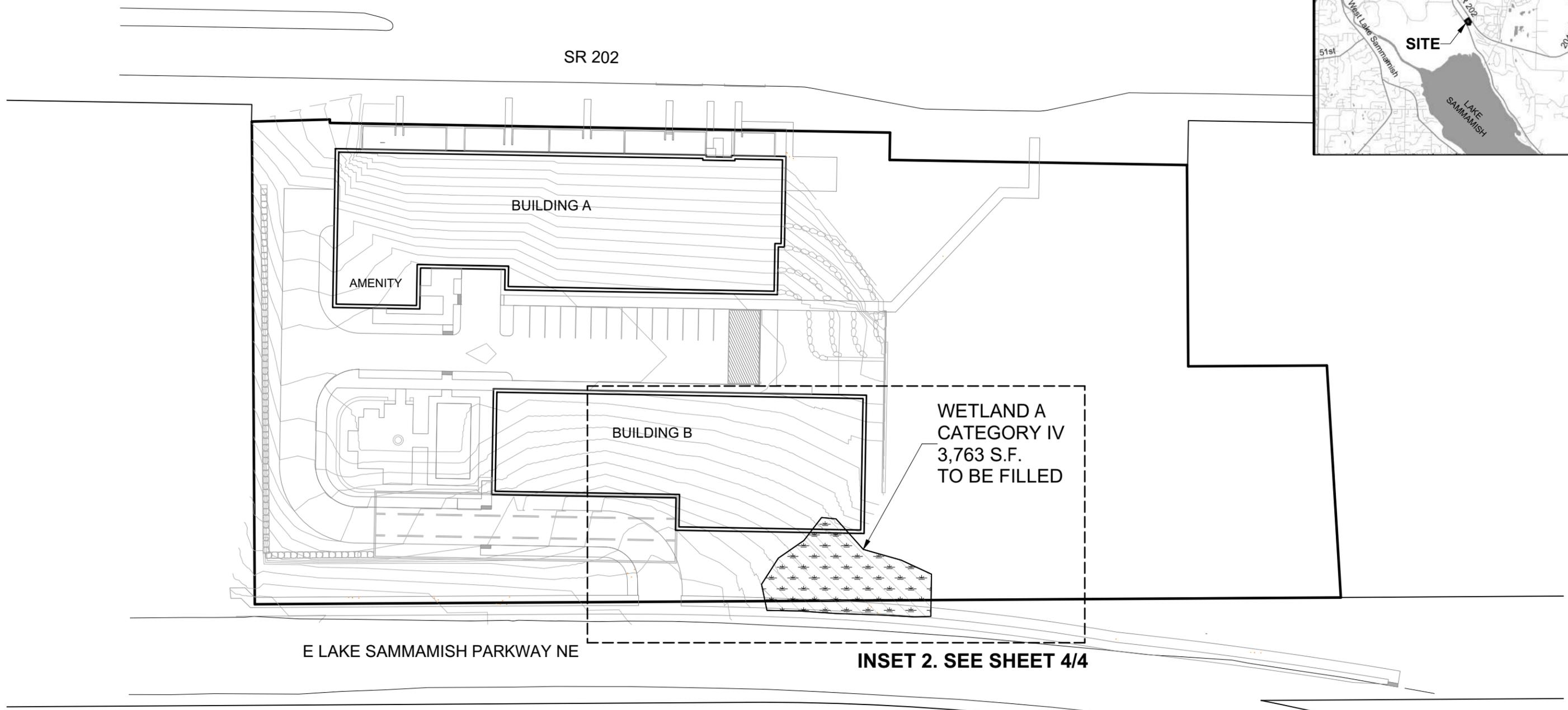
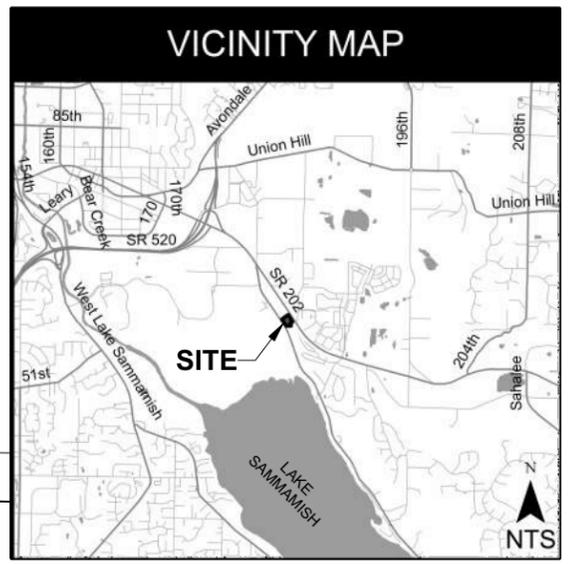
**Wetland Resources, Inc.**  
 Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance  
 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
 Phone: (425) 337-3174  
 Fax: (425) 337-3045  
 Email: mailbox@wetlandresources.com

**CRITICAL AREAS EXISTING CONDITIONS MAP**  
**EAST LAKE SAMMAMISH APARTMENTS**  
 Redmond, Washington

MSPT XVIII LLC.  
 Attn. Marc Boettcher  
 12332 NE 115th PI  
 Kirkland, WA 98033

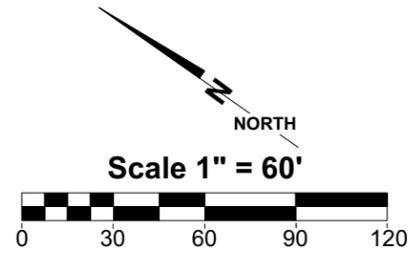
Sheet 1/4  
 WRI Job # 16010  
 Drawn by: SW  
 Date: March 10, 2016

**SITE PLAN & WETLAND IMPACT MAP**  
**EAST LAKE SAMMAMISH APARTMENTS**  
 PORTION OF SECTION 7, TOWNSHIP 25N, RANGE 6E, W.M.



**LEGEND**

-  WETLANDS
-  WETLAND IMPACT AREA
-  2' CONTOURS WITH FINAL GRADING

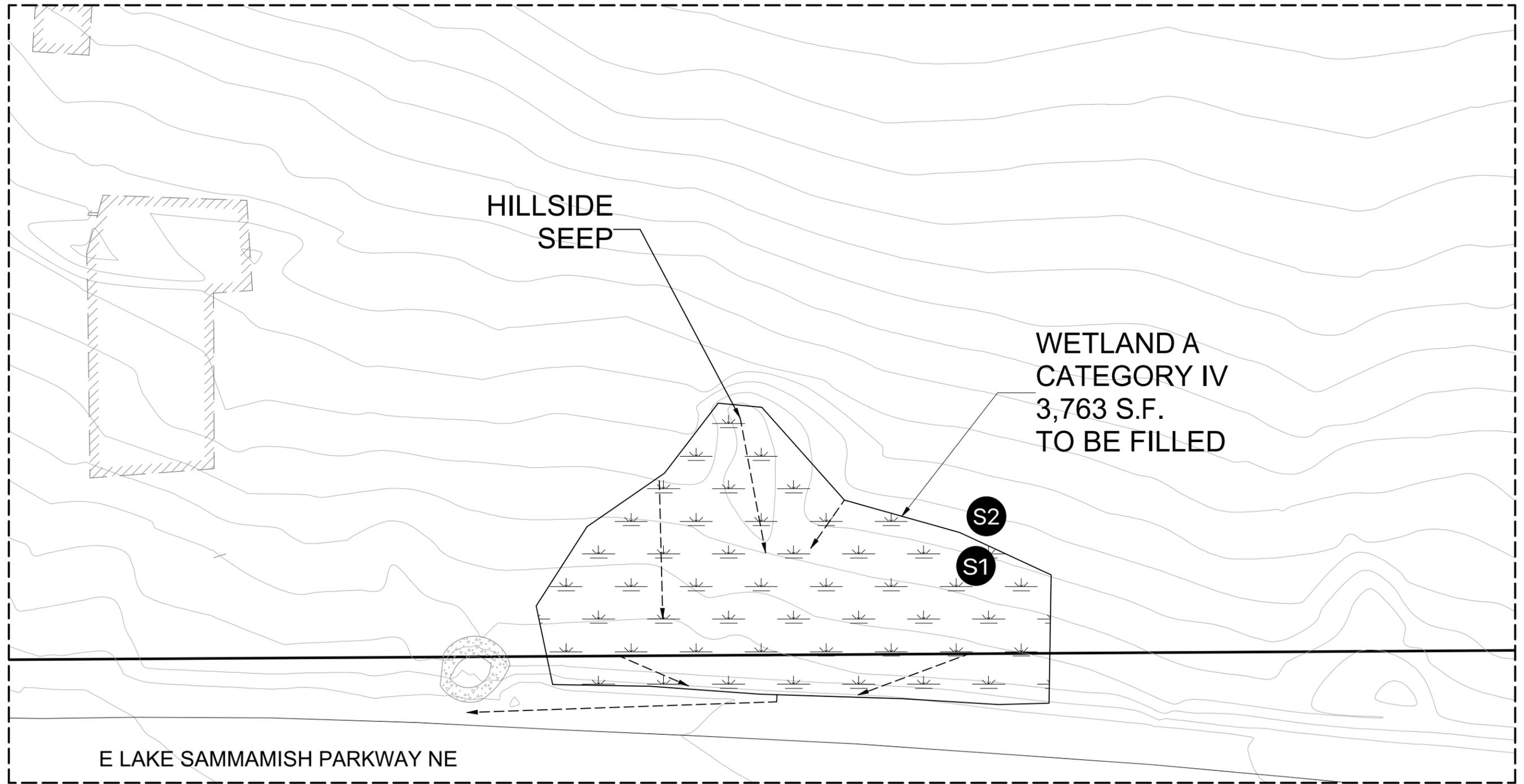


**Wetland Resources, Inc.**  
 Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance  
 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
 Phone: (425) 337-3174  
 Fax: (425) 337-3045  
 Email: mailbox@wetlandresources.com

SITE PLAN & WETLAND IMPACT MAP  
**EAST LAKE SAMMAMISH APARTMENTS**  
 Redmond, Washington

MSPT XVIII LLC. Attn. Marc Boettcher 12332 NE 115th Pl Kirkland, WA 98033	Sheet 2/4 WRI Job # 16010 Drawn by: SW Date: March 10, 2016
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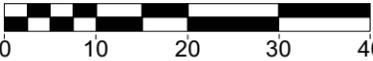
**INSET 1 - EXISTING WETLAND CONDITIONS**  
**EAST LAKE SAMMAMISH APARTMENTS**  
 PORTION OF SECTION 7, TOWNSHIP 25N, RANGE 6E, W.M.



INSET 1. FOR OVERVIEW, SEE SHEET 1/4

**LEGEND**

-  WETLANDS
-  HYDROLOGIC FLOW
-  DATA SITES

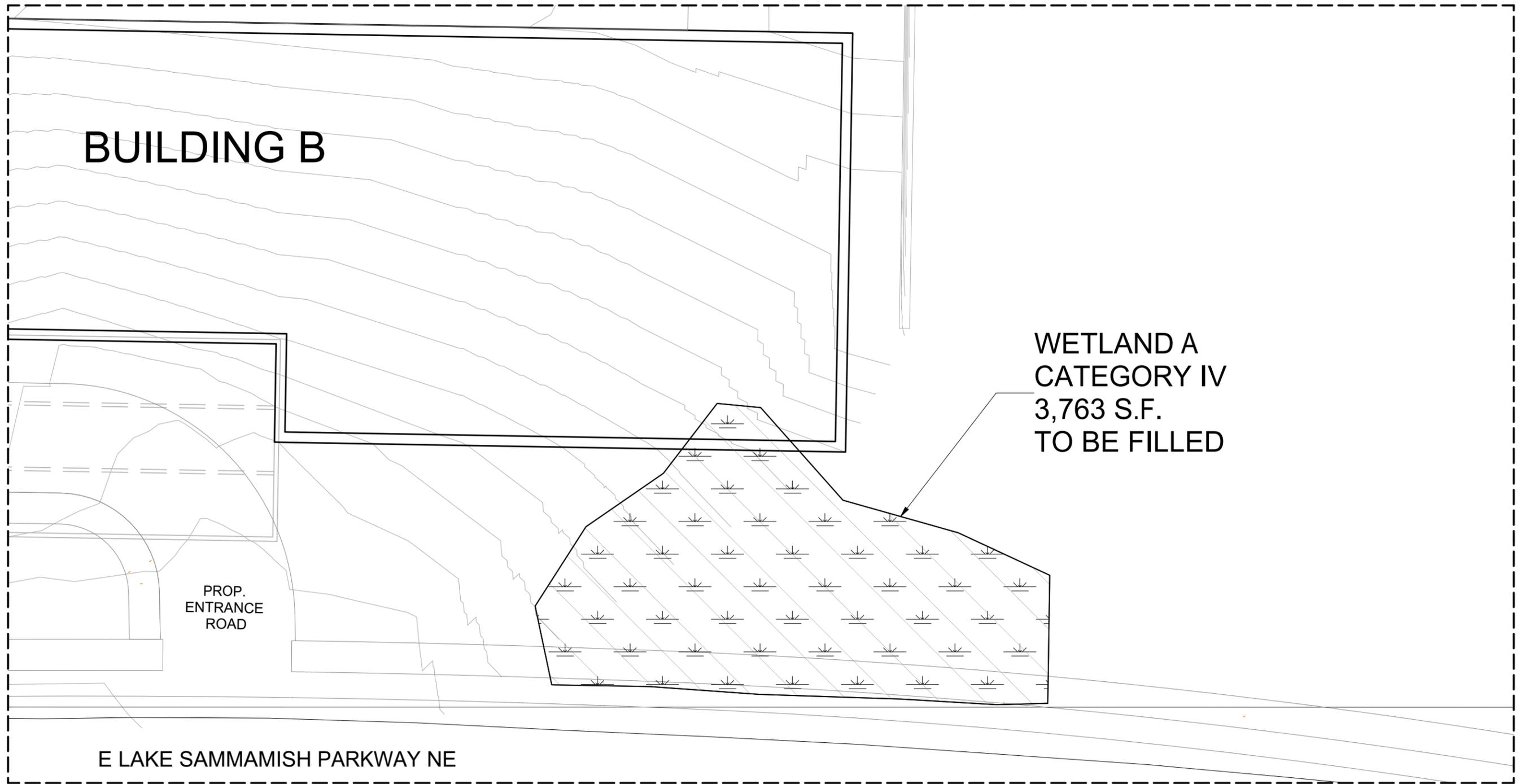
  
 NORTH  
**Scale 1" = 20'**  


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 Email: mailbox@wetlandresources.com

INSET 1 - EXISTING WETLAND CONDITION  
**EAST LAKE SAMMAMISH APARTMENTS**  
 Redmond, Washington

MSPT XVIII LLC.	Sheet 3/4
Attn. Marc Boettcher	WRI Job # 16010
12332 NE 115th PI	Drawn by: SW
Kirkland, WA 98033	Date: March 10, 2016

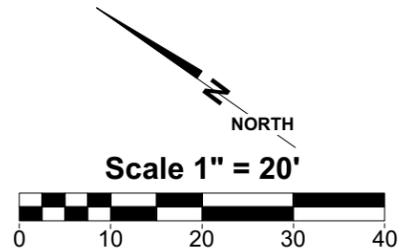
**INSET 2 - WETLAND IMPACTS**  
**EAST LAKE SAMMAMISH APARTMENTS**  
 PORTION OF SECTION 7, TOWNSHIP 25N, RANGE 6E, W.M.



**INSET 2. FOR OVERVIEW, SEE SHEET 2/4**

**LEGEND**

-  WETLANDS
-  WETLAND IMPACT AREA
-  2' CONTOURS WITH FINAL GRADING



***Wetland Resources, Inc.***  
 Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance  
 9505 19th Avenue S.E. Suite 106 Everett, Washington 98208  
 Phone: (425) 337-3174  
 Fax: (425) 337-3045  
 Email: mailbox@wetlandresources.com

INSET 2 - WETLAND IMPACTS  
**EAST LAKE SAMMAMISH APARTMENTS**  
 Redmond, Washington

MSPT XVIII LLC.	Sheet 4/4
Attn. Marc Boettcher	WRI Job # 16010
12332 NE 115th Pl	Drawn by: SW
Kirkland, WA 98033	Date: March 10, 2016

## Section 7 Other Permits

Permits will be provided at a later date.

## Section 8 Operations & Maintenance

A completed Stormwater Management Facility Operation and Maintenance (O&M) Manual will be provided at final engineering in accordance with the COR O&M Manual Template found in Appendix N of the 2012 COR Technical Notebook.



**Stormwater Management Facility  
*Operation and Maintenance (O&M) Manual***

for

East Lake Sammamish Apartments

**Located at:**

6006 East Lake Sammamish Parkway  
Redmond, WA 98052

**Prepared for:**

MSPT XVIII, LLC  
12332 NE 115th Place  
Kirkland, WA 98033  
Contact: Mark Boettcher

**Prepared by:**

The Blueline Group  
25 Central Way, Suite 400  
Kirkland, WA 98033  
(425) 216-4051  
Contact: Christopher H. Miller, PE

**Stormwater Management Facility  
Operation and Maintenance (O&M) Manual**

**Table of Contents**

- I Contact Information
- II Compliance with Redmond Municipal Code
- III. Maintenance
- IV. Preventative Measures to Reduce Maintenance Costs
- V. Safety
- VI. General Location and Description of Stormwater Management Facilities
- VII. Inspecting Stormwater Management Facilities
- VIII. Maintaining Stormwater Management Facilities
- IX. Maintenance Documentation

Appendices

- Appendix A – Maintenance Agreements
- Appendix B – Maintenance Activity Log
- Appendix C – Site Plan
- Appendix D – As-Built Drawings
- Appendix E – Maintenance Standards

**Stormwater Management Facility  
Operation and Maintenance (O&M) Manual**

**I Contact Information**

Owner MSPT XVIII  
Phone (425) 298-0240  
Email marc@mspgroupllc.com

Maintenance Responsible Party:

Phone \_\_\_\_\_  
Email \_\_\_\_\_

Emergency Contact

Phone \_\_\_\_\_  
Email \_\_\_\_\_

City of Redmond, Stormwater Inspection:

The above contact information shall be updated any time that the information changes. Notify the City of Redmond Division of Natural Resources Stormwater Inspector, with this information within 30 days of changes.

**II Compliance with Redmond Municipal Code**

In accordance with Redmond Municipal Code 13.06, all property owners are responsible for ensuring that stormwater facilities installed on their property are properly maintained and that they function as designed. The maintenance responsibility for a stormwater facility may be designated on the subdivision plat, the site development plan, and/or within a maintenance agreement for the property. Property owners should be aware of their responsibilities regarding stormwater facility maintenance. Maintenance agreement(s) associated with this property are provided in Appendix A.

**III. Maintenance**

Maintenance Manuals shall be transferred with the ownership of the property, including from the developer to the first property owner. Maintenance logs shall be provided to the City of Redmond's Public Works Director or his/her designee upon request. A sample Maintenance Log is provided in Appendix B.

#### IV. Preventative Measures to Reduce Maintenance Costs

The most effective way to maintain your water quality facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash & debris, chemicals, dog wastes, runoff from stored materials, illicit discharges into the storm drainage system (like car wash or pressure washing runoff) and many others. A thoughtful maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider in your maintenance program include:

- Educate property owners/residents/tenants to be aware of how their actions affect water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lawn care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings back on the lawn.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscaping materials) unless properly protected from runoff.
- Close the covers on dumpsters to prevent liquids from leaking into the storm system.

#### V. Safety

Never enter a confined space (outlet structure, manhole, etc.) without proper training and equipment. A confined space should never be entered without at least one additional person present.

If a toxic or flammable substance is discovered, leave the immediate area and call 911. Potentially dangerous (e.g., fuel, chemicals, hazardous materials) substances found in the areas must be referred to the local Fire Department immediately for response by the Hazardous Materials Unit. The emergency contact number is 911.

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop.

If any hazard is found within the facility area that poses an immediate threat to public safety, call 911 immediately.

**VI. General Location and Description of Stormwater Management Facilities**

Stormwater management facilities include pipes, catch basins, the combined detention/wet vault including the control structure, and individual lot drains.

The combined detention/wet vault is a public system and shall be maintained by the City of Redmond. Drainage systems (pipes and catch basins) within the public right-of-way are to be maintained by City of Redmond. The maintenance standard tables for combined detention/wet vault, control structure, catch basins, storm conveyance pipes, are included in Appendix E. Semi-annual inspections shall be conducted to ensure proper operations of the drainage system. The inspections should occur prior to the winter rain season (Oct/Nov), leaving sufficient time to correct any detected maintenance problems, and at the end of the season (April/May) to determine the effect of the season's runoff. Once a historical basis is developed the frequency of inspection may be modified as necessary. Sediment can build up inside control structures and catch basins, blocking or restricting flow to the inlet. To prevent this problem, these structures should be routinely cleaned. Regular inspections of control structures should be conducted to detect the need for non-routine cleanout.

Maintenance personnel may use the site plan located in Appendix C containing the locations of the Stormwater Management facilities.

**VII. Inspecting Stormwater Management Facilities**

The City of Redmond, Department of Public Works, inspects private stormwater systems.

**VIII. Maintaining Stormwater Management Facilities**

Stormwater management facilities must be properly maintained to ensure that they operate correctly and provide the water quality treatment for which they were designed. Routine maintenance performed on a frequently scheduled basis, can help avoid more costly rehabilitative maintenance that results when facilities are not adequately maintained. The Maintenance requirements are contained in Appendix E. These requirements should be updated to reflect changes and updates to these facilities.

Routine Work

The majority of this work consists of inspection, scheduled mowing, weed control, and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash rack, and weed control. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with City of Redmond.

Minor Work

This work consists of a variety of isolated or small-scale maintenance and work needed to address operational problems. Most of this work can be completed by a small crew, with minor tools, and small equipment. These items can be completed without any prior correspondence with City of Redmond.

Major Work

This work consists of large-scale maintenance and major improvements needed to address

**East Lake Sammamish Apartments**  
Storm Drainage Report

---

failures within the stormwater management facilities. This work may require an engineering design with construction plans to be prepared for review and approval by the City. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance through private contractors and consultants. These items require prior correspondence with City of Redmond and may be subject to permits.

## **IX. Maintenance Documentation**

The Stormwater Management Facility Maintenance Activity Form provides a record of maintenance activities. Maintenance Forms for each facility type are provided in Appendix B. Maintenance shall be completed by the contractor completing the required maintenance items. The form shall then be reviewed by the property owner or an authorized agent of the property owner and kept on site and submitted to the City of Redmond upon request.

**Appendix A**

**Maintenance Agreements**  
(To Be Provided Prior To Plat Approval)

**Appendix B**

**Stormwater Facility Maintenance Activity Log**

## **Appendix C**

### **Site Plan**

This is a simplified map of the site that shows the location of the stormwater system.

East Lake Sammamish Apartments  
Storm Drainage Report

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INSERT RS-01

[INSERT]

**Appendix D**

**Stormwater As-Built Drawings**  
(To Be Included After Construction)

## **Appendix E**

### **Maintenance Standards**

## Section 9 Bond Quantities

The standard COR estimate forms for final plat and right-of-way performance bond will be completed at final engineering.

## Section 10 Appendix



**December 2015**

**GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT**

**For the**

**MWS-Linear Modular Wetland**

**Ecology's Decision:**

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment
  - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment
  - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment
  - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

**Ecology's Conditions of Use:**

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a “one size fits all” maintenance cycle for a particular model/size of manufactured filter treatment device.

- Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
- Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
- Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
  - Standing water remains in the vault between rain events, or
  - Bypass occurs during storms smaller than the design storm.
  - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
  - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant: Modular Wetland Systems, Inc.  
Applicant's Address: PO. Box 869  
Oceanside, CA 92054

**Application Documents:**

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan: Modular Wetland system – Linear Treatment System performance Monitoring Project*, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data*, April 2014
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring*, April 2014.

**Applicant's Use Level Request:**

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

**Applicant's Performance Claims:**

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

**Ecology Recommendations:**

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

**Findings of Fact:**Laboratory Testing

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

## Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

## **Issues to be addressed by the Company:**

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

## **Technology Description:**

Download at <http://www.modularwetlands.com/>

## **Contact Information:**

Applicant:

Greg Kent  
Modular Wetland Systems, Inc.  
P.O. Box 869  
Oceanside, CA 92054  
[gkent@biocleanenvironmental.net](mailto:gkent@biocleanenvironmental.net)

Applicant website: <http://www.modularwetlands.com/>

Ecology web link: <http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html>

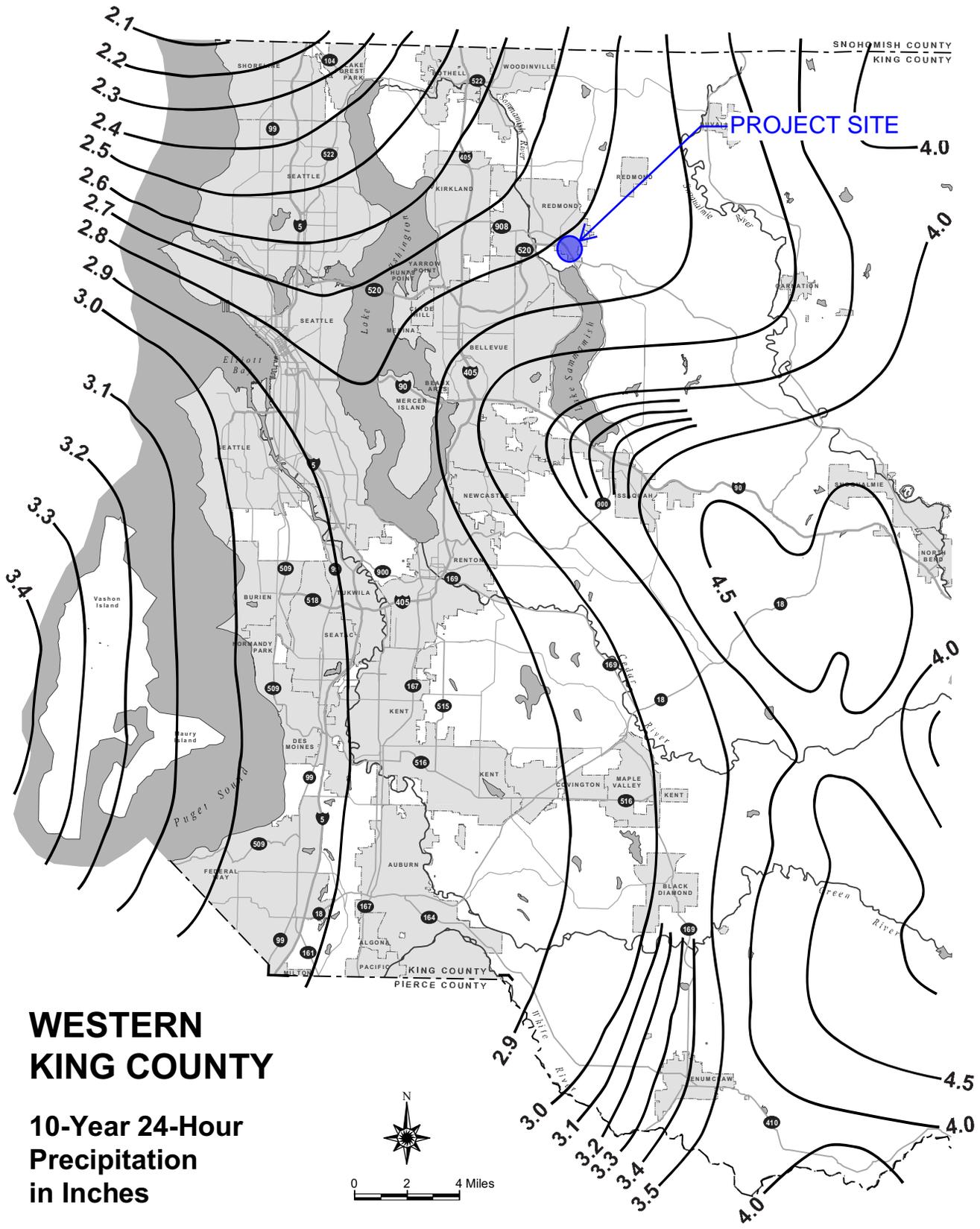
Ecology: Douglas C. Howie, P.E.  
Department of Ecology  
Water Quality Program  
(360) 407-6444  
[douglas.howie@ecy.wa.gov](mailto:douglas.howie@ecy.wa.gov)

**Revision History**

<b>Date</b>	<b>Revision</b>
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants.



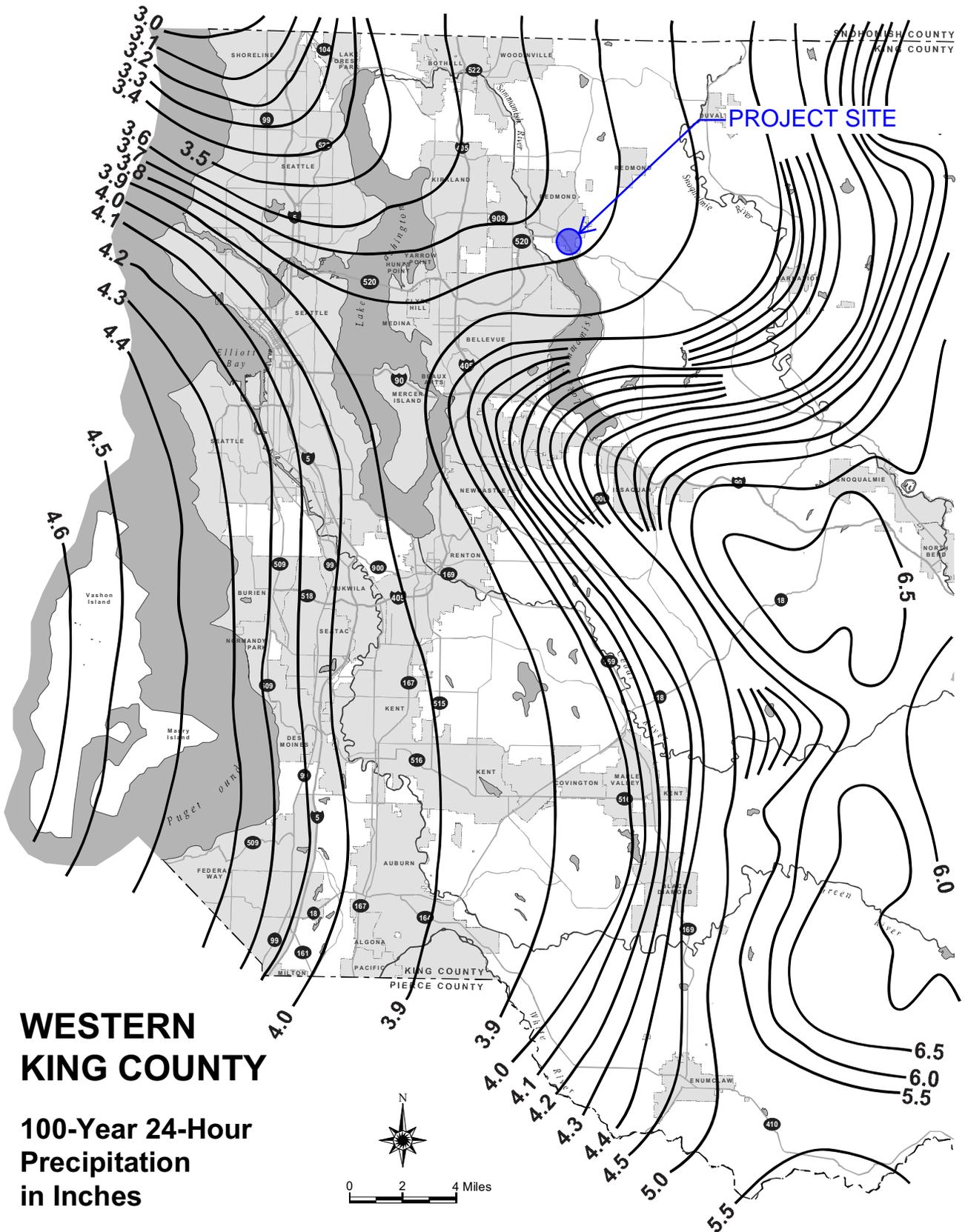
**FIGURE 3.2.1.B 10-YEAR 24-HOUR ISOPLUVIALS**



**WESTERN  
KING COUNTY**  
**10-Year 24-Hour  
Precipitation  
in Inches**



**FIGURE 3.2.1.D 100-YEAR 24-HOUR ISOPLUVIALS**



**WESTERN  
KING COUNTY**

**100-Year 24-Hour  
Precipitation  
in Inches**



## MEMORANDUM

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DATE: May 19, 2016  
TO: Jeff Dendy, PE, City of Redmond  
FROM: Christopher H. Miller, PE, The Blueline Group  
RE: East Lake Sammamish Apartments - LID Assessment

---

As part of the stormwater design process The City of Redmond requires that an assessment for the possible installation of LID Best Management Practices be completed. All design requirements for the BMPs are referenced from the 2012 City of Redmond Stormwater Technical Notebook and the 2012 Washington State Department of Ecology Stormwater Manual for Western Washington. This LID Assessment has been performed for the East Lake Sammamish Apartments development located at 6006 East Lake Sammamish Parkway NE. It will be located on what is now a steep largely undeveloped hillside between State Route 202 to the Northeast and East Lake Sammamish Pkwy NE to the Southwest.

The project will incorporate the following Best Management Practices (BMPs) required by COR per Section 2.5.5 of the 2012 COR Technical Notebook:

- Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V of the 2012 Ecology Manual. **Where slopes are less than 33 percent, existing soil quality and soil depth will be maintained throughout much of the site. New landscaping that requires pesticides, fertilizers, or includes non-native plants or soil will be kept to a minimum. Where soil will be stripped and replaced, the replacement soil will comply with BMP T5.13 soil quality guidelines, or be existing soil that was stockpiled during initial grading activities.**

The project was evaluated and found the that following Low-Impact-Development (LID) Stormwater BMPs, as recommended in the 2012 COR Technical Notebook, were not feasible:

Roofs:

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 in Chapter 3 of Volume III of the 2012 Ecology Manual. **Full dispersion is infeasible. All areas where a flow path for dispersion could be placed have slopes in excess of 15% making the BMP infeasible.**

**Full infiltration is infeasible due to the soils having poor infiltrative capabilities. According to the Geotechnical Report provided by GeoEngineers on June 16, 2015, the onsite soils consist of medium dense silty fill overlaying loose sandy and silt deposits. Neither soil is expected to be**



conductive to infiltration. Additionally, there is a perched water table 15ft-25ft below the current grades.

- Bioretention (See Chapter 7 of Volume V of the 2012 Ecology Manual) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it. **The site soils are not conducive to infiltration and bioretention with underdrains are the only feasible option. However, designs using underdrains provide considerably less flow control benefits. The site is also located on moderately steep to steep slopes which would make this LID BMP infeasible.**
- Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 in Chapter 3 of Volume III of the 2012 Ecology Manual. **The site soils are not conducive to infiltration and areas where a flow path for dispersion could be placed have slopes in excess of 15% making this BMP infeasible. Additionally, due to the space constrained nature of the site the dispersion flow path would be less than 50 feet and would direct sheet flow into onsite buildings, or directly into East Lake Sammamish Parkway. Therefore this LID BMP is infeasible.**
- Perforated Stub-out Connections in accordance with BMP T5.10C in Section 3.1.3 in Chapter 3 of Volume III of the 2012 Ecology Manual. **The site soils are not conducive to infiltration and the slopes are in excess of 20% making this BMP infeasible.**

Other Hard Surfaces:

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the 2012 Ecology Manual. **Full dispersion is infeasible. Areas where a flow path for dispersion could be placed have slopes in excess of 15% making the BMP infeasible.**
- Permeable pavement in accordance with BMP T5.15 in chapter 5 of Volume V of the 2012 Ecology Manual. **The site has very little non PGIS pavement, and the site soils are not expected to infiltrate well per the geotechnical report, which would cause ponding underneath the permeable pavement. Therefore, this BMP is infeasible.**
- Bioretention BMP's (See Chapter 7, Volume V of the 2012 Ecology Manual) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it. **The site soils are not conducive to infiltration and bioretention with underdrains are the only feasible option. However, designs using underdrains provide considerably less flow control benefits. The site is also located on moderately steep to steep slopes which would be very difficult to fit on a site that is already significantly constrained for space. Therefore this LID BMP is infeasible.**
- Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V of the 2012 Ecology Manual. **The site has slopes greater than 20% in the areas where dispersion flow paths would be located making this BMP infeasible.**



We thank you for the opportunity to present our analysis, and, while we trust that this assessment will satisfy your requirements, please feel free to contact me should you have any questions or concerns.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Christopher H. Miller', is written in a cursive style. The signature is fluid and connects the first and last names.

Christopher H. Miller, PE  
Project Manager