



Rose Hill West Subdivision

Drainage Report

March 2019

Drainage Report

March 2019

Prepared for:

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1. Introduction

The Rose Hill West Subdivision is a proposed 24 lot, single-family residential development located in the Rose Hill Neighborhood of Redmond, Washington. The project consists of six existing parcels totaling approximately 6.53 acres (Figure 1-1). This report is intended to support the project's preliminary stormwater facility design and mitigation for preliminary plat approval and project entitlement.



Figure 1-1: Site Map (King County Imap)

The proposed development consists of roadways, grading, utilities, and stormwater management facilities as necessary to support a single-family subdivision. Proposed lots will have individual driveway access off of adjacent roads or shared driveways.

New asphalt paving, sidewalks, planter strips and grass lined swales will be constructed consistent with Redmond's rustic road standard. Approximately 30-percent of site area will be set aside as recreational or open space. A proposed conditions map can be found in Appendix A.

2. Existing Conditions

The site is currently a combination of undeveloped second growth forest and existing large-lot, single-family residences. A ridgeline runs along the west edge of the main body of the development (Figure 2-1) near a power and gas transmission corridor which crosses the site running roughly north/south. Grades in the center of the site are gradual; sloping at 3-5%. The terrain steepens towards the eastern and southern boundaries, sloping at 8-10% and 20-30%, respectively. Topography approaching the ravine has scattered areas of steep slopes where grades exceed 40%. Soil conditions for the site generally consist of Vashon lodgement till over outwash. Refer to the full geotechnical report in Appendix D for additional information.

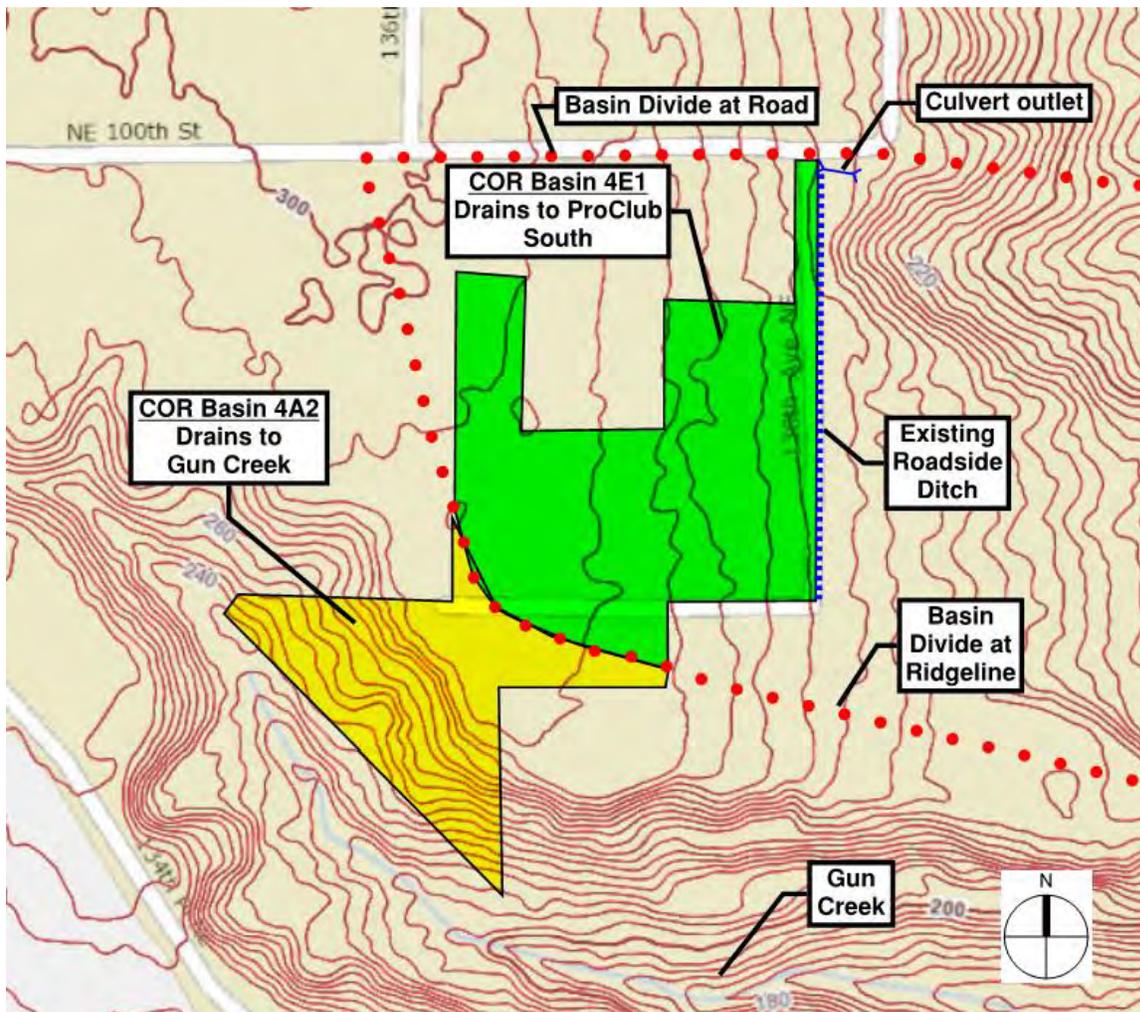


Figure 2-1: Site Topography (King County Imap)

3. Conditions and Requirements Summary

In compliance with the City of Redmond City Code, the proposed development is subject to the requirements of the Washington State Department of Ecology's 2012 Stormwater Management Manual for Western Washington as amended in 2014 (SWMMWW), as well as the 2017 Redmond Stormwater Technical Notebook (RSTN).

MINIMUM REQUIREMENT NO. 1: PREPARATION OF STORMWATER SITE PLANS

Preliminary stormwater site plans were prepared in conjunction with this report to meet the requirements of the RSTN and the SWMMWW. Refer to Section 6 for a detailed description of the stormwater design. Final plans and this report will be prepared with construction documents following preliminary plat approval.

MINIMUM REQUIREMENT NO. 2: CONSTRUCTION STORMWATER POLLUTION PREVENTION

The proposed project includes more than 2,000 square feet of new plus replaced impervious surfaces, and therefore, a Construction Stormwater Pollution Prevention Plan (SWPPP) will be prepared in accordance with the RSTN and SWMMWW as part of construction document preparation. The project also proposes more than one acre of land disturbance, therefore a Notice of Intent will be filed with the Department of Ecology and a National Pollutant Discharge Elimination System (NPDES) permit will be obtained prior to the start of construction.

MINIMUM REQUIREMENT NO. 3: SOURCE CONTROL OF POLLUTION

The proposed residential development does not meet any applicable thresholds for source control of pollution.

MINIMUM REQUIREMENT NO. 4: PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

The project will retain approximately 30 percent of the site as protected open space. There are two natural drainage locations for the project. The City commissioned, *Rose Hill Subarea Plan*, prepared by Osborne Consulting Inc., dated May, 2017, refers to the basin draining toward 100th St as "4E1" and the basin draining to Gun Creek as "4A2".

Stormwater runoff within basin 4E1 will be detained and mitigated by a stormwater vault at the northeastern corner of the subdivision. From there, flows will be conveyed by the Rose Hill Subdivision public stormwater conveyance system to an approved outfall and engineered open-channel conveyance across the downstream Pro-Club site. The Rose Hill subdivision, outfall, and Pro-Club conveyance have all been sized and approved to accommodate the peak mitigated flows from the Rose Hill West development.

Stormwater runoff within basin 4A2 will be dispersed in a trench and sheet flow east, where flows will eventually reach Gun Creek.

MINIMUM REQUIREMENT NO. 5: ON-SITE STORMWATER MANAGEMENT

Full Infiltration of stormwater runoff is infeasible given site topography and onsite soils. Dispersion of stormwater runoff is indirectly feasible for runoff draining to Rose Hill East (Rose Hill East disperses its stormwater discharge). Roof runoff on the lots within basin 4A2 will be dispersed via a dispersion trench. See section 5 of this report for an LID site assessment.

Runoff will be treated to basic water quality standards. Treatment for the entire set will occur in one of the two proposed combined detention and wet vaults located on site. Basic water quality treatment treats up to the 91st percentile, 24-hour runoff volume. Refer to Section 7 for additional information.

MINIMUM REQUIREMENT NO. 7: FLOW CONTROL

The development is required to match flow durations for the existing forested condition. This requirement applies for half of the 2-year recurrence interval storm duration up to the full 50-year recurrence interval storm duration using a continuous runoff model. Refer to Section 6 of this report for additional information.

MINIMUM REQUIREMENT NO. 8: WETLANDS PROTECTION

No wetlands or streams are contained within the project site. Gun Creek, a Class III stream, runs offsite near the project's southern boundary. Stormwater outfall construction is proposed on the ground surface within the stream buffer. The developed area of the project site will meet or exceed the City of Redmond required 100-foot stream buffer. An un-named Class IV stream and Class III wetland have been mapped on the on the adjacent downstream property to the east. No work is proposed within these offsite sensitive areas or buffers.

MINIMUM REQUIREMENT NO. 9: BASIN/WATERSHED PLANNING

The project site is located within the Willows Watershed. Watersheds in the City of Redmond are managed under the City of Redmond Citywide Watershed Management Plan. As previously mentioned, the Osborne report commissioned by the City of Redmond identifies basins and sub-basins within the Rose Hill area. This report also identifies downstream limitations in some of the sub-basin areas and recommends restrictions of further storm drainage connections to the 100th Street Basin (4D1) immediately adjacent to this project to the north until downstream drainage improvements are completed. Recommendations from the Osborne report have been incorporated into the stormwater management for this site.

MINIMUM REQUIREMENT NO. 10: OPERATION AND MAINTENANCE

Operation and maintenance measures for stormwater infrastructure will be provided through the Coordinated Civil Review (CCR).

OPTIONAL GUIDANCE NO. 1: FINANCIAL LIABILITY

Bond quantities for the City of Redmond will be provided through CCR.

OPTIONAL GUIDANCE NO. 2: OFF-SITE ANALYSIS AND MITIGATION

An off-site analysis has been conducted, see Section 4.

4. Off-Site Analysis

UPSTREAM DRAINAGE AREA

A ridgeline runs through the site. Therefore upstream stormwater runoff onto the site is minimal consisting of incidental sheet flow from adjacent parcels to the north and northwest. No visible scouring or drainage courses were discovered during an onsite investigation and no on-site drainage courses are identified on the City of Redmond GIS maps.

DOWNSTREAM ANALYSIS

The majority of the development area of the site (21 of the 24 lots and all of roadways) substantially drains to the east to the Pro Club business park within the City mapped 4E1 sub-basin. The remainder of the development at the southwest corner of the site drains to the southwest toward Gun Creek within the City mapped 4A2 sub-basin.

The downstream flow paths were investigated in conditions of light rain on March 29th 2017 for a distance of one-quarter mile downstream along two separate flow paths. Existing topography shows that runoff splits along a ridgeline, running approximately north-south through the western portion of the site. Runoff from a majority of the development area of the site drains due east to a roadside ditch along 138th Avenue NE which drains north to a culvert under 138th Avenue NE. Runoff from the remaining west and south portions of the site drains southwest as sheet flow towards Gun Creek.

Gun Creek flows roughly west to east, conveying water through second growth forest towards a PSE substation and business park area, located approximately one quarter mile downstream of the project, west of Willows Road. The stream channel was observed to be in satisfactory condition with no apparent erosion. It should be noted, however, that the Osborne report identified sediment build up and subsequent flow obstruction within culverts crossing an access road at the PSE substation. From there runoff is collected and conveyed via a system of catch basins and culverts to the southwestern edge of the Willows Creek Golf Course, approximately 0.6 miles downstream of the site. The Willows Creek Golf course conveys water to the Sammamish River, approximately 0.63 miles to the east. (Figure 4-2)

The previously mentioned ditch along the western edge of 138th Avenue NE runs south to north, conveying runoff to a culvert crossing perpendicular to the road, before discharging to the head of an adjacent forested draw which includes a mapped seasonal stream and wetland. The draw drains to a system of interceptor ditches at the top of a downstream business park (Pro Club) which convey runoff south and then east to Willows Road. Pipe runoff from Willows Road discharges to surface drainage at the western edge of the Willows Creek Golf Course, approximately 0.4 miles downstream.



Figure 4-1: Quarter Mile Downstream Flow Path

Further investigation using the city of Redmond GIS maps shows that the project is not located within a mapped critical aquifer recharge area (CARA) or documented flood zone. At a quarter mile downstream of the site the flow path enters a CARA (Figure 4-3). At one mile downstream of the site the flowpath enters the 100-year flood zone.

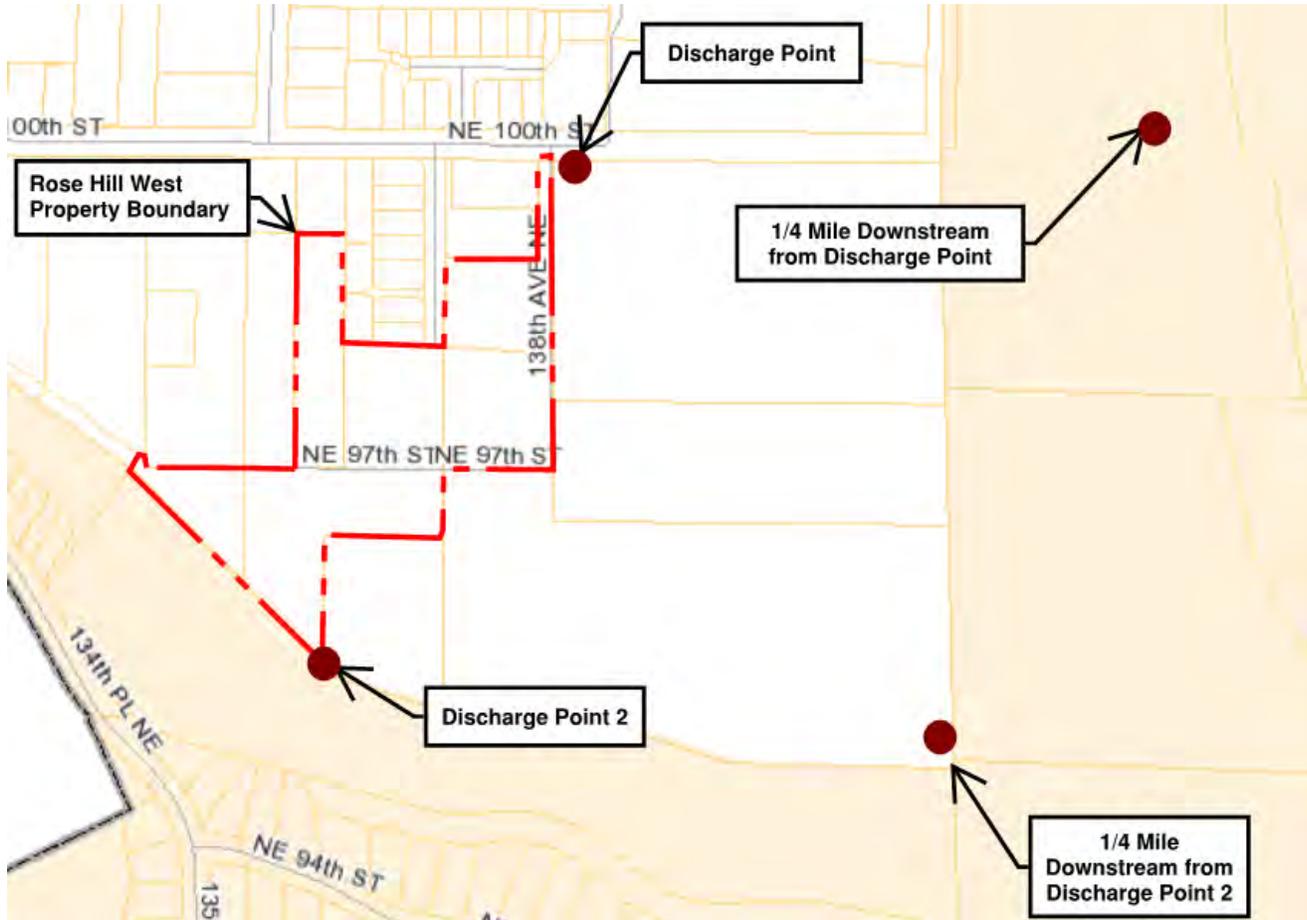


Figure 4-3: GIS Mapping of CARA and Flood Zones

DOWNSTREAM DRAINAGE COMPLAINTS

The City has identified 2 drainage complaints in proximity to the proposed project. These are identified as complaints, 478 and 903. We have reviewed these complaints and their locations.

5. LID Site Assessment

The proposed project will implement low impact development (LID) in accordance with the 2012 Department of Ecology (DOE) Storm Water Management Manual, amended in December 2014 and the RSTN. The following is an evaluation of the List #2 best management practice (BMP) categories, as required by the DOE (Figure 5-1). See Appendix C and D for a critical area study and geotechnical report, respectively.

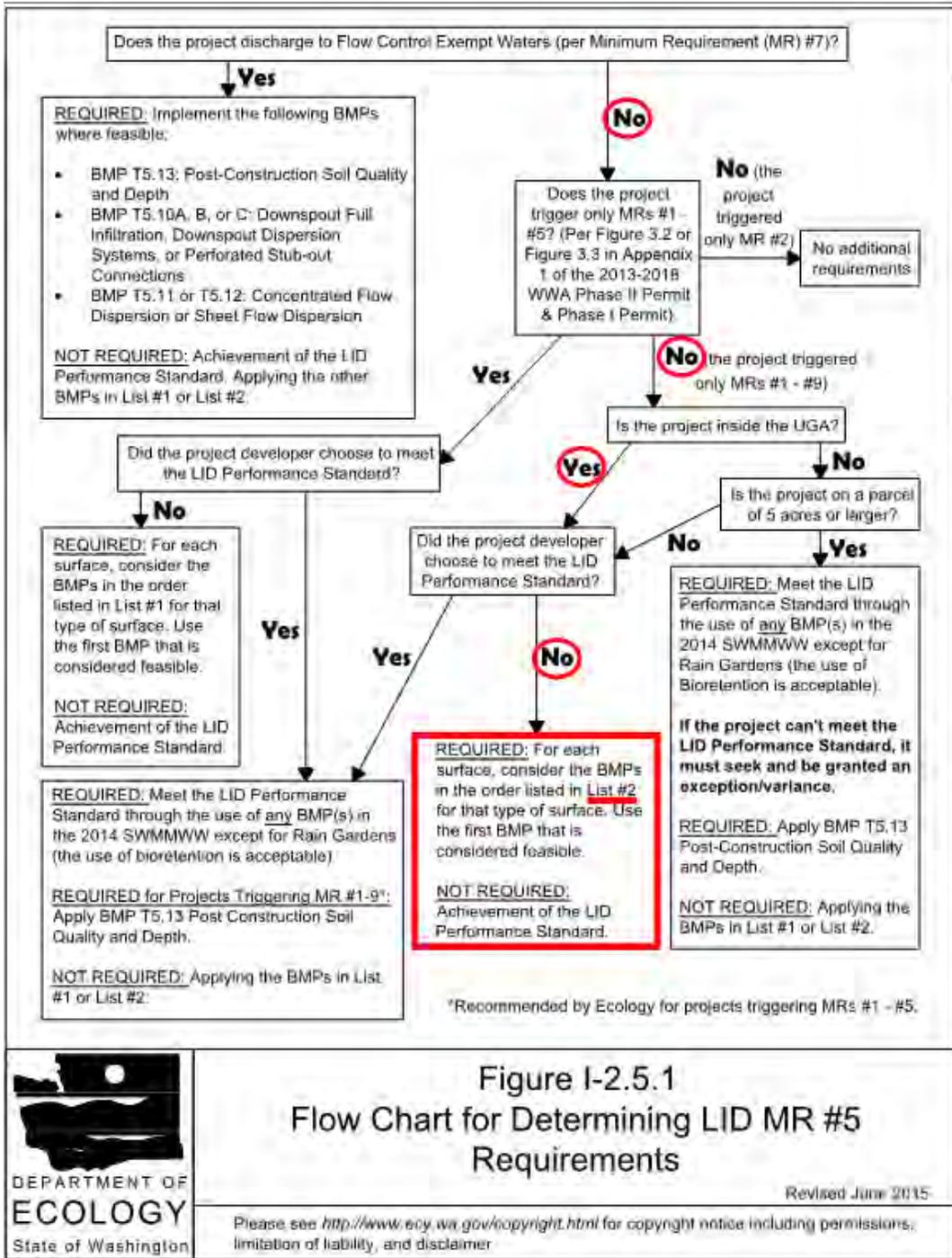


Figure I-2.5.1
Flow Chart for Determining LID MR #5
Requirements

Revised June 2015



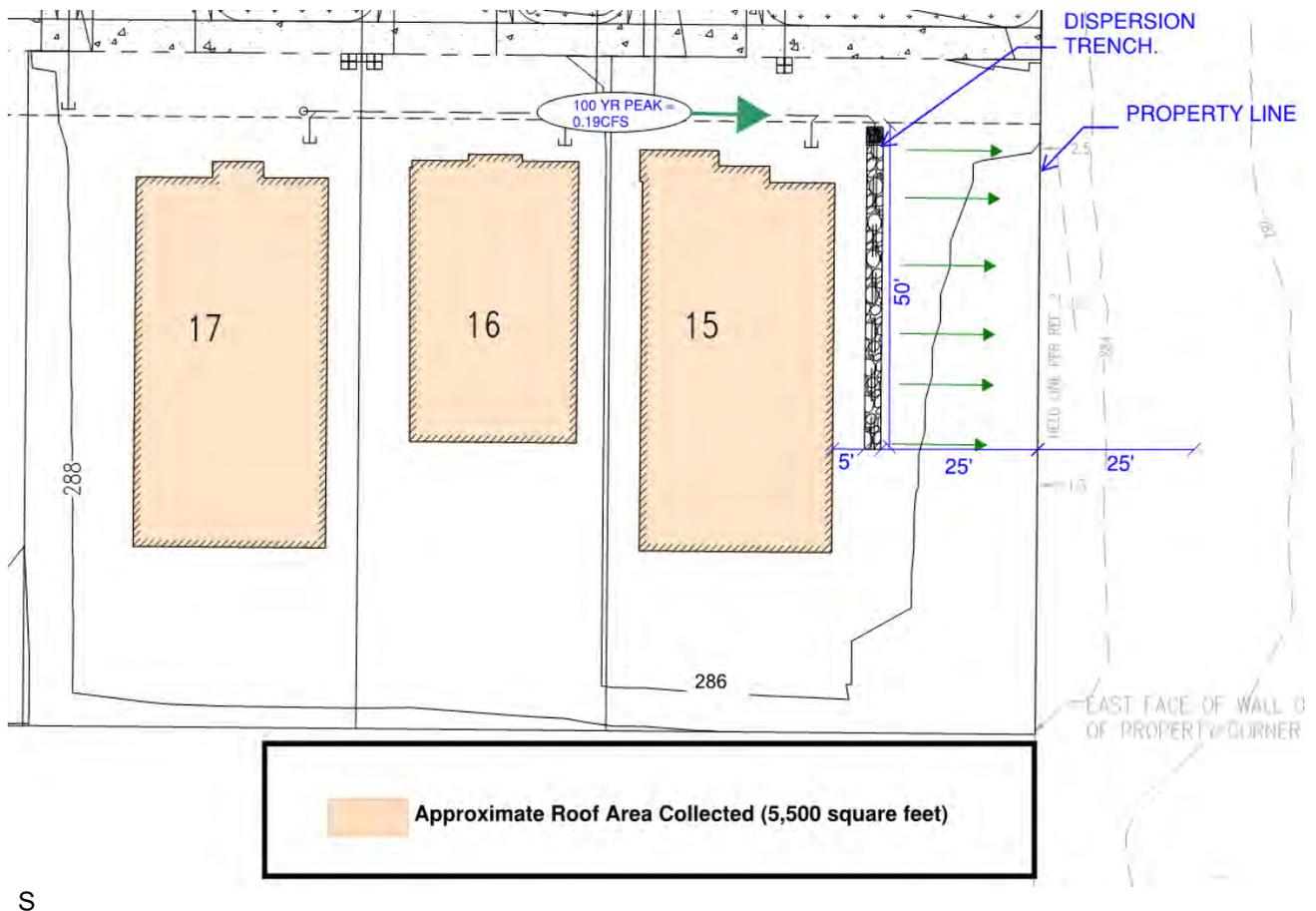
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Figure 5-1: LID MR # 5 Flow Chart

ROOFS

- **FULL DISPERSION OR DOWNSPOUT FULL INFILTRATION:** Full dispersion is not feasible as the project cannot accommodate the required vegetated flow paths. Downspout full infiltration is not feasible as test borings indicate soils consists of Vashon lodgement till over a transitional advance outwash with low infiltration capacity (Appendix D). Infiltration facilities placed higher on the site would increase seepage that would daylight in the adjacent ravines to the southwest and northeast of the site which may result in downstream erosion.
- **BIORETENTION:** Site topography, proximity to building foundations, and potential for downstream erosion make rooftop bioretention areas infeasible.
- **DOWNSPOUT DISPERSION SYSTEMS:** Downspout dispersion is infeasible for the lots within the 100th St Basin as the lots cannot meet the flowpath requirements.

Downspout dispersion is feasible for the lots within the Gun Creek Basin. The downspout dispersion system serving lots 15-17 has been designed per Section 3.12, Volume III of the 2014 DOE SWMMM. Roof drains will collect roof runoff and convey flows to a dispersion trench on the east side of lot 15, where runoff will flow east toward the property line (See figure 5-1).



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Figure 5-2: Lot 15-17 Downspout Dispersion

The DOE SWMM states that a vegetated flow path of at least 25-ft must be maintained to any property line, and a vegetated flowpath of at least 50-ft must be maintained to any slope greater than 15%. There is a 25-ft flowpath to the eastern property line, within a 30-ft drainage easement. Slopes along the onsite 25-ft flowpath will be less than 5%, and slopes along the 25-ft offsite drainage path are roughly 5% as well. Offsite slopes have been estimated through on site visits and available GIS data.

The dispersion trench has been designed per Figure 3.1.6 “Standard Dispersion Trench with Notched Grade Board” of the DOE SWMMM. It should be noted that the DOE SWMM refers to this figure for all trenches serving greater than 700 square feet of roof area. The figure shows a trench length of 50-ft and width of 2.5-ft. Additionally, the trench detail notes the max design flow within the influent pipe is 0.5 cfs. Peak 100yr peak flows will be 0.19 cfs. See Section 6 for additional information regarding flow calculations.

- **PERFORATED STUB-OUT CONNECTIONS:** Perforated stub-out connections will be used for building connections to the proposed storm mains for each roadway.

OTHER HARD SURFACES

- **FULL DISPERSION:** Full dispersion is not feasible as the project cannot accommodate the required vegetated flow paths and dispersion may result in erosion of downstream steep slopes.
- **PERMEABLE PAVEMENT:** As stated in the geotechnical report, the site is not suitable for permeable pavement due to low soil infiltration potential.
- **BIORETENTION:** Bioretention swales are not feasible due to the site’s soil conditions and potential for downstream erosion from infiltrated runoff. Grass lined swales are proposed along 138th AVE NE, NE 97th Street, 137th PL NE and 136th AVE NE as part of the City of Redmond rustic road standard. These facilities will receive stormwater from adjacent road surfaces and will be equipped with overflow connections to the proposed stormwater mains.
- **SHEET FLOW DISPERSION OR COCENTRATED FLOW DISPERSION:** Sheet flow dispersion and concentrated flow dispersion are not feasible as the required vegetated flow paths cannot be met.

LAWN AND LANDSCAPED AREAS

- **POST-CONSTRUCTION SOIL QUALITY AND DEPTH:** The existing duff layer and native topsoil will be maintained to the maximum extent practical. In areas requiring grading, the duff layer and topsoil will be removed and stockpiled onsite in a designated controlled area, not adjacent to public resources or critical areas, to be reapplied on other portions of the site. Areas of new fill, not covered by impervious surfaces, shall have topsoil modified as needed to meet DOE BMP T5.13 requirements.

6. Proposed Drainage Control

The project plans to develop 4.76 acres of the site. Stormwater runoff is anticipated from finished lots, tracts and roadways. As stated in section 4, there are two drainage basins within the development – one draining toward 100th St and one draining toward Gun creek. Each drainage basins drainage control strategy is assessed below.

GUN CREEK BASIN (4A2)

According to Section 2.5.7 “*Minimum Requirement #7: Flow Control*” of the 2014 DOE SWMMM there are three circumstances which require achievement of the standard flow control requirement.

- 1) Projects in which the total effective impervious surfaces totals 10,000 square feet or more in a threshold discharge area.
 - The project plans to develop 16,552 square feet within the Gun Creek Basin, 8,607 of which will be impervious area. (Per 2.9.3.2 of the COR Stormwater Technical Notebook 80% of the maximum 65% impervious area was assumed for each lot.) Impervious area is less than 10,000, and thus does not meet this threshold.
- 2) Projects that convert 3/4 acres or more of vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge are
 - The project plans to develop 0.38 acres, thus does not meet this threshold.
- 3) Projects that through a combination of effective hard surfaces and converted vegetation cause a 0.15 cfs increase, using 15-minute time steps, in the 100-year flow frequency from a threshold discharge area. (For the purpose of applying this threshold, the existing condition is the pre-project land cover)
 - Peak flows were analyzed using the areas in Tables 6-1 and 6-2 and 15-min time step WHMM methodology.

Table 6-1 Predeveloped Areas, Gun Creek Basin

	Basin Area (ac)
Pervious Land Use C Pasture Flat	0.38
Total Predeveloped Area (ac)	0.38

Table 6-2 Developed Areas, Gun Creek Basin

	Basin Area (ac)
Pervious Land Use C Lawn Flat	0.166
Rooftops	0.214
Total Developed Area (ac)	0.38

Table 6-3 Peak Flows Gun Creek Basin

Predeveloped 100 yr Peak Flow	Developed 100 yr Peak flow
0.061 cfs	0.194 cfs

Project development will not result in a peak flow increase of 0.15 cfs, thus does not meet this threshold.

The threshold drainage area does not meet any of the three circumstances which require achievement of flow control. Thus, the development within Gun Creek Basin is exempt from flow control requirements.

100TH ST BASIN (4E1)

Runoff from 4.38 acres of the site will be collected and conveyed to a combined water quality and detention vault on the eastern edge of the site (Figure 6-1). The outfall from the vault will be conveyed to the Rose Hill east stormwater conveyance system.



Figure 6-1: Schematic Drainage Areas

The 138th frontage area (0.44 acres) will be collected in a series of catch basins along the avenue and conveyed to the Rose Hill East conveyance system. The Rose Hill East detention and conveyance system has been designed to account for this runoff.

The detention volume and flow restrictor for vault discharge have been sized using WWHM methodology according to the requirements described in Section 3 of this report. Table 6-1 provides a summary of land use inputs for the pre-developed site condition, and Table 6-2 provides a summary of land use inputs for the developed site condition draining to the vault. Note that per 2.9.3.2 of the COR Stormwater Technical Notebook, for single-family developments, the impervious area associated with each lot can be estimated at 80% of the maximum impervious area allowed by zoning code.

A detention vault volume was determined using these area inputs and DOE WWHM methodology. The proposed detention vault characteristics are summarized in Table 6-4. Refer to Appendix B for detailed WWHM output.

Table 6-4 Predeveloped Areas

	Basin Area (ac)
Pervious Land Use C, Forest, Flat	2.19
Pervious Land Use C, Forest, Mod	2.19
Total Predeveloped Area (ac)	4.38

Table 6-5 Developed Areas

	Basin Area (ac)
Pervious Land Use C, Lawn Flat	1.63
Impervious Land Use, Roads Flat	0.85
Impervious Land Use, Roads Mod	0.43
Roof Tops	1.26
Forest ,Flat	0.21
Total Developed Area (ac)	4.38

Table 6-6: Peak Flow Summary

	Predeveloped	Mitigated
50% 2 yr	0.064	0.039
10 yr	0.256	0.169
50 yr	0.349	0.300
100 yr	0.383	0.372

Table 6-7: Stormwater Vault Summary

Vault Data	
Required Volume	56,767cf
Proposed Volume	56,865 cf
Live Storage Depth	7.5 feet
Riser Diameter	18 inches

7. Water Quality Treatment

As previously described, stormwater runoff to the east will be collected and conveyed to a combined stormwater detention and wet vault at the east edge of the site. The water quality volume has been sized using WWHM methodology according to the requirements described in Section 3 of this report. Table 7-1 provides a summary of the dead storage portion of the proposed stormwater vault.

Table 7-1: Water Quality Volume Summary

	Water Quality Data
Water Quality Volume Required	0.364 ac-ft (15,873 cu ft)
Water Quality Online Flow Rate	0.41 cfs
Water Quality Volume Proposed	22,707 cu ft

8. Conveyance

The proposed conveyance system will be designed to convey the flows anticipated for a 100-year, 24-hour return frequency rainfall event using the WWHM 2012 continuous model for flow frequencies. Storm pipes size and type, conveyance check calculations, and a backwater analysis will be provided at the CCR.

9. Temporary Erosion and Sedimentation Control (TESC)

TESC will be installed to prevent transport of sediment-laden runoff from entering adjacent properties and sewer systems. TESC plans, descriptions of how runoff will be treated, and details of the proposed TESC facilities will be provided at the CCR.

10. Drainage System Maintenance

An Operation and Maintenance Manual of the drainage system facilities will be provided at the CCR.

11. Bond Quantities and Declaration of Covenant

BOND QUANTITIES

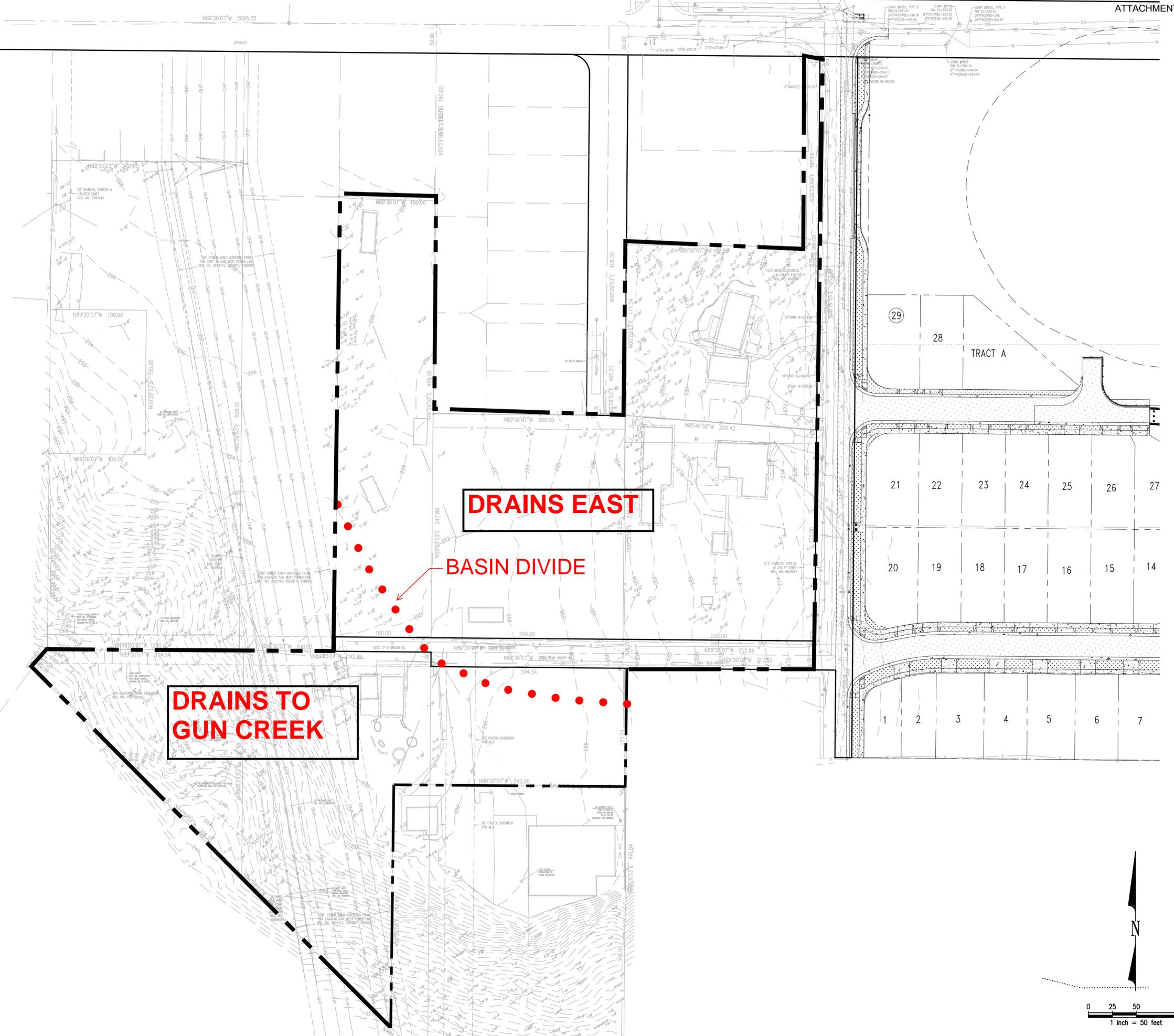
Bond Quantities will be provided at the CCR.

DECLARATION OF COVENANT

Declaration of Covenant will be detailed at the CCR, and will be finalized prior to recording of the final plat. Specific Home Owners Association (HOA) responsibilities will be noted in the Hearing Examiner's Conditions.

Appendix A

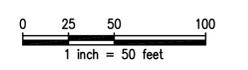
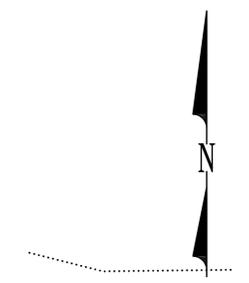
1. Existing Conditions Site Map
2. Proposed Conditions Site Plan

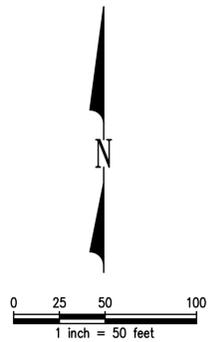
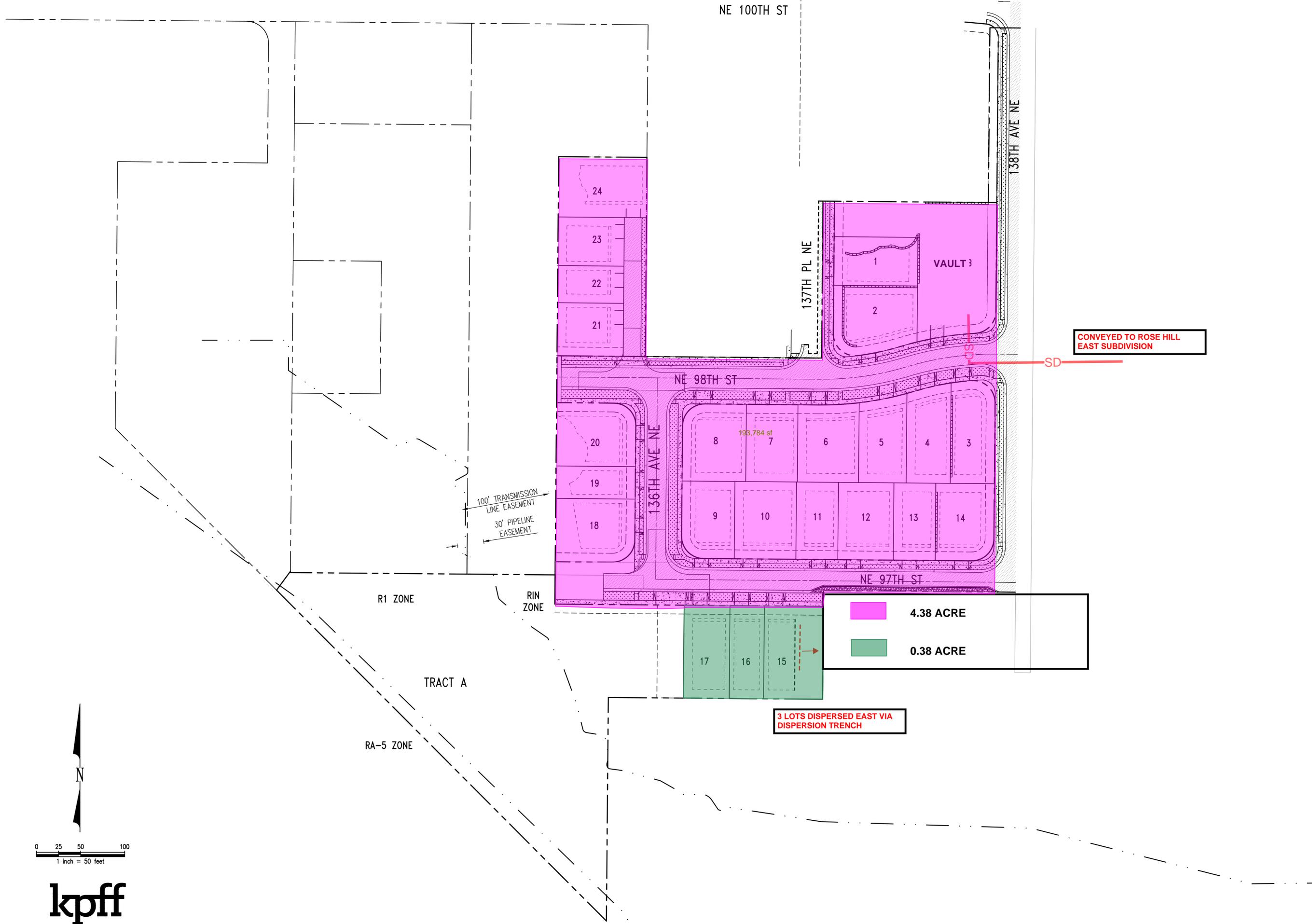


DRAINS EAST

BASIN DIVIDE

DRAINS TO GUN CREEK





Appendix B

WWHM Output

**DENTENTION
VAULT SIZING**

**WWHM2012
PROJECT REPORT**

General Model Information

Project Name: Vault 3-1-2019
Site Name:
Site Address:
City:
Report Date: 3/7/2019
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.00
Version Date: 2016/02/25
Version: 4.2.12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	2.19
C, Forest, Mod	2.19
Pervious Total	4.38
Impervious Land Use	acre
Impervious Total	0
Basin Total	4.38

Element Flows To:		
Surface	Interflow	Groundwater

Mitigated Land Use

Developed

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	1.632
C, Forest, Flat	0.21

Pervious Total 1.842

Impervious Land Use	acre
ROADS FLAT	0.854
ROADS MOD	0.426
ROOF TOPS FLAT	1.258

Impervious Total 2.538

Basin Total 4.38

Element Flows To:

Surface	Interflow	Groundwater
Northern Vault	Northern Vault	

Routing Elements
Predeveloped Routing

Mitigated Routing

Northern Vault

Width: 87 ft.
 Length: 87 ft.
 Depth: 8.5 ft.
 Discharge Structure
 Riser Height: 7.5 ft.
 Riser Diameter: 18 in.
 Orifice 1 Diameter: 1.0625 in Elevation: 0 ft.
 Orifice 2 Diameter: 1.6875 in Elevation: 5 ft.
 Orifice 3 Diameter: 1.25 in. Elevation: 5.5 ft.
 Element Flows To:
 Outlet 1 Outlet 2

RISER & ORIFICE DIMENSIONS

Vault Hydraulic Table

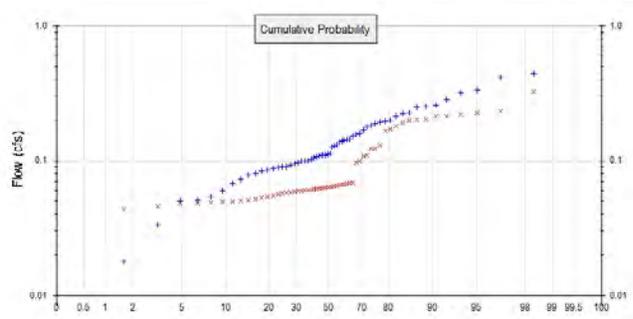
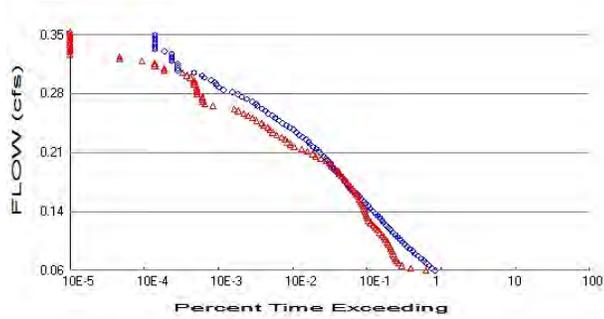
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.173	0.000	0.000	0.000
0.0944	0.173	0.016	0.009	0.000
0.1889	0.173	0.032	0.013	0.000
0.2833	0.173	0.049	0.016	0.000
0.3778	0.173	0.065	0.018	0.000
0.4722	0.173	0.082	0.021	0.000
0.5667	0.173	0.098	0.023	0.000
0.6611	0.173	0.114	0.024	0.000
0.7556	0.173	0.131	0.026	0.000
0.8500	0.173	0.147	0.028	0.000
0.9444	0.173	0.164	0.029	0.000
1.0389	0.173	0.180	0.031	0.000
1.1333	0.173	0.196	0.032	0.000
1.2278	0.173	0.213	0.033	0.000
1.3222	0.173	0.229	0.035	0.000
1.4167	0.173	0.246	0.036	0.000
1.5111	0.173	0.262	0.037	0.000
1.6056	0.173	0.279	0.038	0.000
1.7000	0.173	0.295	0.039	0.000
1.7944	0.173	0.311	0.041	0.000
1.8889	0.173	0.328	0.042	0.000
1.9833	0.173	0.344	0.043	0.000
2.0778	0.173	0.361	0.044	0.000
2.1722	0.173	0.377	0.045	0.000
2.2667	0.173	0.393	0.046	0.000
2.3611	0.173	0.410	0.047	0.000
2.4556	0.173	0.426	0.048	0.000
2.5500	0.173	0.443	0.048	0.000
2.6444	0.173	0.459	0.049	0.000
2.7389	0.173	0.475	0.050	0.000
2.8333	0.173	0.492	0.051	0.000
2.9278	0.173	0.508	0.052	0.000
3.0222	0.173	0.525	0.053	0.000
3.1167	0.173	0.541	0.054	0.000
3.2111	0.173	0.558	0.054	0.000
3.3056	0.173	0.574	0.055	0.000
3.4000	0.173	0.590	0.056	0.000
3.4944	0.173	0.607	0.057	0.000

ATTACHMENT 10

3.5889	0.173	0.623	0.058	0.000
3.6833	0.173	0.640	0.058	0.000
3.7778	0.173	0.656	0.059	0.000
3.8722	0.173	0.672	0.060	0.000
3.9667	0.173	0.689	0.061	0.000
4.0611	0.173	0.705	0.061	0.000
4.1556	0.173	0.722	0.062	0.000
4.2500	0.173	0.738	0.063	0.000
4.3444	0.173	0.754	0.063	0.000
4.4389	0.173	0.771	0.064	0.000
4.5333	0.173	0.787	0.065	0.000
4.6278	0.173	0.804	0.065	0.000
4.7222	0.173	0.820	0.066	0.000
4.8167	0.173	0.836	0.067	0.000
4.9111	0.173	0.853	0.067	0.000
5.0056	0.173	0.869	0.074	0.000
5.1000	0.173	0.886	0.093	0.000
5.1944	0.173	0.902	0.103	0.000
5.2889	0.173	0.919	0.112	0.000
5.3833	0.173	0.935	0.118	0.000
5.4778	0.173	0.951	0.125	0.000
5.5722	0.173	0.968	0.142	0.000
5.6667	0.173	0.984	0.153	0.000
5.7611	0.173	1.001	0.162	0.000
5.8556	0.173	1.017	0.170	0.000
5.9500	0.173	1.033	0.178	0.000
6.0444	0.173	1.050	0.185	0.000
6.1389	0.173	1.066	0.192	0.000
6.2333	0.173	1.083	0.198	0.000
6.3278	0.173	1.099	0.204	0.000
6.4222	0.173	1.115	0.210	0.000
6.5167	0.173	1.132	0.216	0.000
6.6111	0.173	1.148	0.221	0.000
6.7056	0.173	1.165	0.226	0.000
6.8000	0.173	1.181	0.231	0.000
6.8944	0.173	1.198	0.236	0.000
6.9889	0.173	1.214	0.241	0.000
7.0833	0.173	1.230	0.246	0.000
7.1778	0.173	1.247	0.251	0.000
7.2722	0.173	1.263	0.255	0.000
7.3667	0.173	1.280	0.260	0.000
7.4611	0.173	1.296	0.264	0.000
7.5556	0.173	1.312	0.476	0.000
7.6500	0.173	1.329	1.191	0.000
7.7444	0.173	1.345	2.154	0.000
7.8389	0.173	1.362	3.226	0.000
7.9333	0.173	1.378	4.273	0.000
8.0278	0.173	1.394	5.167	0.000
8.1222	0.173	1.411	5.824	0.000
8.2167	0.173	1.427	6.251	0.000
8.3111	0.173	1.444	6.682	0.000
8.4056	0.173	1.460	7.047	0.000
8.5000	0.173	1.477	7.394	0.000
8.5944	0.173	1.493	7.724	0.000
8.6889	0.000	0.000	8.041	0.000

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 4.38
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 1.842
 Total Impervious Area: 2.538

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.128838
5 year	0.207799
10 year	0.256488
25 year	0.312249
50 year	0.349492
100 year	0.383244

PREDEVELOPED PEAK FLOWS NOTED IN TABLE 6-6

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.077204
5 year	0.126649
10 year	0.169472
25 year	0.237178
50 year	0.298945
100 year	0.371744

MITIGATED PEAK FLOWS NOTED IN TABLE 6-6

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.137	0.055
1950	0.168	0.067
1951	0.284	0.232
1952	0.089	0.049
1953	0.072	0.061
1954	0.111	0.060
1955	0.177	0.058
1956	0.142	0.130
1957	0.114	0.060
1958	0.128	0.064

1959	0.110	0.054
1960	0.194	0.190
1961	0.108	0.068
1962	0.067	0.048
1963	0.092	0.062
1964	0.126	0.065
1965	0.087	0.110
1966	0.084	0.059
1967	0.188	0.065
1968	0.110	0.059
1969	0.107	0.058
1970	0.088	0.062
1971	0.096	0.062
1972	0.214	0.198
1973	0.096	0.108
1974	0.105	0.063
1975	0.145	0.056
1976	0.102	0.060
1977	0.014	0.048
1978	0.089	0.065
1979	0.054	0.045
1980	0.227	0.201
1981	0.080	0.061
1982	0.159	0.124
1983	0.140	0.063
1984	0.085	0.050
1985	0.051	0.052
1986	0.223	0.068
1987	0.197	0.165
1988	0.078	0.054
1989	0.051	0.051
1990	0.443	0.201
1991	0.250	0.171
1992	0.099	0.067
1993	0.100	0.050
1994	0.034	0.044
1995	0.143	0.068
1996	0.316	0.227
1997	0.254	0.219
1998	0.060	0.050
1999	0.258	0.179
2000	0.099	0.064
2001	0.018	0.040
2002	0.110	0.097
2003	0.156	0.057
2004	0.182	0.214
2005	0.133	0.060
2006	0.153	0.123
2007	0.330	0.324
2008	0.415	0.214
2009	0.198	0.100

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.4425	0.3236
2	0.4152	0.2320
3	0.3295	0.2270

4	0.3162	0.2189
5	0.2843	0.2141
6	0.2582	0.2136
7	0.2537	0.2013
8	0.2495	0.2007
9	0.2274	0.1979
10	0.2233	0.1900
11	0.2137	0.1793
12	0.1984	0.1711
13	0.1973	0.1646
14	0.1942	0.1302
15	0.1877	0.1235
16	0.1820	0.1227
17	0.1770	0.1098
18	0.1679	0.1079
19	0.1595	0.1000
20	0.1556	0.0968
21	0.1529	0.0684
22	0.1445	0.0677
23	0.1431	0.0677
24	0.1418	0.0668
25	0.1396	0.0667
26	0.1373	0.0655
27	0.1329	0.0651
28	0.1280	0.0649
29	0.1263	0.0642
30	0.1136	0.0638
31	0.1110	0.0631
32	0.1102	0.0628
33	0.1098	0.0624
34	0.1096	0.0623
35	0.1081	0.0618
36	0.1068	0.0614
37	0.1052	0.0610
38	0.1022	0.0605
39	0.0998	0.0604
40	0.0995	0.0602
41	0.0991	0.0597
42	0.0963	0.0595
43	0.0959	0.0588
44	0.0924	0.0583
45	0.0895	0.0581
46	0.0893	0.0572
47	0.0881	0.0559
48	0.0871	0.0546
49	0.0851	0.0543
50	0.0837	0.0536
51	0.0800	0.0519
52	0.0779	0.0510
53	0.0723	0.0501
54	0.0673	0.0496
55	0.0598	0.0496
56	0.0541	0.0491
57	0.0510	0.0484
58	0.0505	0.0481
59	0.0335	0.0454
60	0.0179	0.0439
61	0.0138	0.0404

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0644	17789	13362	75	Pass
0.0673	16119	8280	51	Pass
0.0702	14726	6293	42	Pass
0.0731	13430	5713	42	Pass
0.0759	12613	5390	42	Pass
0.0788	11458	5189	45	Pass
0.0817	10459	5005	47	Pass
0.0846	9559	4845	50	Pass
0.0875	8782	4680	53	Pass
0.0903	8089	4537	56	Pass
0.0932	7418	4402	59	Pass
0.0961	6836	4190	61	Pass
0.0990	6466	4019	62	Pass
0.1019	5980	3822	63	Pass
0.1047	5570	3638	65	Pass
0.1076	5165	3422	66	Pass
0.1105	4806	3181	66	Pass
0.1134	4470	2984	66	Pass
0.1163	4173	2802	67	Pass
0.1191	3893	2631	67	Pass
0.1220	3604	2421	67	Pass
0.1249	3437	2274	66	Pass
0.1278	3191	2180	68	Pass
0.1306	2975	2120	71	Pass
0.1335	2772	2069	74	Pass
0.1364	2556	2017	78	Pass
0.1393	2385	1970	82	Pass
0.1422	2203	1914	86	Pass
0.1450	2051	1825	88	Pass
0.1479	1948	1777	91	Pass
0.1508	1813	1717	94	Pass
0.1537	1692	1622	95	Pass
0.1566	1574	1544	98	Pass
0.1594	1442	1471	102	Pass
0.1623	1331	1393	104	Pass
0.1652	1242	1303	104	Pass
0.1681	1160	1214	104	Pass
0.1710	1115	1167	104	Pass
0.1738	1054	1090	103	Pass
0.1767	995	1035	104	Pass
0.1796	917	971	105	Pass
0.1825	865	910	105	Pass
0.1854	803	858	106	Pass
0.1882	750	798	106	Pass
0.1911	713	715	100	Pass
0.1940	683	671	98	Pass
0.1969	635	604	95	Pass
0.1998	596	513	86	Pass
0.2026	562	439	78	Pass
0.2055	519	401	77	Pass
0.2084	481	334	69	Pass
0.2113	445	281	63	Pass
0.2142	402	225	55	Pass

0.2170	369	200	54	Pass
0.2199	349	183	52	Pass
0.2228	323	167	51	Pass
0.2257	292	151	51	Pass
0.2286	263	131	49	Pass
0.2314	240	116	48	Pass
0.2343	218	106	48	Pass
0.2372	195	99	50	Pass
0.2401	175	87	49	Pass
0.2429	155	81	52	Pass
0.2458	139	70	50	Pass
0.2487	125	62	49	Pass
0.2516	114	54	47	Pass
0.2545	100	47	47	Pass
0.2573	92	40	43	Pass
0.2602	82	35	42	Pass
0.2631	72	18	25	Pass
0.2660	68	14	20	Pass
0.2689	61	13	21	Pass
0.2717	52	13	25	Pass
0.2746	44	13	29	Pass
0.2775	39	11	28	Pass
0.2804	33	11	33	Pass
0.2833	25	11	44	Pass
0.2861	22	11	50	Pass
0.2890	20	10	50	Pass
0.2919	19	10	52	Pass
0.2948	17	10	58	Pass
0.2977	14	9	64	Pass
0.3005	13	8	61	Pass
0.3034	10	7	70	Pass
0.3063	6	4	66	Pass
0.3092	6	4	66	Pass
0.3121	6	3	50	Pass
0.3149	6	3	50	Pass
0.3178	5	2	40	Pass
0.3207	5	1	20	Pass
0.3236	5	1	20	Pass
0.3265	5	0	0	Pass
0.3293	4	0	0	Pass
0.3322	3	0	0	Pass
0.3351	3	0	0	Pass
0.3380	3	0	0	Pass
0.3409	3	0	0	Pass
0.3437	3	0	0	Pass
0.3466	3	0	0	Pass
0.3495	3	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0.3644 acre-feet

On-line facility target flow: 0.4109 cfs.

Adjusted for 15 min: 0.4109 cfs.

Off-line facility target flow: 0.2295 cfs.

Adjusted for 15 min: 0.2295 cfs.

WATER QUALITY DESIGN
VOLUME REFERENCED IN
TABLE 7-1

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Northern Vault POC	<input type="checkbox"/>	489.46			<input type="checkbox"/>	0.00			
Total Volume Infiltrated		489.46	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

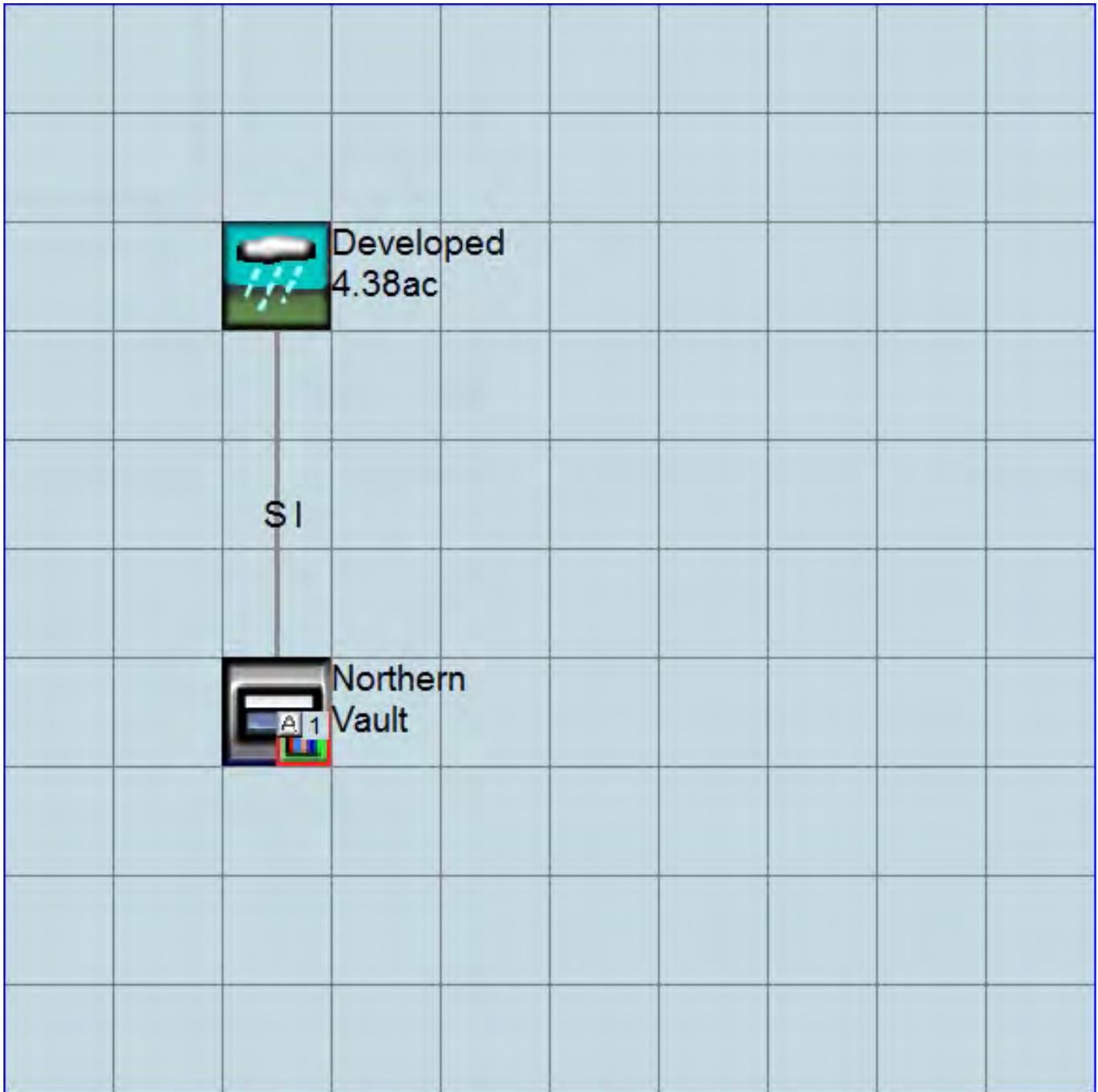
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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**GUN CREEK
PEAK FLOW**

**WWHM2012
PROJECT REPORT**

General Model Information

Project Name: Rose Hill West-Peak Flow 15 min
Site Name: Rose Hill West
Site Address:
City: Redmond
Report Date: 3/5/2019
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.00
Version Date: 2016/02/25
Version: 4.2.12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Predeveloped-Existing Conditions

Bypass:	No
GroundWater:	No
Pervious Land Use C, Pasture, Flat	acre 0.38
Pervious Total	0.38
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.38

Element Flows To:		
Surface	Interflow	Groundwater

Mitigated Land Use

Postdeveloped

Bypass: No

GroundWater: No

Pervious Land Use acre
C, Lawn, Flat 0.214

Pervious Total 0.214

Impervious Land Use acre
ROOF TOPS FLAT 0.166

Impervious Total 0.166

Basin Total 0.38

Element Flows To:

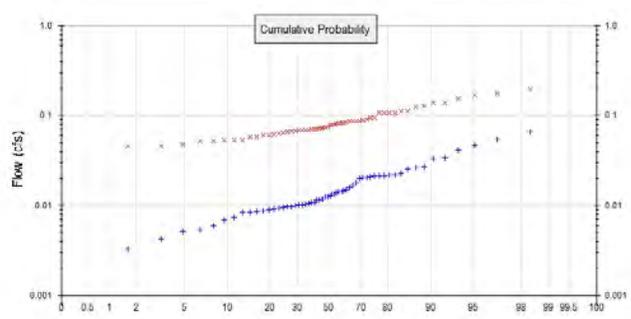
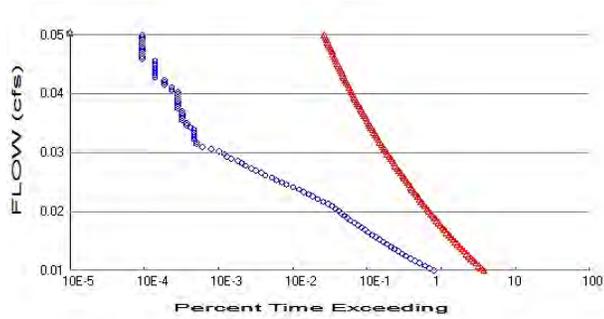
Surface Interflow Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.38
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.214
 Total Impervious Area: 0.166

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.013319
5 year	0.022867
10 year	0.030516
25 year	0.041702
50 year	0.051153
100 year	0.061575

PREDEVELOPED PEAK FLOWS NOTED IN TABLE 6-3

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.077865
5 year	0.105247
10 year	0.124846
25 year	0.151332
50 year	0.172345
100 year	0.194483

DEVELOPED PEAK FLOWS NOTED IN TABLE 6-3

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.018	0.113
1950	0.021	0.108
1951	0.026	0.070
1952	0.009	0.048
1953	0.007	0.052
1954	0.011	0.063
1955	0.017	0.068
1956	0.014	0.068
1957	0.013	0.086
1958	0.012	0.060

1959	0.011	0.054
1960	0.021	0.073
1961	0.010	0.071
1962	0.007	0.053
1963	0.010	0.068
1964	0.013	0.062
1965	0.010	0.090
1966	0.008	0.052
1967	0.022	0.109
1968	0.012	0.106
1969	0.012	0.082
1970	0.009	0.072
1971	0.013	0.086
1972	0.021	0.107
1973	0.010	0.046
1974	0.012	0.083
1975	0.016	0.087
1976	0.012	0.064
1977	0.003	0.060
1978	0.009	0.074
1979	0.006	0.094
1980	0.033	0.124
1981	0.009	0.078
1982	0.023	0.127
1983	0.014	0.084
1984	0.009	0.058
1985	0.005	0.079
1986	0.022	0.070
1987	0.020	0.095
1988	0.008	0.054
1989	0.005	0.067
1990	0.067	0.193
1991	0.027	0.140
1992	0.011	0.057
1993	0.010	0.046
1994	0.004	0.045
1995	0.013	0.068
1996	0.034	0.090
1997	0.025	0.081
1998	0.010	0.068
1999	0.041	0.168
2000	0.010	0.078
2001	0.003	0.073
2002	0.015	0.112
2003	0.021	0.087
2004	0.021	0.154
2005	0.014	0.071
2006	0.015	0.066
2007	0.054	0.174
2008	0.047	0.138
2009	0.021	0.086

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0666	0.1932
2	0.0542	0.1745
3	0.0466	0.1683

4	0.0414	0.1542
5	0.0340	0.1404
6	0.0335	0.1376
7	0.0268	0.1266
8	0.0265	0.1237
9	0.0251	0.1130
10	0.0226	0.1124
11	0.0218	0.1085
12	0.0216	0.1075
13	0.0214	0.1068
14	0.0213	0.1065
15	0.0212	0.0951
16	0.0208	0.0941
17	0.0206	0.0904
18	0.0205	0.0897
19	0.0200	0.0874
20	0.0182	0.0874
21	0.0168	0.0864
22	0.0159	0.0862
23	0.0149	0.0856
24	0.0146	0.0836
25	0.0144	0.0832
26	0.0142	0.0818
27	0.0139	0.0814
28	0.0134	0.0793
29	0.0133	0.0785
30	0.0128	0.0782
31	0.0125	0.0745
32	0.0124	0.0734
33	0.0118	0.0728
34	0.0118	0.0723
35	0.0116	0.0713
36	0.0116	0.0706
37	0.0108	0.0703
38	0.0108	0.0699
39	0.0106	0.0684
40	0.0103	0.0684
41	0.0102	0.0683
42	0.0102	0.0682
43	0.0100	0.0680
44	0.0098	0.0670
45	0.0097	0.0659
46	0.0096	0.0642
47	0.0094	0.0630
48	0.0092	0.0621
49	0.0089	0.0605
50	0.0086	0.0601
51	0.0086	0.0579
52	0.0084	0.0574
53	0.0084	0.0538
54	0.0074	0.0536
55	0.0069	0.0530
56	0.0059	0.0524
57	0.0054	0.0519
58	0.0052	0.0479
59	0.0042	0.0460
60	0.0033	0.0457
61	0.0026	0.0447

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0067	17137	79973	466	Fail
0.0071	14752	73791	500	Fail
0.0076	12829	68166	531	Fail
0.0080	11032	63140	572	Fail
0.0085	9548	58434	612	Fail
0.0089	8297	54178	652	Fail
0.0094	7268	50328	692	Fail
0.0098	6365	46863	736	Fail
0.0103	5634	43633	774	Fail
0.0107	5020	40681	810	Fail
0.0112	4504	37880	841	Fail
0.0116	4025	35356	878	Fail
0.0121	3568	33110	927	Fail
0.0125	3168	30928	976	Fail
0.0130	2810	28939	1029	Fail
0.0134	2507	27100	1080	Fail
0.0139	2239	25410	1134	Fail
0.0143	1995	23827	1194	Fail
0.0147	1804	22394	1241	Fail
0.0152	1639	20957	1278	Fail
0.0156	1447	19708	1361	Fail
0.0161	1272	18503	1454	Fail
0.0165	1156	17402	1505	Fail
0.0170	1061	16412	1546	Fail
0.0174	965	15466	1602	Fail
0.0179	889	14589	1641	Fail
0.0183	801	13777	1719	Fail
0.0188	728	12953	1779	Fail
0.0192	643	12185	1895	Fail
0.0197	549	11537	2101	Fail
0.0201	460	10904	2370	Fail
0.0206	395	10316	2611	Fail
0.0210	351	9747	2776	Fail
0.0215	302	9219	3052	Fail
0.0219	259	8763	3383	Fail
0.0224	217	8335	3841	Fail
0.0228	175	7940	4537	Fail
0.0233	154	7522	4884	Fail
0.0237	129	7152	5544	Fail
0.0242	112	6791	6063	Fail
0.0246	91	6434	7070	Fail
0.0251	80	6094	7617	Fail
0.0255	68	5760	8470	Fail
0.0260	59	5456	9247	Fail
0.0264	50	5212	10424	Fail
0.0269	44	4966	11286	Fail
0.0273	39	4744	12164	Fail
0.0278	32	4502	14068	Fail
0.0282	28	4273	15260	Fail
0.0287	26	4051	15580	Fail
0.0291	22	3835	17431	Fail
0.0296	17	3660	21529	Fail
0.0300	13	3493	26869	Fail
0.0305	11	3360	30545	Fail

0.0309	11	3206	29145	Fail
0.0314	10	3071	30710	Fail
0.0318	10	2935	29350	Fail
0.0323	10	2800	28000	Fail
0.0327	10	2656	26560	Fail
0.0332	10	2537	25370	Fail
0.0336	9	2428	26977	Fail
0.0341	8	2342	29275	Fail
0.0345	8	2246	28075	Fail
0.0350	7	2152	30742	Fail
0.0354	7	2072	29600	Fail
0.0359	7	1970	28142	Fail
0.0363	7	1898	27114	Fail
0.0368	7	1813	25900	Fail
0.0372	6	1749	29150	Fail
0.0377	6	1684	28066	Fail
0.0381	6	1607	26783	Fail
0.0386	6	1549	25816	Fail
0.0390	6	1491	24850	Fail
0.0395	6	1435	23916	Fail
0.0399	6	1382	23033	Fail
0.0404	6	1337	22283	Fail
0.0408	5	1285	25700	Fail
0.0413	5	1235	24700	Fail
0.0417	4	1188	29700	Fail
0.0422	4	1127	28175	Fail
0.0426	4	1093	27325	Fail
0.0431	3	1057	35233	Fail
0.0435	3	1017	33900	Fail
0.0440	3	991	33033	Fail
0.0444	3	950	31666	Fail
0.0449	3	914	30466	Fail
0.0453	3	888	29600	Fail
0.0458	3	860	28666	Fail
0.0462	3	825	27500	Fail
0.0467	2	793	39650	Fail
0.0471	2	765	38250	Fail
0.0476	2	737	36850	Fail
0.0480	2	721	36050	Fail
0.0485	2	692	34600	Fail
0.0489	2	671	33550	Fail
0.0494	2	652	32600	Fail
0.0498	2	628	31400	Fail
0.0503	2	607	30350	Fail
0.0507	2	592	29600	Fail
0.0512	2	572	28600	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet

On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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Appendix C

Critical Areas Report

TECHNICAL MEMORANDUM

September 25, 2018

To:	Mr. Kelly Foster, Project Owner/Applicant Laird Holdings LLC
From:	Will K. Hohman, PWS, Senior Wetland Ecologist Chris W. Wright., Senior Wetland and Soil Scientist Raedeke Associates, Inc.
For Submittal To:	Mr. Scott Reynolds, Planner City of Redmond
RE:	Critical Areas Report Update Rose Hill West Property (R.A.I. No. 2017-032-006) (City of Redmond LAND-2018-00501)

The purpose of this technical memorandum is to provide a project update describing the changes made to the original Rose Hill West subdivision design prepared by KPFF Consulting Engineers (KPFF) as it relates to critical area wetlands and streams found in the vicinity of the project site. The last Critical Areas Report prepared by Raedeke Associates, Inc., dated May 17, 2017 and last revised May 18, 2018, was submitted to the City of Redmond. The City provided comments back to the applicant on June 27, 2018. This memo provides information necessary to demonstrate that the project no longer proposes to impact any wetlands or stream critical areas or their associated buffers based on the latest project design revisions prepared by Mr. Kelly Foster, Laird Holdings LLC, and project engineer KPFF. It also addresses specific Critical Areas Report redlines and comments from the City's development review staff.

1.0 CRITICAL AREA STUDY AREA

The Rose Hill West project site critical area study area consists of an assemblage of eight parcels totaling approximately 10.64 acres located south of NE 100th Street, west of 138th Avenue NE, and along NE 97th Street in the City of Redmond, Washington (Figure 1). The properties are identified by King County Tax Parcel Nos. 0325059183, 0325059164,

0325059005, 0325059187, 0325059186, 0325059168, 0325059037, and 0325059104. This places the project site in a portion of Section 3, Township 25 North, Range 5 East, W.M. Parcel maps retrieved on-line from King County depict the property boundaries and survey base map information provided by KPFF Consulting Engineers (KPFF) presented on Figure 9. These are the parcels that Raedeke Associates, Inc. was initially hired to review for presence or absence of critical area streams and wetlands. This area is referred to herein as the critical area study area. The proposed project itself is located on a smaller assemblage of these parcels.

The project site is bordered to the north by NE 100th Street and residential properties, 138th Ave NE and forested areas to the east, a single-family home and forested areas to the west, and Gun Club Creek and forested areas southwest and south of the site. Access to the project site is from NE 100th Street for the northwest parcel, and from 138th Avenue NE and NE 97th Street for the remaining parcels.

Methods, wetlands and streams, regulatory considerations, and all associated critical area study results and findings on the above-mentioned parcels are all described in our previous Critical Areas Report for this project (Raedeke Associates, Inc. 2018). General figures depicting the extent of critical areas work performed for this project remain unchanged from our previous report (reference Figures 2-8 in Raedeke Associates, Inc. 2018 report). Figure 9 depicting existing conditions has been updated to address City related comments as well as distinguishing between the extent of critical areas studied and the updated proposed project subdivision. The proposed project subdivision design has changed since submittal of previous critical area reports. The following section describes the reduced project footprint associates with the Rose Hill West subdivision design. Furthermore, Figures attached herein as Figures 10, 11, and 12 serve to replace the previous report (Raedeke Associates, Inc. 2018) Figures 10 and 11. Off-site wetland and stream features including estimated buffers are to be considered approximate as shown on these figures.

2.0 PROPOSED PROJECT SUBDIVISION & DESCRIPTION

The Rose Hill West project proposed subdivision consists of only six of the eight parcels evaluated for critical area wetlands and streams and associated habitats. The current proposed project design consists of the following King County Tax Parcel Nos. 0325059164, 0325059005, 0325059187, 0325059186, 0325059168, and 0325059037 totaling approximately 6.21 acres according to King County (2017) iMap property information. The proposed project design evaluated for potential impacts to critical areas is attached as Figures 10, 11, and 12. These drawings were provided by KPFF on September 21, 2018.

The following project parcels are now considered to be adjacent to proposed project subdivision and off-site since no work is proposed on these parcels: 0325059183 and 0325059104. These two parcels, however, were part of the previously contracted critical

areas reconnaissance work and therefore included in the overall critical areas study area described herein and in previous project reports (Raedeke Associates, Inc. 2018).

The Rose Hill West project subdivision is now a proposed 31 lot (31 unit) development with four tracts (A, B, C, and D). The project consists of the above-mentioned parcels. Stormwater is anticipated from finished lots, tracts, and roadways shown on the attached KPFF figures (Figures 10, 11, and 12). All runoff from the site will be collected and conveyed to a combined water quality and detention vault on the eastern edge of the project area. This location is depicted as Tract C on the attached figures. The discharge from the vault will be conveyed to the Rose Hill East stormwater conveyance system. No structures are proposed within 50-feet of the steep slopes located in the project area and no grading is proposed within the 15-foot steep slope buffer areas located in the southwest corner of the project assemblage. Tract B is a proposed open space tract that will not contain any structures. This updated project description is based on direct communication with KPFF on September 19, 2018 and review of the drawings provided as Figures 10, 11, and 12 of this technical memorandum.

3.0 EXISTING SITE CONDITIONS & ON-SITE OBSERVATIONS

The southwestern portions of the site assemblage, specifically parcels 0325059164 and portions of parcels 0325059183 (part of critical area study area not project subdivision) and 0325059005, consist of undeveloped areas and contains a mixed deciduous and coniferous forest vegetation community. The southernmost portion, parcel 0325059104 (part of critical area study area not project subdivision), consists of a developed area along NE 97th Street with a driveway and two buildings. The southern portion of this parcel is undeveloped and contains a mixed coniferous and deciduous forest community growing on steep slopes. The easternmost portions (three parcels) of the property slope to the east toward 138th Ave. NE, whereas the middle of the assemblage is generally flat and the western portions of the assemblage generally slope to the southwest in the direction of Gun Club Creek (Figure 9). The Rose Hill West project site contains three existing single-family homes, with driveways and landscaped yard areas located within the southernmost parcel and the two parcels abutting 138th Ave. NE. Additional maintenance yards, storage sheds and work trailers, and mowed maintained lawn areas were also observed across the majority of the site. The 100-foot transmission line area, or existing utility corridor, consisted primarily of nuisance and invasive shrub and herbaceous plant species.

During our April 27, 2017, and May 8, 2018, site investigations we verified that the project site critical area study area did not contain any wetlands. Since the updated proposed subdivision is a smaller assemblage of parcels located within the critical area study area, we can conclude that the project subdivision did not contain any wetlands either. In locations appearing to be dominant with facultative (FAC) or wetter species, we investigated soils and site conditions further to confirm the absence of wetlands on site. Specifically, we investigated a concave area located at the top of slope at the end of NE

97th Street (Sample Plot SP2), a sloped area on the southernmost portion of parcel number 0325059005 (Sample Plot SP1), and the southernmost portions of parcel 0325059104 (Sample Plot 3). Sample Plots 1 and 2 were within the transmission line easement that extends through the site. Although these two areas exhibited wetland-like characteristics, these two areas did not meet the criteria to be classified as a wetland. Sample Plot 3 and the steep slope portions nearest this plot, consisted of FAC and FACU dominant plant species no evidence of hydrology. Finally, areas observed to be dominant with FACU or UPL plant species and/or lacking positive indications of hydric soils and/or wetland hydrology also did not meet the criteria to be classified as a wetland. Sample plot locations are depicted on Figure 9 while associated data sheets and preliminary wetland ratings were provided in our previous Critical Areas Report (Raedeke Associates, Inc. 2018). City of Redmond Habitat Assessment and Stream Summary data sheets are also provided in our previous report (Raedeke Associates, Inc. 2018). Figure 13 depicts the habitat areas, per City of Redmond (2017) code Appendix B.2, as requested in the City's June 27, 2018 comments.

More details regarding our project delineation results and findings may be reviewed in our previous Critical Areas Report (Raedeke Associates, Inc. 2018).

4.0 OFF-SITE CONDITIONS AND OBSERVATIONS

During our field work, we observed two potential off-site wetlands and an off-site stream. These are described in our previous report as Wetland 1, Wetland 2, and Gun Club Creek and are located southwest of the proposed project subdivision. Since wetlands were not identified within the critical area study area or proposed project subdivision and we did not have permission to access off site areas, we could only do preliminary ratings using the 2014 WDOE Wetland Rating System for Western Washington (Hruby 2014), as required by City of Redmond (2017) code for determination of wetland buffer widths. Based on our preliminary ratings, Wetland 1 and Wetland 2 would meet the criteria to be classified as a Category II and IV wetland, respectively. Preliminary rating forms were included in our previous report (Raedeke Associates, Inc. 2018).

Although Gun Club Creek is classified as a Class III stream with a Class IV segment further upstream according to the City of Redmond (2016) stream classification map, we determined that it actually meets the criteria of a Class II stream according to City of Redmond (2017) Code, field observations, and recent guidance from Washington Department of Fish and Wildlife and WDOE. Refer to our previous report for more information regarding these determinations (Raedeke Associates, Inc. 2018).

As discussed in our previous report, Wetland 1 and Wetland 2 are anticipated to have a 150 and 50-foot wetland buffer respectively. Class II streams are provided a 100-foot wide stream buffer and 50-foot-wide outer buffer (150-foot total buffer width) under City of Redmond Code. The locations that these buffers extend onto the project site are depicted

on Figures 10, 11, and 12. They are approximate, not formerly surveyed, and based off a combination of field observations relative to fixed surveyed on-site structures (fences), review of available GIS data, and aerial imagery (Google Earth 2017). Although these locations are approximate, the nearest proposed development area (Tract B) is located approximately 65-feet from the estimated buffer depicted nearest the proposed subdivision. That placed the estimated off-site wetland, Wetland 1, more than 200-feet away from the proposed project subdivision. It is also separated by steep slopes and their associated setbacks required by City of Redmond (2017) Code. According to KPFF, no work is proposed in Tract A as shown on the proposed development drawings (Figures 10, 11, and 12).

5.0 MITIGATION

City of Redmond (2017) Code requires that development of the site avoid or minimize impacts to regulated sensitive areas. Where impacts to sensitive areas cannot be avoided, they must be compensated through replacement, enhancement, or providing substitute areas to replace ecological functions of the resource. The approach to mitigation is based on the Federal CFR 40 15.08.20 for Mitigation, the State WAC 197-11-768, and City of Redmond (2017) code. In order of desirability, mitigation may include:

1. Avoidance - avoiding impacts by not taking action or parts of an action;
2. Minimization - minimizing impacts by limiting the degree or magnitude of the action and its implementation;
3. Compensatory Mitigation - which may involve:
 - a) repairing, rehabilitating, or restoring the affected environment;
 - b) replacing or creating substitute resources or environments;
 - c) mitigation banking or in-lieu fee mitigation.

5.1 AVOIDANCE AND MINIMIZATION OF IMPACTS

Based on the revised project description, reduced footprint of the proposed subdivision, and after reviewing the drawings provided by KPFF, it is Raedeke Associates, Inc.'s opinion that the proposed subdivision will avoid impacts to critical areas and their buffers located in the southwest corner. The proposed development plan incorporates a number of design features that would avoid or minimize impacts to the retained areas and off-site habitats:

- Direct impacts to the potential off-site wetlands and their buffers would be avoided;

- Direct impacts to the Class II stream near the southern and southwestern site boundary, and its buffer, would be avoided;
- The forested buffer and forested corridor surrounding Gun Club Creek would retain a substantial portion of the forested habitat on site; the limits of the buffer tract would be clearly marked with critical area signage per City of Redmond requirements and conditions of approval;
- No residential structures, impervious surfaces, or new trails would be located within the designated open space tract;
- The proposed development would route storm water runoff from new impervious surfaces to a detention vault stormwater facility to provide the required stormwater management treatment. The detention facility in the eastern side of the proposed subdivision would discharge stormwater to an adjacent previously approved stormwater facility into a storm drain at rate similar to natural drainage patterns. This assumes that the proposed detention facility is designed to accommodate the capacity and previous approvals associated with the stormwater management requirements associated with the Rose Hill East subdivision project.
- Temporary erosion and sediment control (TESC) measures would be installed during construction and would utilize appropriate best management practices (BMPs) designed to prevent sediment deposition to on-site open space tracts and off-site areas.

6.0 CONCLUSIONS

Since the project is completely avoiding direct impacts to the off-site stream and potential wetland areas including the estimated buffers that extend onto the project site, we propose that this report along with the previous report (Raedeke Associates, Inc. 2018) describing existing on-site and off-site critical areas existing conditions and habitats be reviewed for approval by the City for the proposed project design described herein.

7.0 LIMITATIONS

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

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

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

Thank you for the opportunity to provide this information. If you have any questions or need additional information, please do not hesitate to contact us at (206) 525-8122 or via email at whohman@raedeke.com or cwright@raedeke.com.

LITERATURE CITED

- Google Earth. 2017. Image for 47.687774°N -122.159149°E in Redmond, WA. © 2017 Google. Accessed April 27, 2017.
- Hruby, T. 2014. Washington State wetlands rating system for western Washington: 2014 Update. Washington State Department of Ecology, Publication No. 14-06-029. October 2014.
- King County. 2017. iMAP GIS Interactive map center, King County, Washington. http://www.metrokc.gov/gis/iMAP_main.htm#. Accessed April 2017.
- Raedeke Associates, Inc. 2018. Critical Areas Report: Rose Hill West Property Redmond, Washington prepare for Mr. Kelly Foster, Laird Holdings LLC. May 17, 2017, revised September 15, 2017, last revised May 18, 2018.
- Redmond, City of. 2017. Redmond Zoning Code, Chapter 21.64. Critical Areas Regulations. Current through Ordinance 2877, passed March 21, 2017.

LIST OF FIGURES

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13. Existing Conditions Showing Habitat Areas 14

PROJECT
LOCATION

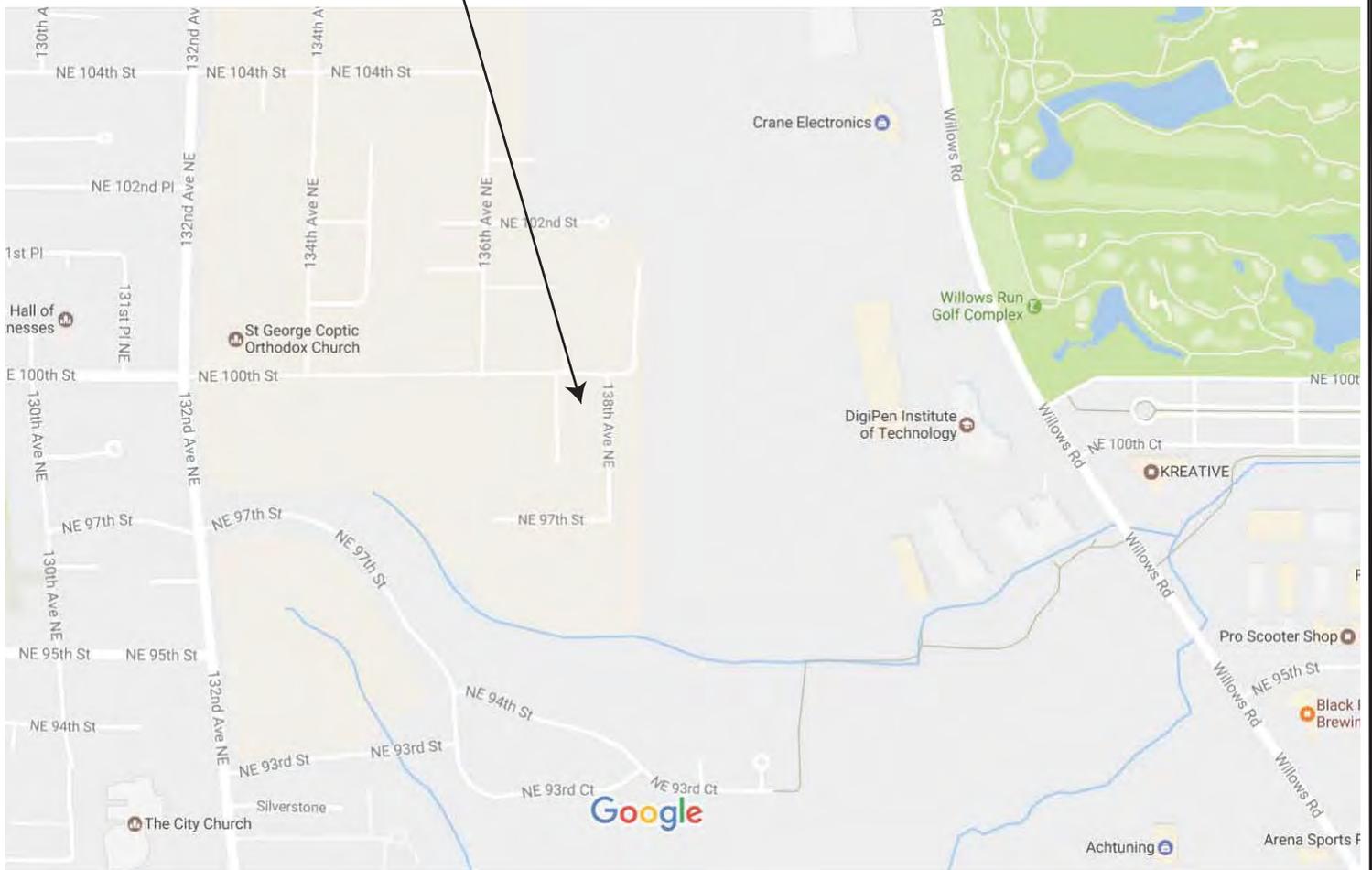


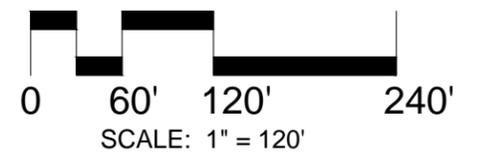
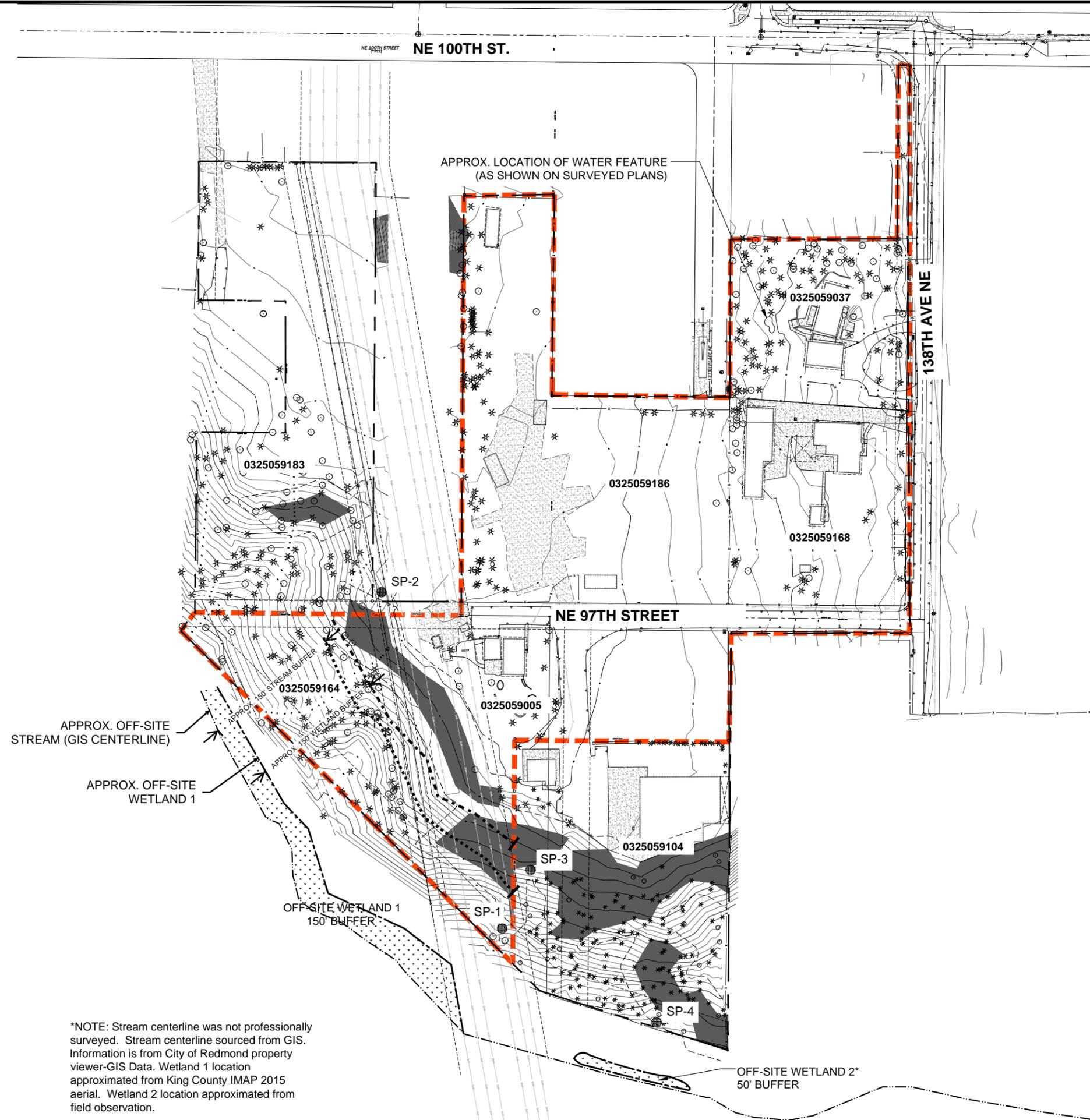
FIGURE 1
REGIONAL & VICINITY MAP
ROSE HILL WEST
REDMOND, WA



ATTACHMENT FIGURE 9
 LAIRD HOLDINGS, LLC
 ROSE HILL WEST
 REDMOND, WA
 CRITICAL AREAS REPORT
 EXISTING CONDITIONS

LEGEND

-  STUDY AREA BOUNDARY
-  PROPOSED PROJECT BOUNDARY
-  APPROX. OFF-SITE STREAM
-  APPROX. OFF-SITE WETLAND
-  STEEP SLOPE & BUFFER
-  SP-# APPROX. SAMPLE PLOT LOCATIONS

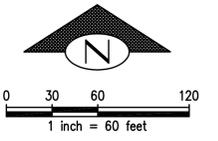


Raedeke
 Associates, Inc.
 2111 N. Northgate Way, Ste 219
 Seattle, WA 98133

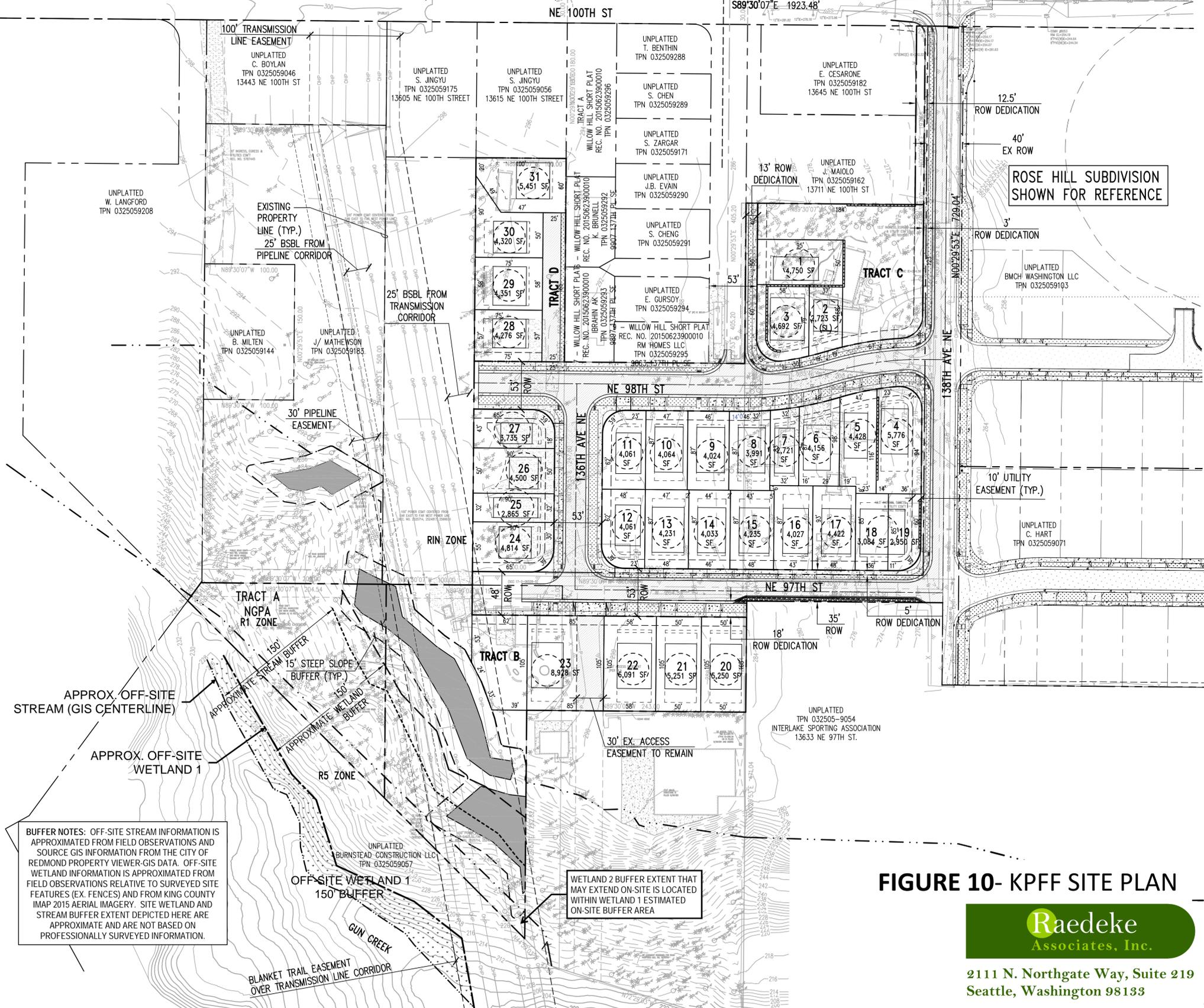
RAI PROJECT: 2017-032	
DATE: 09/20/2018	
DRAWN BY: AC	PM: WH
BASE INFORMATION: KPFF ENGINEERS- Source files 16220 T received 5/9/2018; RHW SP received 5/17/18	

*NOTE: Stream centerline was not professionally surveyed. Stream centerline sourced from GIS. Information is from City of Redmond property viewer-GIS Data. Wetland 1 location approximated from King County IMAP 2015 aerial. Wetland 2 location approximated from field observation.

NW AND NE 1/4 OF THE NW 1/4, SEC. 03 TWP. 25 N, RGE. 5E., W.M.



FOUND TACK AND LEAD IN CONC. MONUMENT. DOWN 0.75' IN CASE. C.O.R. GLO-2DSW HELD POSITION N 254,332.76 E 1,312,455.34



- NOTES:**
- SEE GRADING PLANS FOR FINISHED GRADES AND WALL ELEVATIONS.
 - GUN CREEK AND OFFSITE WETLAND BUFFER LOCATION ARE APPROXIMATE AND BASED ON GIS DATA.

PROJECT AREA
6.53 AC
SF

LEGEND

- PROPERTY LINE
- - - PROPOSED LOT LINE
- - - EASEMENT LINE
- - - BUILDING SETBACK LINE
- - - CRITICAL AREA BUFFER
- - - ZONE BOUNDARY LINE
- - - STEEP SLOPE BUFFER
- - - PROPOSED FENCE
- STEEP SLOPE
- AF AFFORDABLE
- SL SIZE LIMITED
- LOT WIDTH CIRCLE
- APPROXIMATE BUILDING FOOTPRINT

BUFFER NOTES: OFF-SITE STREAM INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS AND SOURCE GIS INFORMATION FROM THE CITY OF REDMOND PROPERTY VIEWER-GIS DATA. OFF-SITE WETLAND INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS RELATIVE TO SURVEYED SITE FEATURES (EX. FENCES) AND FROM KING COUNTY IMAP 2015 AERIAL IMAGERY. SITE WETLAND AND STREAM BUFFER EXTENT DEPICTED HERE ARE APPROXIMATE AND ARE NOT BASED ON PROFESSIONALLY SURVEYED INFORMATION.

WETLAND 2 BUFFER EXTENT THAT MAY EXTEND ON-SITE IS LOCATED WITHIN WETLAND 1 ESTIMATED ON-SITE BUFFER AREA

FIGURE 10- KPFF SITE PLAN



2111 N. Northgate Way, Suite 219
Seattle, Washington 98133

NOT FOR CONSTRUCTION

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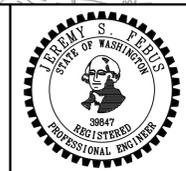
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NO.	DATE	BY	CHD.	APPR.	REVISION

DRAWN BY
KSA&KJS
CHECKED BY
JSF
DATE
5/21/2018
DESIGNED BY
KJS
APPROVED BY
JSF
JOB No.: 1600612

CALL TWO BUSINESS DAYS BEFORE YOU DIG 1-800-424-5555
SCALE: AS NOTED



APPLICANT/OWNER'S AGENT
LAIRD HOLDINGS LLC
1916 126TH AVENUE SE
BELLEVUE, WA 98005
PHONE: (206) 605-2371
CONTACT: KELLY M. FOSTER
EMAIL: kelly@lairdholdingsllc.com

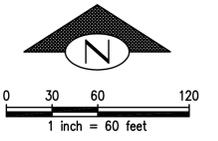


ROSE HILL WEST SUBDIVISION
CITY OF REDMOND
KING COUNTY, WASHINGTON

SITE PLAN

SHEET
C-1.00

NW AND NE 1/4 OF THE NW 1/4, SEC. 03 TWP. 25 N, RGE. 5E., W.M.

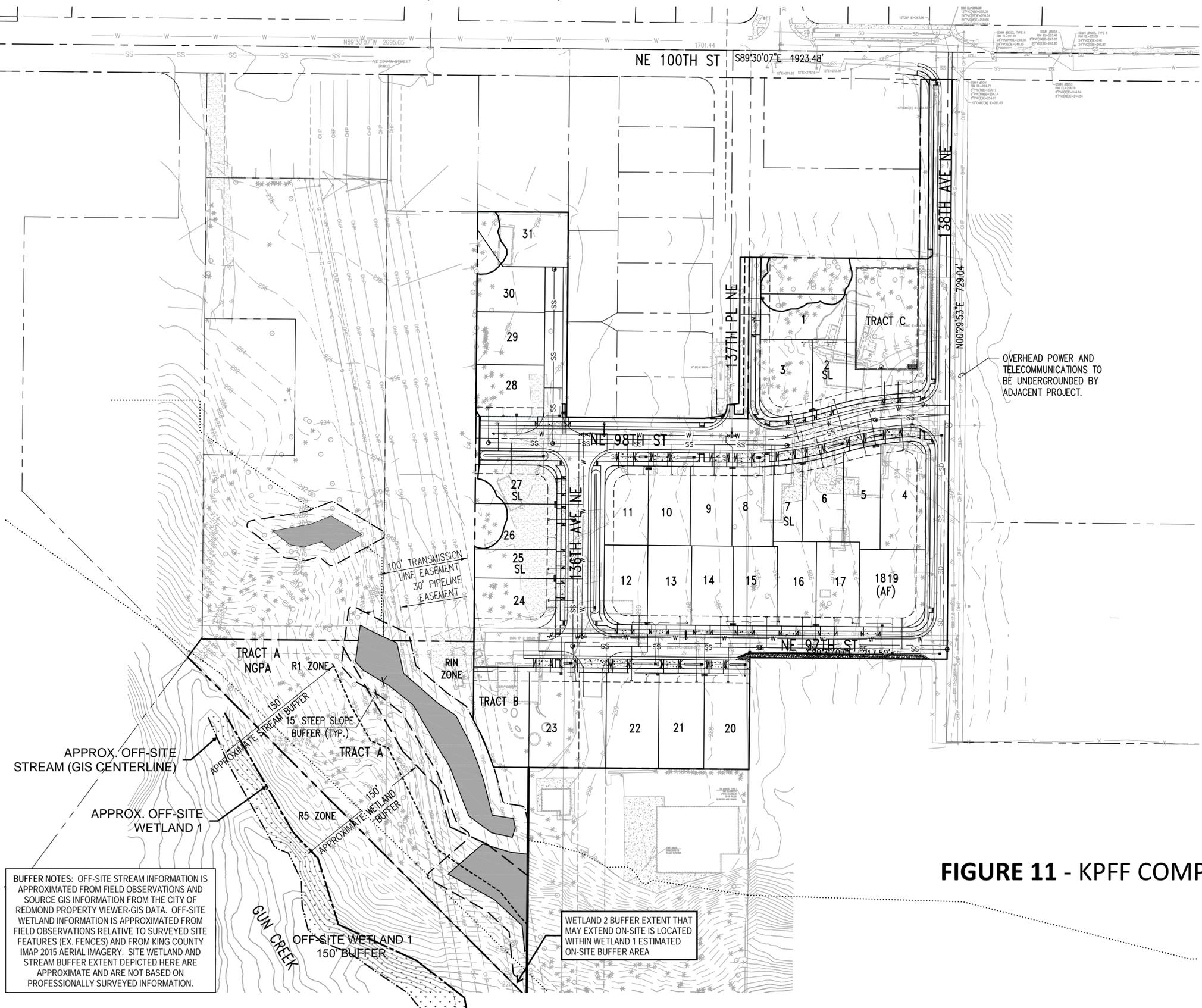


FOUND TACK AND LEAD IN CONC. MONUMENT. DOWN 0.75' IN CASE. C.O.R. GLO-2DSW HELD POSITION N 254,332.76 E 1,312,455.34

- GENERAL NOTES:**
- PAD MOUNTED TRANSFORMER LOCATIONS AND OTHER UTILITY RISERS PER PLAN BY OTHERS.
 - EXISTING GAS MAIN IN 138TH AVE NE TO REMAIN. GAS MAIN EXTENSION BY OTHERS.
 - PROPERTIES TO THE SOUTH ARE ON PRIVATE SEPTIC SYSTEMS.
 - ALL ADJACENT PROPERTIES ARE ON CITY OF REDMOND WATER.
 - THE PROJECT SITE IS WITHIN CITY OF REDMOND WATER PRESSURE ZONE 425.
 - GUN CREEK AND OFFSITE WETLAND BUFFER LOCATION ARE APPROXIMATE AND BASED ON GIS DATA.

LEGEND

- PROPERTY LINE
- PROPOSED LOT LINE
- RIGHT OF WAY CENTERLINE
- EASEMENT LINE
- W WATER MAIN
- SS SANITARY SEWER
- FM SANITARY SEWER FORCE MAIN
- SS SIDE SEWER
- SD STORM DRAIN
- PERFORATED STORM PIPE
- ⊞ WATER METER
- ⊙ FIRE HYDRANT
- ⊗ GATE VALVE
- △ CONCRETE THRUST BLOCK
- ⊙ SANITARY SEWER MANHOLE
- ⊞ CATCH BASIN
- ⊙ COBRA HEAD LUMINAIRE AND POLE
- ⊙ POST TOP DECORATIVE LUMINAIRE
- 254- EXISTING GRADE CONTOUR
- 254- PROPOSED GRADE CONTOUR
- VERTICAL CURB AND GUTTER
- CRITICAL AREA BUFFER
- █ STEEP SLOPE



BUFFER NOTES: OFF-SITE STREAM INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS AND SOURCE GIS INFORMATION FROM THE CITY OF REDMOND PROPERTY VIEWER-GIS DATA. OFF-SITE WETLAND INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS RELATIVE TO SURVEYED SITE FEATURES (EX. FENCES) AND FROM KING COUNTY IMAF 2015 AERIAL IMAGERY. SITE WETLAND AND STREAM BUFFER EXTENT DEPICTED HERE ARE APPROXIMATE AND ARE NOT BASED ON PROFESSIONALLY SURVEYED INFORMATION.

WETLAND 2 BUFFER EXTENT THAT MAY EXTEND ON-SITE IS LOCATED WITHIN WETLAND 1 ESTIMATED ON-SITE BUFFER AREA

FIGURE 11 - KPFF COMPOSITE UTILITY PLAN



2111 N. Northgate Way, Suite 219
Seattle, Washington 98133

NOT FOR CONSTRUCTION

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Sep 21, 2018 - 3:16pm
kens

1	5/21/2018	KJS	JSF	JSF	PRELIMINARY PLAT SUBMITTAL
NO.	DATE	BY	CHD.	APPR.	REVISION

DRAWN BY
KSA&KJS
CHECKED BY
JSF
DATE
5/21/2018
DESIGNED BY
KJS
APPROVED BY
JSF
J O B No. :1600612

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SCALE: AS NOTED

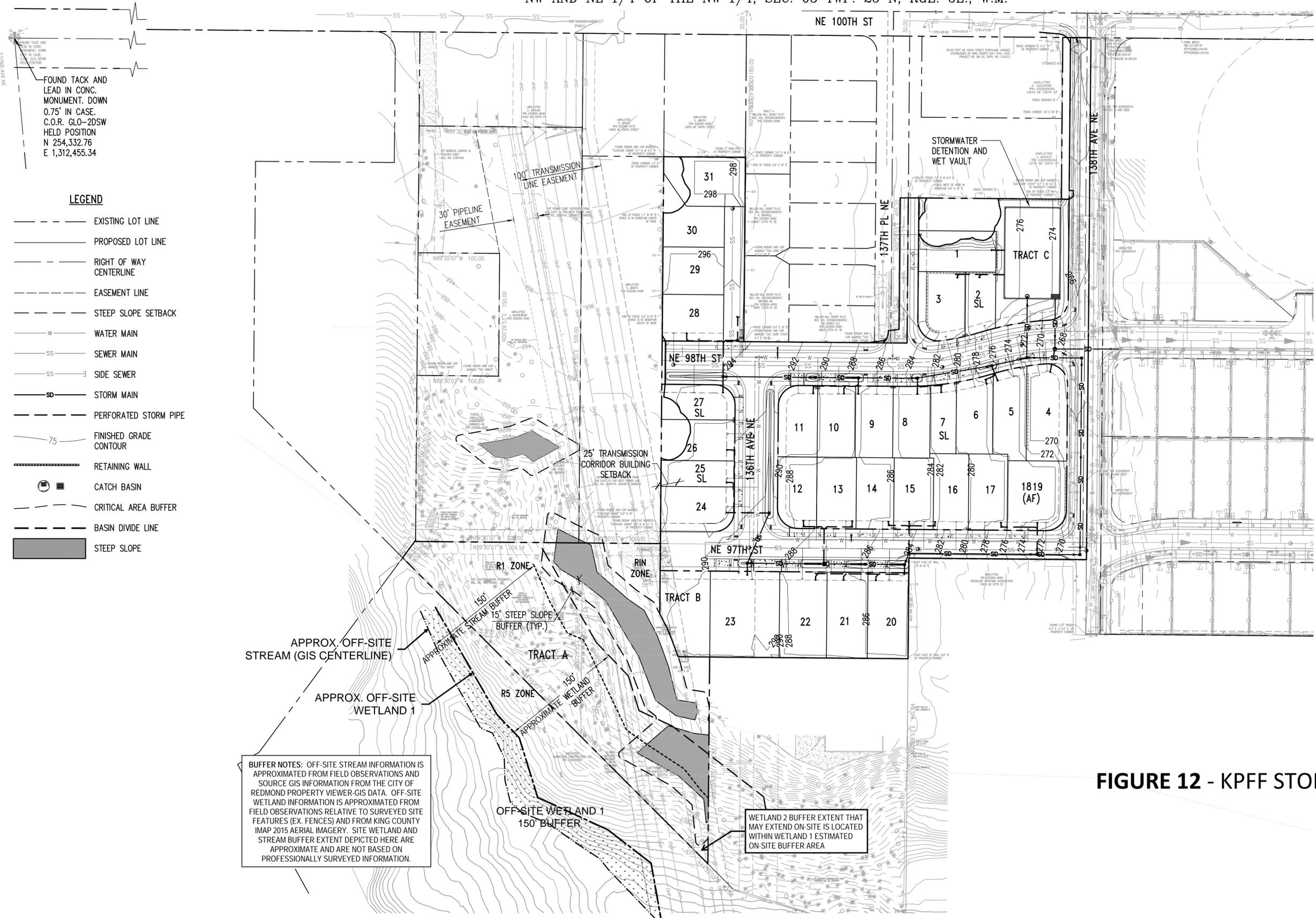
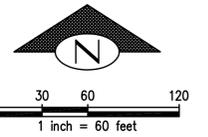


APPLICANT/OWNER'S AGENT
LAIRD HOLDINGS LLC
1916 126TH AVENUE SE
BELLEVUE, WA 98005
PHONE: (206) 605-2371
CONTACT: KELLY M. FOSTER
EMAIL: kelly@lairdholdingsllc.com



ROSE HILL WEST SUBDIVISION CITY OF REDMOND KING COUNTY, WASHINGTON	SHEET
COMPOSITE UTILITY PLAN	C-4.00

NW AND NE 1/4 OF THE NW 1/4, SEC. 03 TWP. 25 N, RGE. 5E., W.M.



BUFFER NOTES: OFF-SITE STREAM INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS AND SOURCE GIS INFORMATION FROM THE CITY OF REDMOND PROPERTY VIEWER-GIS DATA. OFF-SITE WETLAND INFORMATION IS APPROXIMATED FROM FIELD OBSERVATIONS RELATIVE TO SURVEYED SITE FEATURES (EX. FENCES) AND FROM KING COUNTY IMPAP 2015 AERIAL IMAGERY. SITE WETLAND AND STREAM BUFFER EXTENT DEPICTED HERE ARE APPROXIMATE AND ARE NOT BASED ON PROFESSIONALLY SURVEYED INFORMATION.

WETLAND 2 BUFFER EXTENT THAT MAY EXTEND ON-SITE IS LOCATED WITHIN WETLAND 1 ESTIMATED ON-SITE BUFFER AREA

Z:\1600061-1600612 (Rose Hill West)\CAD\Design\C-7.00_RHW_SD.dwg
 Sep 21, 2018 - 3:20pm
 kems

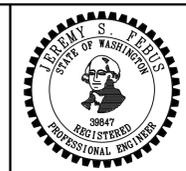
1	5/21/2018	KJS	JSF	JSF	PRELIMINARY PLAT SUBMITTAL
NO.	DATE	BY	CHD.	APPR.	REVISION

DRAWN BY KSA&KJS
 CHECKED BY JSF
 DESIGNED BY KJS
 APPROVED BY JSF
 DATE 5/21/2018
 J O B No. :1600612

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ROSE HILL WEST SUBDIVISION
 CITY OF REDMOND
 KING COUNTY, WASHINGTON
OVERALL STORM DRAINAGE PLAN

SHEET C-7.00

ATTACHMENT FIGURE 13
 LAIRD HOLDINGS, LLC
 ROSE HILL WEST
 REDMOND, WA
 CRITICAL AREAS REPORT
 EXISTING CONDITIONS
 SHOWING HABITAT
 AREAS

LEGEND

- STUDY AREA BOUNDARY
- PROPOSED PROJECT BOUNDARY
- APPROX. OFF-SITE STREAM
- APPROX. OFF-SITE WETLAND
- STEEP SLOPE & BUFFER
- SP-# APPROX. SAMPLE PLOT LOCATIONS

NOTE: CITY OF REDMOND HABITAT ASSESSMENT FORM DISCUSSES THE ENTIRE PROJECT SITE RELATIVE TO KING COUNTY PARCEL NUMBERS AND DESCRIPTIONS PROVIDED IN MAY 17, 2017 LAST REVISED MAY 18, 2018 CRITICAL AREAS REPORT



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

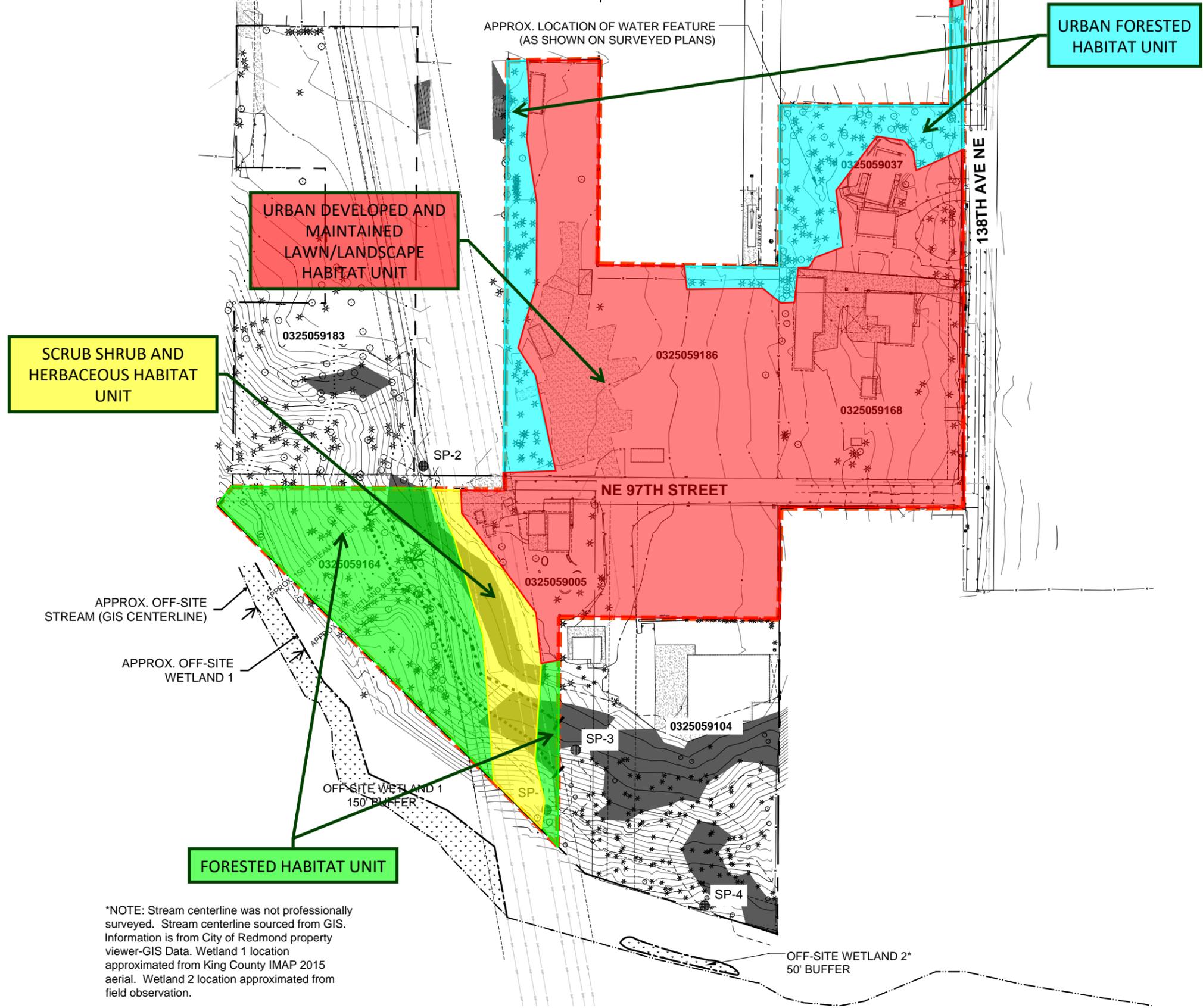
RAI PROJECT: 2017-032

DATE: 09/20/2018

DRAWN BY: AC

PM: WH

BASE INFORMATION:
 KPFF ENGINEERS- Source files 16220 T received 5/9/2018; RHW SP received 5/17/18



*NOTE: Stream centerline was not professionally surveyed. Stream centerline sourced from GIS. Information is from City of Redmond property viewer-GIS Data. Wetland 1 location approximated from King County IMAP 2015 aerial. Wetland 2 location approximated from field observation.

Appendix D

Geotechnical Report

Appendix E

Conveyance and Backwater Calculations

Roadside swale sizing calculation

Will be provided with construction documentation and permitting.

.

Appendix F

1. TESC Plans
2. Sediment Pond and Infiltration Basin WWHM2012 Data
3. Temporary Erosion and Sedimentation Control Calculations Summary

Will be provided with construction documentation and permitting.

Appendix G

Operation and Maintenance

Will be provided with construction documentation and permitting.

Appendix H

Bond Quantities & Draft Declaration of Covenant

Will be provided with construction documentation and permitting.

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Appendices

Appendix A

1. Existing Conditions Site Map
2. Proposed Conditions Site Plan

Appendix B

WWHM Output

Appendix C

- Conveyance and Backwater Calculations (Provided at CCR)
- Roadside Swale Sizing Calculation (Provided at CCR)

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