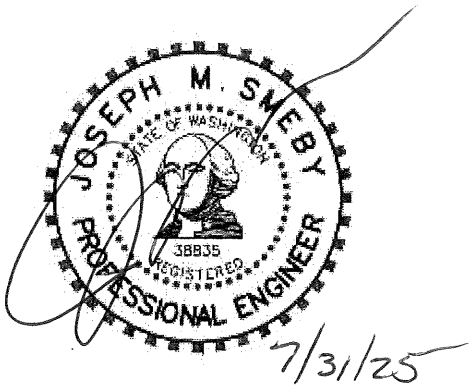
Drainage Report
Quail Ridge SP

PFN:

for

KJR Family LLC
Attn: John Robinett
131 Colby Ave
Everett, WA 98201

SITE LOCATION:
XXXX 196th Pl NE
Arlington, WA 98223
TPN: 01052300099900



Prepared by:
Joseph M. Smeby, P.E.

Job No: 24-0701
Preliminary: July, 2025

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1. INTRODUCTION

This document is intended to provide the engineering information necessary to support the 2-lot short plat for this project which includes the development of Tract 999 into two lots totaling 0.89 acres with the two future lots being designed for disturbance for SFRs and driveways. The lots will take access from the existing private road 196th Pl NE. This project will include 2 new lots with driveway access.

The proposed improvements for this project will not require any improvements as part of the short plat since all of the existing infrastructure was constructed as part of the original subdivision. Runoff from all new impervious and pervious surfaces will be dispersed on-site.

The Geotechnical Engineer for this project, Cobalt Geoscience, LLC has prepared a report summarizing their findings in the field. They found a till layer consisting of weather till to 4-feet over hardpan with mottling at 3' or shallower. 5' of fill was also logged in TP-3.

The site is located on Tract 999 of the Quail Ridge subdivision on 196th Pl NE and west of 95th Ave NE, in the City of Arlington, and in Section 13, Township 31N, Range 5E, Willamette Meridian. See Figure 1 - Vicinity Map.

A. DRAINAGE INFORMATION SUMMARY FORM

Project: **Quail Ridge Short Plat**
PFN:

Engineer: **Omega Engineering, Inc.**
2707 Wetmore Ave
Everett, WA 98201
Attention: Joseph Smeby, P.E.

Total site area: **13.08 acres**
Offsite area: **0.00 acres**
Project area: **0.88 acres**

Applicant: **KJR Family, LLC**
1311 Colby Ave
Everett, WA 98201
Attention: John Robinettd

New Lots/Units: 2

Drainage Basin Information	**Basin A**
On-site Developed Area	0.88 acres
Off-site Improved Area	0.00 acres
Types of storage proposed on site	Sheet Flow Disp
Approximate total storage volume	0
Soil Types	Type C Soils
Basin Data	
Existing Basin	
2-year	0.044 cfs
50-year	0.219 cfs
100-year	0.284 cfs
Developed Basin (Vault Discharge)	
2-year	0.141 cfs
50-year	0.310 cfs
100-year	0.373 cfs

2. EXISTING SITE CONDITIONS

The site is located on 196th Pl NE and west of 95th Ave NE, in the City of Arlington, and in Section 13, Township 31N, Range 5E, Willamette Meridian. See Figure 1 - Vicinity Map.

Land use around the site is primarily native with single-family homes in the Quail Ridge development. The parcel associated with this project currently is Tract 999 which was platted as a future development tract which contains areas for the two future lots along with critical areas and other open space. The area of the Tract for the new lots has been cleared and contains pasture or brush/blackberries. 196th Pl NE was constructed as part of the original subdivision so no new frontage improvements will be required.

The existing developable site is irregular in shape made up of one tract. The grades on the site, in the area of the future lots, are moderate with the steepest slopes approximately 8%. The vegetation found on the existing property consists of pasture grasses or brush.

A site visit was conducted in July 2025. The weather was clear with temperatures in the 70's. No surface water was observed on this site.

The soil hydrologic types for this site have been identified as Type C from the Snohomish County Soil Survey Map, see figure 4. These soils, Tokul gravelly medial loam typically consists of weathered medial loam over hardpan at around 33”. This soil type is identified as a Till soil (Type C/D) in the 2021 DOE Manual. Based on the geotechnical findings for this project the site does not have infiltration capacity due to the shallow mottling logged in the test pits at less than 3’. Refer to the Geotech report in Appendix B.

This project proposes to build 2 new SFRs. Approximately 14% of the future lots 1 & 2 will be impervious surface with the remaining area to be landscaped or left as pasture.

3. DEVELOPED SITE CONDITIONS

This development proposes to cover the site with 14% impervious surfaces. The runoff from these surfaces will be dispersed on-site via splash blocks, sheet flow dispersion or level spreaders. Per the project Geotech's report, there is a shallow mottling layer at less than 3 feet making infiltration infeasible.

Based on the recommendations of the project Geotechnical Engineer in the soils report, no infiltration will be used for this project. However, roof downspout dispersion, sheet flow dispersion and soil amendments will be utilized for on-site LID BMPs prior to the runoff leaving either lot.

4. OFFSITE ANALYSIS

DEFINE STUDY AREA:

From observations made during the field visit, and the topographic survey, no significant areas drain onto this project site, this is due to the existing road being constructed and low areas to the east and west of the lot areas.

Runoff from the future lots 1 & 2 drain either to the east or west respectively. Runoff from lot 1 drains to the east and is collected by the detention system constructed as part of the Quail Ridge subdivision. The pond discharges into a critical area buffer and wetland near the northeast corner of Tract 999. The wetland drains to the north/northwest for approximately 1000-feet before reaching the ¼ mile downstream point for this project. The area of the wetland is in a broad low area which is densely vegetated.

The runoff from Lot 2 drains to the west and is collected by a wetland the cuts through Tract 999 and flows to the north/northwest. The wetland flows for approximately 1,200 feet before it reaches the ¼ mile downstream point for this project. This point is near where the wetland crosses a PUD parcel that is long and narrow running north/south. This wetland area is a narrow low area which is also densely vegetated.

Since the flow paths do not combine within ¼ mile of the site lots 1 & 2 are considered to be in two separate TDA. However, the drainage design for this project will be completed considering the site a single threshold discharge area which is more conservative since the improvements cannot be split to meet the required thresholds.

REVIEW AVAILABLE INFORMATION:

The City and County GIS Maps were reviewed along with the original plat documents to identify two existing wetlands in Tract 999. These are the closest critical areas to the project.

FIELD INSPECTION:

This site slopes to the east and west depending on what side of 196th Pl NE you are on. Each future lot area appeared in good condition with no indications of standing water or erosion issues were noticed at the time of the field visit.

DESCRIPTION OF DRAINAGE SYSTEM AND ANY EXISTING OR PREDICTED PROBLEMS:

The downstream systems for this project appear in good condition. The systems consist of overland flow to a wetland or overland flow to man-made detention with outfall to wetland. Each critical area flows easily to the north/northwest. Since this project will disperse runoff over the future lots and the current site is pasture/lawn, the runoff flow rates from the developed conditions will only be slightly higher than in the current conditions for the site.

5. STORMWATER CONTROL PLAN

A. On-Site Stormwater BMPs

As documented in Section 1 of this report this project is required to meet Minimum Requirements 1-9. As a result, per Table 1.1 in Section 2.5.5 of Volume I in the 2024 DOESWMMWW this project is required to provide BMPs per List #2.

Lawn/Landscaping Areas:

BMP T5.13 will be used over all disturbed/converted pervious surfaces to remain after mass grading and prior to final site stabilization.

Roofs:

Full Dispersion: Infeasible due to lack of 100-foot native vegetation flow path prior to the runoff leaving the site or being collected by the existing detention pond or wetlands.

Roof Downspout Infiltration: The project geotech found soils with mottling at less than 3-feet. Therefore, infeasible based on Geotech recommendations.

Sheet flow or concentrated flow dispersion: Feasible, runoff from the future roof areas will be dispersed via splash blocks (50-foot vegetated flow path) or dispersion trench (25' vegetated flow path).

Perforated Stubout Connection: Not selected since higher priority BMP was found feasible.

Other Hard Surfaces:

Full Dispersion: Infeasible due to lack of 100-foot native vegetation flow path prior to the runoff leaving the site or being collected by the existing detention pond or wetlands.

Permeable Pavement: The project geotech found soils with mottling at less than 3-feet. In addition, 5' of fill was found in TP-3. Therefore, infeasible based on Geotech recommendations.

Bioretention: Not feasible refer to infiltration discussion above.

Sheet Flow Dispersion:
Feasible, all driveway, walk and patio surfaces will be designed to sheet flow over the adjacent amended soils and vegetation on-site.

B. FLOW CONTROL SYSTEM

This project proposes to construct less than 10,000 sf of new/replaced effective impervious surfaces, convert less than ¾ acre or 2.5 acres of forest to lawn or pasture respectively. Therefore, if the proposed improvements are found to increase the peak 100-year flow rate from the developed site by less than 0.15 cfs

over the current land cover conditions using the WWHM2012 software and 15-minute time steps, then this project would be considered exempt from this MR.

Using the WWHM2012 software the existing and developed 100-year flows for lots 1 & 2 combined are 0.28 & 0.37 cfs respectively. This results in an increase of 0.09 cfs which is less than the 0.15 cfs threshold, so as noted, this project is exempt from flow control

D. WATER QUALITY SYSTEM

This project proposes to construct less than 5,000 sf of effective impervious surfaces and is exempt from this MR.

6. SWPPP NARRATIVE

The intent of this section is to provide the information necessary to support the engineering plans to implement a design that will reduce, eliminate, or prevent the discharge of stormwater pollutants, meet or exceed the water quality and sediment management standards for the City and State, and prevent adverse impacts to the receiving waters for this project. Note: this narrative is intended to support the SWPPP that is included with the Drainage Plans also a part of this submittal package to the city.

A. SITE GRADING/EROSION CONTROL RISK ASSESSMENT

Area proposed to be cleared/worked:	0.88 acres
Average slope for the site:	8% (Area of Disturbance Only)
Erosion Hazard of Soil	Slight to Moderate
Critical Areas downslope	Yes
Site is upstream of an ESA Stream	No

Based on the above information and the fact that significant areas of vegetation can be retained along the perimeter of the area of disturbance, and that if site conditions warrant, additional BMP's can be implemented as corrective measures the Risk Category for this site is **Low Risk.**

B. SWPPP Minimum Elements

1: Preserve Vegetation and Mark Clearing Limits
The first step in the construction process is for the contractor to flag or fence the limits of clearing/disturbance prior to any other construction activity. The engineering plans locate and provide the square footages for the areas of grading, clearing, impervious surfaces and un-disturbed areas on the proposed site. Existing vegetation can be preserved around the perimeter of the site during the initial construction phases on this project. Approximately 90% of the entire site will be cleared or disturbed for this project.

2: Establish Construction Access
The SWPPP calls for the proposed construction entrance to be installed as the second step after the staking of clearing limits. At this time winter work is expected during the wet season.

3: Control Flow Rates
This project is exempt from MR 7 and by retaining as much existing vegetation as possible during the SFR construction the runoff from this project will be attenuated.

4: Install Sediment Controls
This site SWPPP proposes to construct/maintain gravel entrances, vegetative buffer, silt fencing or a brush barrier if necessary. The construction of these features should be completed before the clearing and grading of the site. Mulch will also be used on the exposed soil as necessary to limit erosion.

5: Stabilize Soils
The “Construction Sequence” calls for the stabilization of soils that remain unworked for certain lengths of time based on the time of year. Stabilization techniques may include but not limited to mulching, plastic sheeting or hydroseeding, notes have been added to the plan regarding protection for the stockpile area if necessary. Stockpile areas have been identified on the SWPPP and are setback a minimum of 25-feet from any down slope property line.

6: Protect Slopes
All disturbed slopes on site during construction are required to be protected with mulch or other means as specified in the construction sequence. No concentrated runoff or significant amounts of sheet flow will be directed to new cut or fill slopes during construction.

7: Protect Drain Inlets
All existing catch basins adjacent to this project w/in 196th Pl NE and immediately downslope will be protected with inlet protection. No new CBs are proposed.

8: Stabilize Channels and Outlets
All new/temporary or existing channels/outlets will be protected with check dams and rock pads as appropriate.

9: Control Pollutants
No outside chemicals are expected to be necessary for the construction of this project. All vehicles working on and around the site would need to meet the State requirements for emissions. Vehicle fueling locations will be used to limit the potential impacts from any spills and concrete washout areas will also be provided well away from the detention vault.

10: Control DeWatering
DeWatering may be necessary during construction of this project. However, the existing vegetation retained on site will be available to spread any water from construction for filtration and disposal

11: Maintain BMPs
The construction supervisor will be responsible for maintaining all BMPs during construction and working with the City to relocate or add BMPs as necessary as site conditions change.

12: Manage the Project
It will be the responsibility of the Contractor and Developer to manage this project and coordinate with the City Inspector and Engineer.

Inspection and Monitoring:
Site inspections shall be done by a person who is knowledgeable in the principles and practices of erosion and sediment control. The person must have skills to first assess the site conditions and construction activities that could impact the quality of stormwater, and second assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

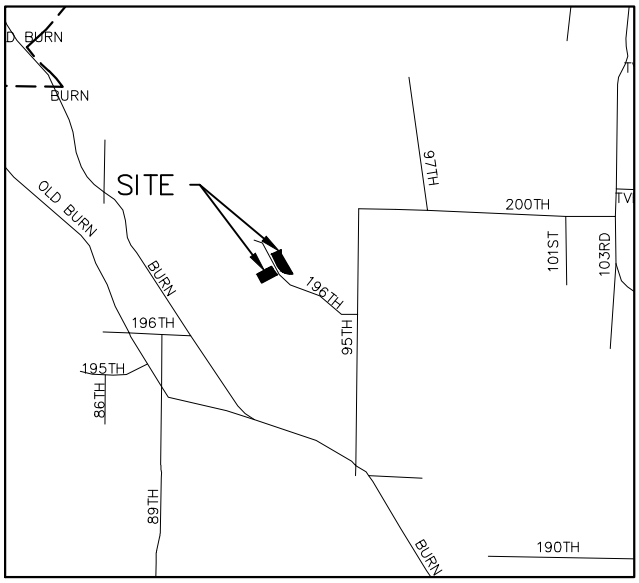
Maintaining an Updated Construction SWPPP:
The construction SWPPP shall be retained on-site or within reasonable access to the site.
The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven days following inspection.

13: Protect On-Site Stormwater Management BMPs for Runoff from Hard Surfaces
The use of on-site management BMPs for this project will allow for the installation of the roof dispersion BMPs and sheet flow dispersion of driveways and soil amendments at the time of building permit.

7. PROJECT OVERVIEW

This project proposes to construct 2 new SFRs/Units on the site. Approximately 0.88 acres of the site will be developed/disturbed under this project. All the new impervious and pervious surfaces will be dispersed on-site to provide mitigation prior to the runoff leaving the site. The existing ground cover of pasture/grass and brush will be converted to landscaping and impervious surfaces because of this project.

The site grades for this project range from 5-8%. Site grading will be necessary to create driveways and lot building pads for the future SFRs. An off-site septic easement is provided for both lots on the west side of the project. New water meters will be installed for each lot.



VICINITY MAP

SCALE 1" = 2000'

FIG. 1

OMEGA
ENGINEERING, INC.
2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

VICINITY MAP
QUAIL RIDGE SP

DATE	JOB NO.	SCALE	SHEET
7/31/25	24-0701	1" = 2000'	1 OF 1

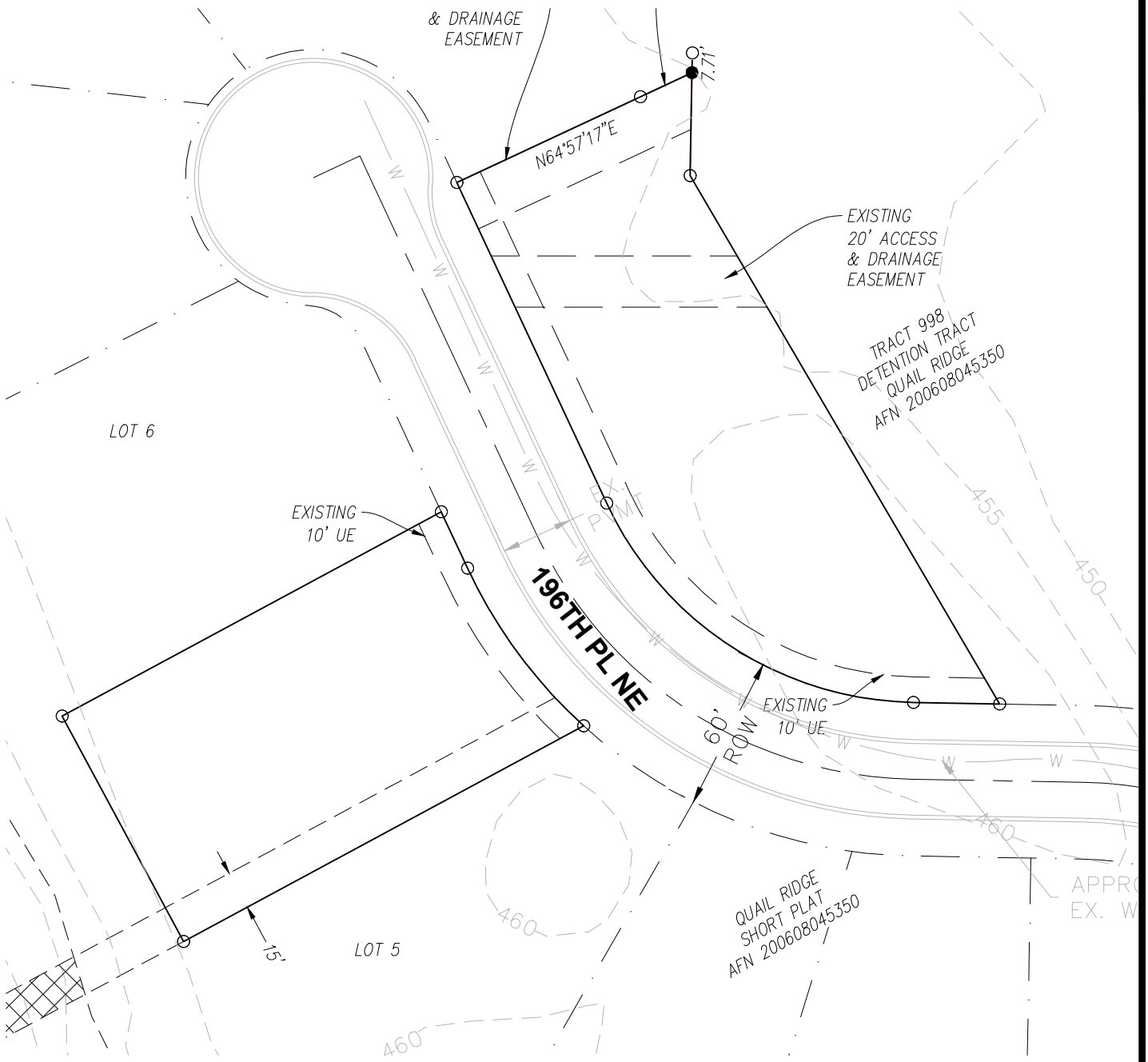


FIG. 2

OMEGA
ENGINEERING, INC.
2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

EXISTING BASIN MAP
QUAIL RIDGE SP

DATE	JOB NO.	SCALE	SHEET
7/31/25	24-0701	1" = 60'	1 OF 1

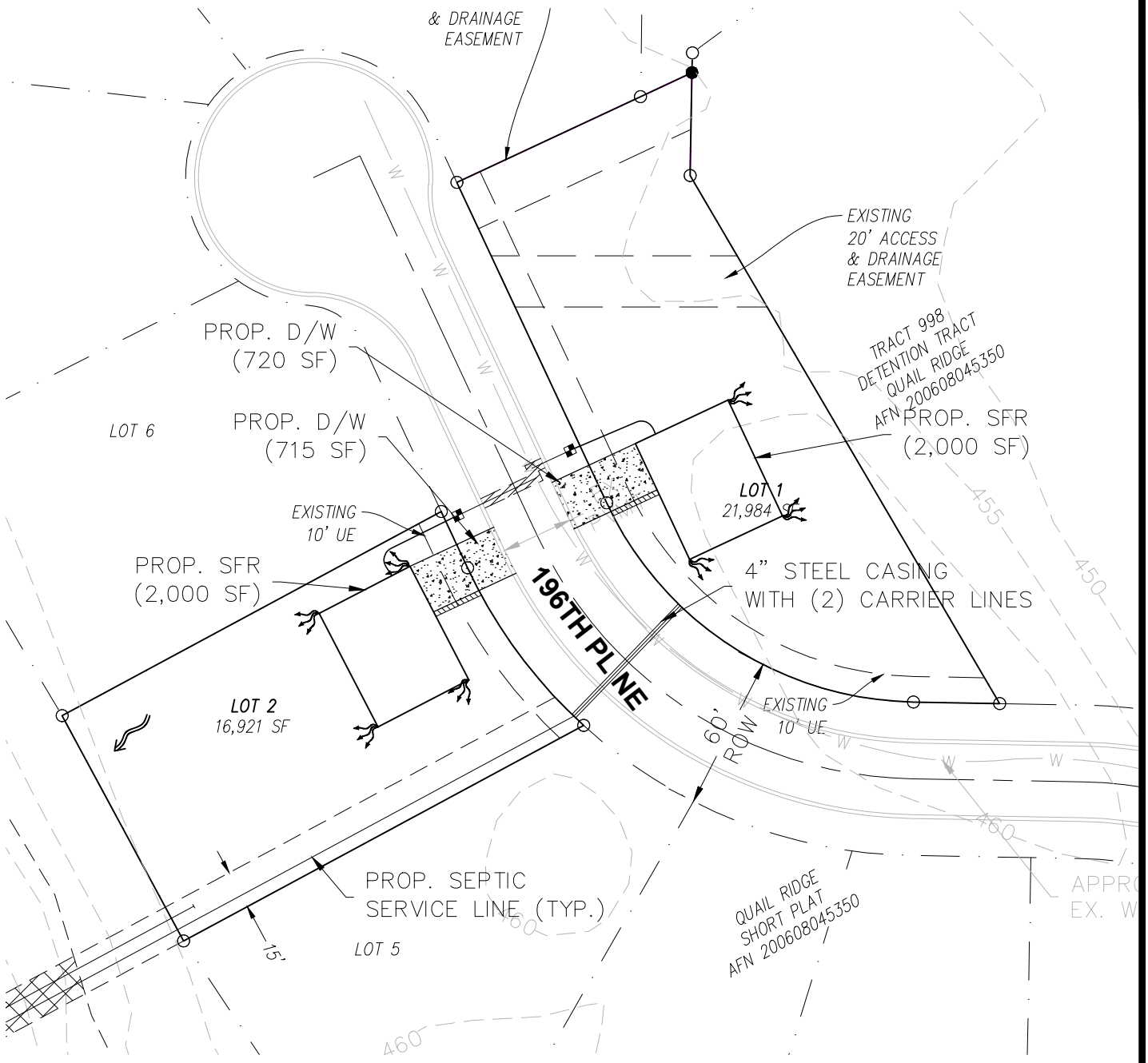


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FIG. 3

OMEGA
ENGINEERING, INC.
2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

DEVELOPED BASIN MAP
QUAIL RIDGE SP

DATE	JOB NO.	SCALE	SHEET
7/31/25	24-0701	1" = 60'	1 OF 1

Soil Map—Snohomish County Area, Washington
(QUAIL RIDGE SP)

Map Scale: 1:897 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
72	Tokul gravelly medial loam, 0 to 8 percent slopes	1.5	44.6%
73	Tokul gravelly medial loam, 8 to 15 percent slopes	1.9	55.4%
Totals for Area of Interest		**3.4**	**100.0%**

APPENDIX A

STORMWATER CALCULATIONS

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: default[11]

Site Name:	QUAIL RIDGE SP
Site Address:	
City:	ARLINGTON
Report Date:	7/31/2025
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2025/05/13
Version:	4.3.2

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, Pasture, Flat	0.88
Pervious Total	0.88
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.88

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Flat	0.76
Pervious Total	0.76

Impervious Land Use	acre
ROOF TOPS FLAT	0.09
DRIVEWAYS FLAT	0.03
Impervious Total	0.12
Basin Total	0.88

Element Flow Componants:

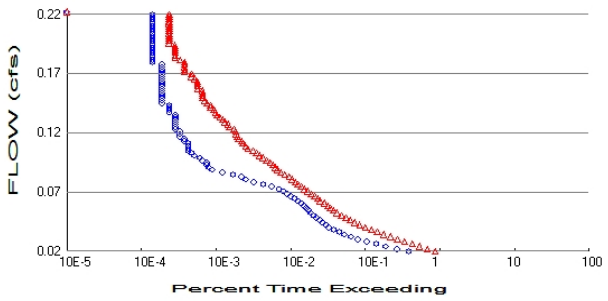
Surface	Interflow	Groundwater

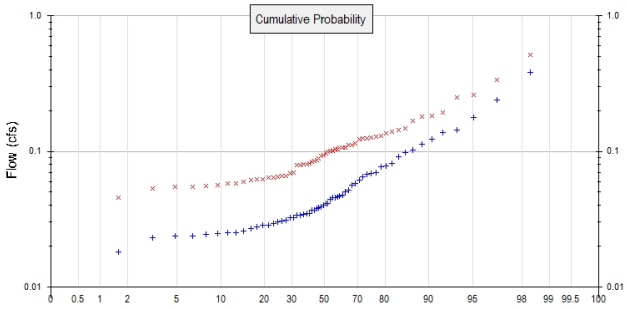
Componant Flows To:

POC 1	POC 1

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.88
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.76
Total Impervious Area: 0.12

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.043676
5 year	0.078777
10 year	0.111466
25 year	0.166377
50 year	0.219217
100 year	0.284228

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.092335
5 year	0.14325
10 year	0.185495
25 year	0.249949
50 year	0.306928
100 year	0.372408

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.069	0.128
1950	0.061	0.126
1951	0.038	0.079
1952	0.037	0.085
1953	0.035	0.107
1954	0.178	0.250
1955	0.065	0.124
1956	0.039	0.061
1957	0.069	0.115
1958	0.137	0.262

1959	0.037	0.080
1960	0.050	0.102
1961	0.383	0.514
1962	0.046	0.086
1963	0.102	0.167
1964	0.057	0.081
1965	0.028	0.056
1966	0.018	0.058
1967	0.041	0.124
1968	0.046	0.092
1969	0.240	0.335
1970	0.028	0.066
1971	0.052	0.104
1972	0.058	0.140
1973	0.035	0.103
1974	0.091	0.144
1975	0.047	0.111
1976	0.032	0.070
1977	0.023	0.054
1978	0.025	0.058
1979	0.123	0.183
1980	0.047	0.084
1981	0.025	0.064
1982	0.038	0.065
1983	0.077	0.106
1984	0.034	0.081
1985	0.046	0.094
1986	0.113	0.180
1987	0.044	0.099
1988	0.024	0.080
1989	0.041	0.096
1990	0.030	0.066
1991	0.031	0.062
1992	0.034	0.088
1993	0.027	0.064
1994	0.025	0.054
1995	0.032	0.054
1996	0.068	0.112
1997	0.144	0.194
1998	0.034	0.106
1999	0.026	0.055
2000	0.029	0.136
2001	0.010	0.045
2002	0.030	0.045
2003	0.024	0.060
2004	0.040	0.124
2005	0.029	0.062
2006	0.099	0.148
2007	0.078	0.130
2008	0.081	0.101
2009	0.024	0.068

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3831	0.5143
2	0.2398	0.3347
3	0.1779	0.2622

4	0.1444	0.2504
5	0.1372	0.1943
6	0.1232	0.1832
7	0.1133	0.1799
8	0.1019	0.1670
9	0.0986	0.1485
10	0.0911	0.1438
11	0.0811	0.1395
12	0.0780	0.1360
13	0.0769	0.1305
14	0.0695	0.1283
15	0.0686	0.1261
16	0.0680	0.1245
17	0.0652	0.1242
18	0.0610	0.1235
19	0.0582	0.1148
20	0.0566	0.1120
21	0.0517	0.1107
22	0.0503	0.1072
23	0.0474	0.1064
24	0.0468	0.1063
25	0.0465	0.1037
26	0.0456	0.1035
27	0.0455	0.1015
28	0.0442	0.1009
29	0.0414	0.0992
30	0.0409	0.0960
31	0.0400	0.0940
32	0.0392	0.0920
33	0.0383	0.0882
34	0.0380	0.0862
35	0.0368	0.0855
36	0.0367	0.0837
37	0.0349	0.0815
38	0.0346	0.0807
39	0.0344	0.0805
40	0.0337	0.0797
41	0.0336	0.0792
42	0.0325	0.0696
43	0.0323	0.0683
44	0.0313	0.0662
45	0.0304	0.0660
46	0.0302	0.0653
47	0.0293	0.0643
48	0.0287	0.0641
49	0.0283	0.0621
50	0.0276	0.0619
51	0.0269	0.0613
52	0.0258	0.0596
53	0.0251	0.0582
54	0.0251	0.0578
55	0.0247	0.0559
56	0.0244	0.0555
57	0.0237	0.0545
58	0.0235	0.0544
59	0.0231	0.0535
60	0.0182	0.0455
61	0.0097	0.0449

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0218	8138	18491	227	Fail
0.0238	5668	14514	256	Fail
0.0258	3993	11407	285	Fail
0.0278	3003	9073	302	Fail
0.0298	2212	7195	325	Fail
0.0318	1684	5730	340	Fail
0.0338	1360	4667	343	Fail
0.0358	1122	3762	335	Fail
0.0378	953	3074	322	Fail
0.0398	804	2562	318	Fail
0.0418	695	2138	307	Fail
0.0438	632	1800	284	Fail
0.0458	570	1539	270	Fail
0.0478	518	1331	256	Fail
0.0498	476	1173	246	Fail
0.0517	431	1018	236	Fail
0.0537	394	889	225	Fail
0.0557	369	796	215	Fail
0.0577	346	725	209	Fail
0.0597	322	667	207	Fail
0.0617	294	600	204	Fail
0.0637	265	530	200	Fail
0.0657	239	489	204	Fail
0.0677	215	447	207	Fail
0.0697	192	404	210	Fail
0.0717	169	364	215	Fail
0.0737	148	324	218	Fail
0.0757	118	296	250	Fail
0.0777	91	266	292	Fail
0.0797	68	246	361	Fail
0.0816	54	221	409	Fail
0.0836	46	204	443	Fail
0.0856	36	178	494	Fail
0.0876	26	157	603	Fail
0.0896	19	142	747	Fail
0.0916	17	133	782	Fail
0.0936	16	123	768	Fail
0.0956	16	113	706	Fail
0.0976	14	101	721	Fail
0.0996	13	91	700	Fail
0.1016	11	81	736	Fail
0.1036	10	74	740	Fail
0.1056	9	67	744	Fail
0.1076	9	57	633	Fail
0.1096	9	53	588	Fail
0.1116	9	49	544	Fail
0.1135	8	47	587	Fail
0.1155	8	42	525	Fail
0.1175	7	41	585	Fail
0.1195	7	40	571	Fail
0.1215	7	39	557	Fail
0.1235	6	37	616	Fail
0.1255	6	32	533	Fail
0.1275	6	31	516	Fail

0.1295	6	28	466	Fail
0.1315	6	26	433	Fail
0.1335	6	24	400	Fail
0.1355	6	22	366	Fail
0.1375	5	21	419	Fail
0.1395	5	20	400	Fail
0.1415	5	18	360	Fail
0.1435	5	18	360	Fail
0.1454	4	16	400	Fail
0.1474	4	15	375	Fail
0.1494	4	14	350	Fail
0.1514	4	14	350	Fail
0.1534	4	14	350	Fail
0.1554	4	14	350	Fail
0.1574	4	12	300	Fail
0.1594	4	12	300	Fail
0.1614	4	12	300	Fail
0.1634	4	12	300	Fail
0.1654	4	11	275	Fail
0.1674	4	10	250	Fail
0.1694	4	10	250	Fail
0.1714	4	8	200	Fail
0.1734	4	8	200	Fail
0.1754	4	8	200	Fail
0.1773	4	8	200	Fail
0.1793	3	8	266	Fail
0.1813	3	7	233	Fail
0.1833	3	6	200	Fail
0.1853	3	6	200	Fail
0.1873	3	6	200	Fail
0.1893	3	6	200	Fail
0.1913	3	6	200	Fail
0.1933	3	6	200	Fail
0.1953	3	5	166	Fail
0.1973	3	5	166	Fail
0.1993	3	5	166	Fail
0.2013	3	5	166	Fail
0.2033	3	5	166	Fail
0.2053	3	5	166	Fail
0.2073	3	5	166	Fail
0.2092	3	5	166	Fail
0.2112	3	5	166	Fail
0.2132	3	5	166	Fail
0.2152	3	5	166	Fail
0.2172	3	5	166	Fail
0.2192	3	5	166	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.

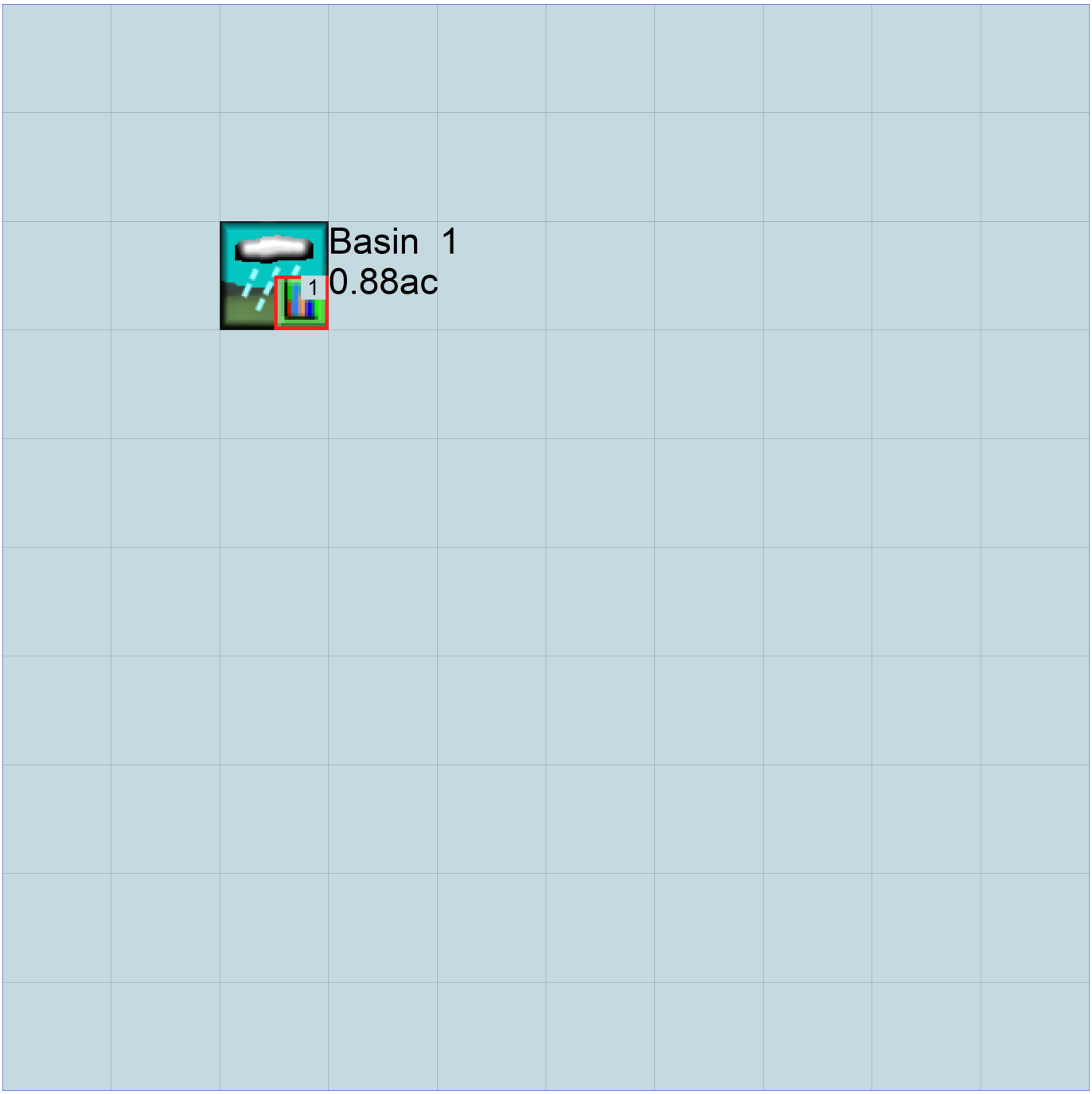
PERLND Changes

No PERLND changes have been made.

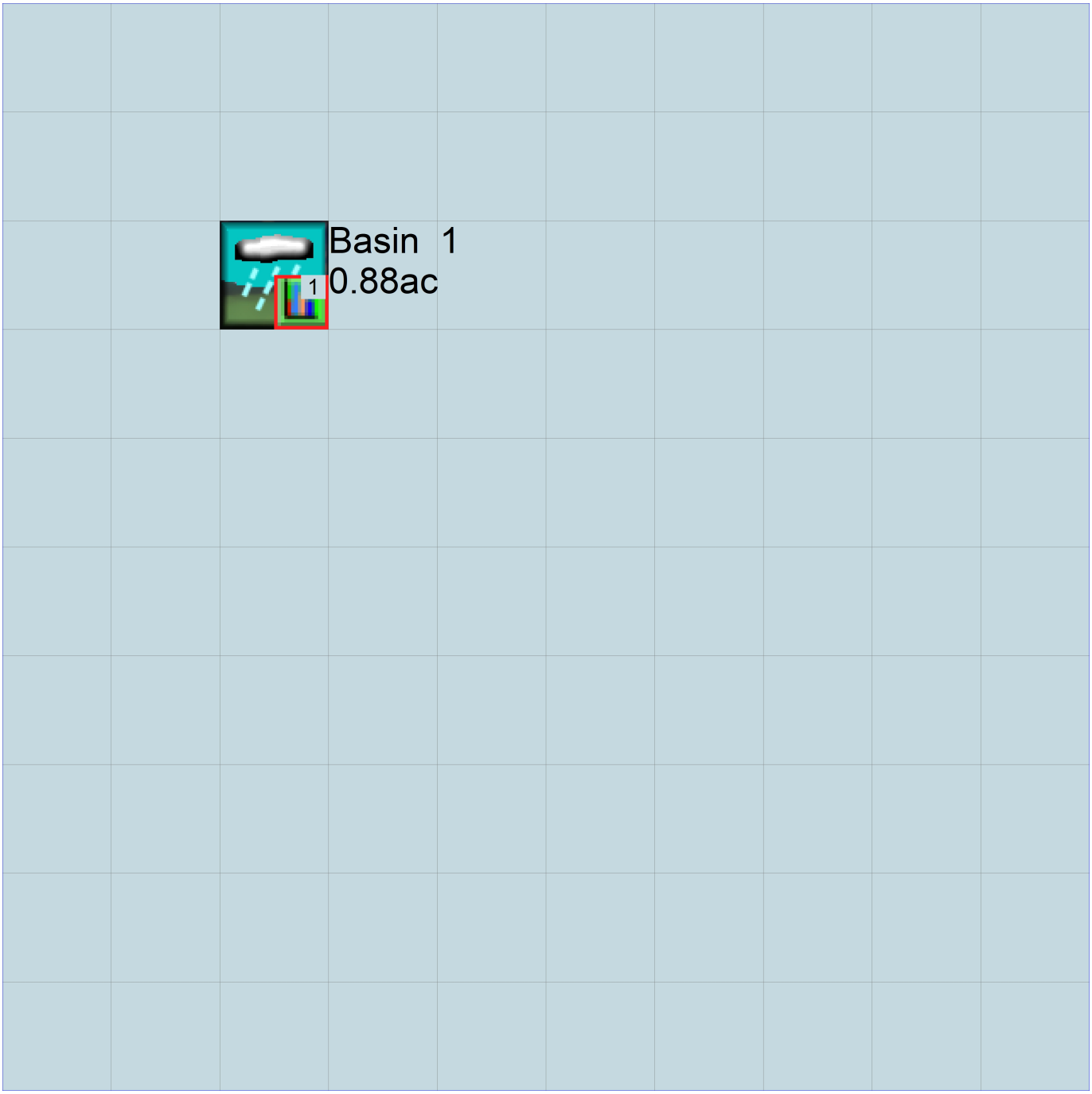
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default[11].wdm
MESSU       25   Predefault[11].MES
            27   Predefault[11].L61
            28   Predefault[11].L62
            30   POCdefault[11]1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   13         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   13              0       4.5      0.06       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13          0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   13             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  13                        0.88     COPY   501     12
PERLND  13                        0.88     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default[11].wdm
MESSU       25   Mitdefault[11].MES
            27   Mitdefault[11].L61
            28   Mitdefault[11].L62
            30   POCdefault[11]1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      13
      IMPLND       4
      IMPLND       5
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   13         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   13              0       4.5      0.06       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   13              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    4    1    9
    5         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
    5         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
```

```
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
    5              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
    5              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  13                       0.76     COPY   501     12
PERLND  13                       0.76     COPY   501     13
IMPLND   4                       0.09     COPY   501     15
IMPLND   5                       0.03     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Disclaimer

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APPENDIX B

Geotechnical Assessment

Cobalt Geosciences, LLC
P.O. Box 1792
North Bend, WA 98045

July 14, 2025

KJR Family LLC
John Robinett
Jrobinett2500@aol.com

RE: Geotechnical Evaluation
Proposed Development
Two Lots at Quail Ridge 196th Place NE
Arlington, Washington

In accordance with your authorization, Cobalt Geosciences, LLC has prepared this report to discuss the results of our geotechnical evaluation at the referenced site.

The purpose of our evaluation was to provide recommendations for foundation design, grading, and earthwork.

Site & Project Description

The site is located at 93xx 196th Place NE in Arlington, Washington. The site includes two small tracts along 196th Place NE (Figure 1).

Both of the properties are undeveloped and previously graded during plat development. The properties are vegetated with grasses, blackberry vines, understory, bushes, and sparse trees.

The site areas are mostly level with local slopes to the east and west of the two properties, extending downward to the east and west, respectively. The site areas are along the margins of 196th Place NE west of 95th Avenue NE.

The proposed development includes a new residence and driveway on each property. Stormwater will include infiltration or other systems depending on feasibility.

Site grading may include cuts and fills of 3 feet or less and foundation loads are expected to be light.

We should be provided with the final plans to verify that our recommendations remain valid and do not require updating.

Area Geology

The Geologic Map of the Arlington East Quadrangle, indicates that the site is underlain by Vashon Glacial Till.

Vashon Glacial Till includes mixtures of silt, sand, clay, and gravel. These materials are usually impermeable and are typically dense to very dense below a weathered zone.

Soil & Groundwater Conditions

As part of our evaluation, we excavated three test pits, where accessible. The explorations encountered approximately 6 inches of grass and topsoil underlain by approximately 3 to 6.5 feet of loose to medium dense, silty-fine to medium grained sand trace gravel (Fill in TP-3 over Weathered Glacial Till).

These materials were underlain by dense to very dense, silty-fine to medium grained sand trace gravel (Vashon Glacial Till), which continued to the termination depths of the explorations.

While groundwater was not observed, the soils were locally mottled. Additionally, there is a detention pond to the east, indicating that groundwater becomes perched in this area. Minor interflow may develop within the upper glacial till soils, likely where the soils become relatively dense.

Water table elevations often fluctuate over time. The groundwater level will depend on a variety of factors that may include seasonal precipitation, irrigation, land use, climatic conditions and soil permeability. Water levels at the time of the field investigation may be different from those encountered during the construction phase of the project.

Erosion Hazard

The Natural Resources Conservation Services (NRCS) maps for Snohomish County indicate that the site is underlain by Tokul gravelly medial loam (0 to 8 percent slopes). Based on our experience, the site soils would have a slight to moderate erosion potential in a disturbed state depending on the slope magnitude.

It is our opinion that soil erosion potential at this project site can be reduced through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, such as silt fences, hay bales, mulching, control ditches and diversion trenches. The typical wet weather season, with regard to site grading, is from October 31st to April 1st. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The overall subsurface profile corresponds to a Site Class *D* as defined by Table 1613.5.2 of the International Building Code (IBC). A Site Class *D* applies to an overall profile consisting of medium dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_S, S_1, F_a, and F_v. The USGS website includes the most updated published data on seismic conditions. The following tables provide seismic parameters from the USGS web site referenced parameters from ASCE 7-16 and ASCE 7-22.

Seismic Design Parameters (ASCE 7-16)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Design PGA
			F_a	F_v	S_{DS}	S_{D1}	
D	1.031	0.368	1.0	Null	0.747	Null	0.438

Seismic Design Parameters (ASCE 7-22)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Design PGA_M
			F_a	F_v	S_{DS}	S_{D1}	
D	1.14	0.34	-	-	0.9	0.51	0.53

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft/loose soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. The site has a low likelihood of liquefaction. For items listed as "Null" see Section 11.4.8 of the ASCE.

Conclusions and Recommendations

General

The site is underlain by areas of fill and at depth by glacial till which becomes denser with depth. The proposed residential structures may be supported on shallow foundation systems bearing on medium dense or firmer native soils or on structural fill placed on the native soils. Local overexcavation of loose weathered native soils may be necessary depending on the proposed elevations and locations of the new footings. Significant removal of fill will be necessary in the area of the eastern structure, where mass grading historically occurred. Pin piles could be used in lieu of excavations, if desired.

We recommend dispersion devices or direct/perforated connection to utility conveyance. We can provide additional input once a civil plan is prepared.

Site Preparation

Trees, shrubs and other vegetation should be removed prior to stripping of surficial organic-rich soil and fill. Based on observations from the site investigation program, it is anticipated that the stripping depth will be 6 to 12 inches. Deeper excavations will be necessary in areas of existing foundation systems (where present), larger trees where roots persist, and in any areas underlain by undocumented fill.

The native soils consist of silty-sand with gravel. Most of the native soils may be used as structural fill provided they achieve compaction requirements and are within 3 percent of the optimum moisture. Some of these soils may only be suitable for use as fill during the summer months, as they will be above the optimum moisture levels in their current state. These soils are HIGHLY moisture sensitive and may degrade during periods of wet weather and under equipment traffic.

Imported structural fill should consist of a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill should be placed in maximum lift thicknesses of 12 inches and should be compacted to a minimum of 95 percent of the modified proctor maximum dry density, as determined by the ASTM D 1557 test method.

Temporary Excavations

Based on our understanding of the project, we anticipate that the grading could include local cuts on the order of approximately 3 feet or less for foundation and most of the utility placement. Temporary excavations should be sloped no steeper than 1.5H:1V (Horizontal:Vertical) in loose native soils and fill, 1H:1V in medium dense native soils and 3/4H:1V in dense to very dense native soils. If an excavation is subject to heavy vibration or surcharge loads, we recommend that the excavations be sloped no steeper than 2H:1V, where room permits.

Temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. Temporary slopes should be visually inspected daily by a qualified person during construction activities and the inspections should be documented in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

Foundation Design

The proposed structures may be supported on shallow spread footing foundation systems bearing on undisturbed medium dense or firmer native soils or on properly compacted structural fill placed on the suitable native soils. Any undocumented fill and/or loose native soils should be removed and replaced with structural fill below foundation elements.

Structural fill below footings should consist of clean angular rock 5/8 to 4 inches in size. We should verify soil conditions during foundation excavation work.

For shallow foundation support, we recommend widths of at least 16 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed structure. Provided that the footings are supported as recommended above, a net allowable bearing pressure of 2,500 pounds per square foot (psf) may be used for design.

All fill should be removed below the new buildings, where present. Note that fill was significantly thick within the eastern lot.

A 1/3 increase in the above value may be used for short duration loads, such as those imposed by wind and seismic events. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

If constructed as recommended, the total foundation settlement is not expected to exceed 1 inch. Differential settlement, along a 25-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch. This translates to an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. All footing excavations should be observed by a qualified geotechnical consultant.

Resistance to lateral footing displacement can be determined using an allowable friction factor of 0.40 acting between the base of foundations and the supporting subgrades. Lateral resistance for footings can also be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglect the upper 12 inches below grade in exterior areas). The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

Care should be taken to prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry materials, or any loose or disturbed materials at the bottom of the footing excavations, should be removed prior to placing concrete. The potential for wetting or drying of the bearing materials can be reduced by pouring concrete as soon as possible after completing the footing excavation and evaluating the bearing surface by the geotechnical engineer or his representative.

Concrete Retaining Walls

The following table, titled **Wall Design Criteria**, presents the recommended soil related design parameters for retaining walls with a level backslope. Contact Cobalt if an alternate retaining wall system is used. This has been included for new cast in place walls.

Wall Design Criteria	
"At-rest" Conditions (Lateral Earth Pressure – EFD^{+})	55 pcf (Equivalent Fluid Density)
"Active" Conditions (Lateral Earth Pressure – EFD^{+})	35 pcf (Equivalent Fluid Density)
Seismic Increase for "At-rest" Conditions (Lateral Earth Pressure)	12H* (Uniform Distribution)

Seismic Increase for "Active" Conditions (Lateral Earth Pressure)	6H* (Uniform Distribution)
Passive Earth Pressure on Low Side of Wall (Allowable, includes F.S. = 1.5)	Neglect upper 12 inches, then 250 pcf EFD+
Soil-Footing Coefficient of Sliding Friction (Allowable; includes F.S. = 1.5)	0.40

*H is the height of the wall; Increase based on one in 500 year seismic event (10 percent probability of being exceeded in 50 years),
+EFD – Equivalent Fluid Density

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls. Uniform horizontal lateral active and at-rest pressures on the retaining walls from vertical surcharges behind the wall may be calculated using active and at-rest lateral earth pressure coefficients of 0.3 and 0.5, respectively. A soil unit weight of 125 pcf may be used to calculate vertical earth surcharges.

To reduce the potential for the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by a minimum 6 inches of pea gravel in all directions.

The backfill adjacent to and extending a lateral distance behind the walls at least 2 feet should consist of free-draining granular material. All free draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. The primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the backfill be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand operated equipment is recommended within 3 feet of walls so that excessive stress is not imposed on the walls.

Stormwater Management Feasibility

The near surface weathered glacial till has very limited capacity for infiltration of runoff. The soil becomes mottled and very dense at shallow depths. Infiltration is not recommended in fill, which was significant within the eastern lot. The denser till at these depths acts as an aquitard.

We recommend that most of the runoff (roof areas and pavements) be routed to City infrastructure via a perforated or tightline connection per City requirements.

Local permeable pavements and biortetention could be utilized to manage runoff in the shallow weathered soils. We can provide additional recommendations once a civil plan has been prepared. If possible, systems should have overflow to an approved conveyance.

Slab-on-Grade

We recommend that the upper 12 inches of the native soils within slab areas be re-compacted to at least 95 percent of the modified proctor (ASTM D1557 Test Method).

Often, a vapor barrier is considered below concrete slab areas. However, the usage of a vapor barrier could result in curling of the concrete slab at joints. Floor covers sensitive to moisture typically requires the usage of a vapor barrier. A materials or structural engineer should be consulted regarding the detailing of the vapor barrier below concrete slabs. Exterior slabs typically do not utilize vapor barriers.

The American Concrete Institutes ACI 360R-06 Design of Slabs on Grade and ACI 302.1R-04 Guide for Concrete Floor and Slab Construction are recommended references for vapor barrier selection and floor slab detailing.

Slabs on grade may be designed using a coefficient of subgrade reaction of 210 pounds per cubic inch (pci) assuming the slab-on-grade base course is underlain by structural fill placed and compacted as outlined above. A 4- to 6-inch-thick capillary break layer should be placed over the prepared subgrade. This material should consist of pea gravel or 5/8 inch clean angular rock.

A perimeter drainage system is recommended unless interior slab areas are elevated a minimum of 12 inches above adjacent exterior grades. If installed, a perimeter drainage system should consist of a 4-inch diameter perforated drain pipe surrounded by a minimum 6 inches of drain rock wrapped in a non-woven geosynthetic filter fabric to reduce migration of soil particles into the drainage system. The perimeter drainage system should discharge by gravity flow to a suitable stormwater system.

Exterior grades surrounding buildings should be sloped at a minimum of one percent to facilitate surface water flow away from the building and preferably with a relatively impermeable surface cover immediately adjacent to the building.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to reduce the transportation of eroded sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented, and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features for the site:

- Schedule the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be completed during the wet season (generally October through April).
- All site work should be completed and stabilized as quickly as possible.
- Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.
- Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Utilities

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The contractor is responsible for the safety of open trenches. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

In general, silty and sandy soils were encountered at shallow depths in the explorations at this site. These soils have low cohesion and density and will have a tendency to cave or slough in excavations. Shoring or sloping back trench sidewalls is required within these soils in excavations greater than 4 feet deep.

All utility trench backfill should consist of imported structural fill or suitable on site soils. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. Depending on the depth and location of the proposed utilities, we anticipate the need to re-compact existing fill soils below the utility structures and pipes. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction procedures.

CONSTRUCTION FIELD REVIEWS

Cobalt Geosciences should be retained to provide part time field review during construction in order to verify that the soil conditions encountered are consistent with our design assumptions and that the intent of our recommendations is being met. This will require field and engineering review to:

- Monitor and test structural fill placement and soil compaction
- Observe bearing capacity at foundation locations
- Observe slab-on-grade preparation
- Observe soil conditions at stormwater system locations (if utilized)
- Monitor foundation drainage placement
- Observe excavation stability

Geotechnical design services should also be anticipated during the subsequent final design phase to support the structural design and address specific issues arising during this phase. Field and engineering review services will also be required during the construction phase in order to provide a Final Letter for the project.

CLOSURE

This report was prepared for the exclusive use of KJR Family LLC and their appointed consultants. Any use of this report or the material contained herein by third parties, or for other than the intended purpose, should first be approved in writing by Cobalt Geosciences, LLC.

The recommendations contained in this report are based on assumed continuity of soils with those of our test holes and assumed structural loads. Cobalt Geosciences should be provided with final architectural and civil drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of KJR Family LLC who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Cobalt Geosciences should any of these not be satisfied.

Sincerely,

Cobalt Geosciences, LLC

7/14/2025
Phil Haberman, PE, LG, LEG
Principal

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Cobalt Geosciences and the Client. Any use which a third party makes of this report is the responsibility of such third party.

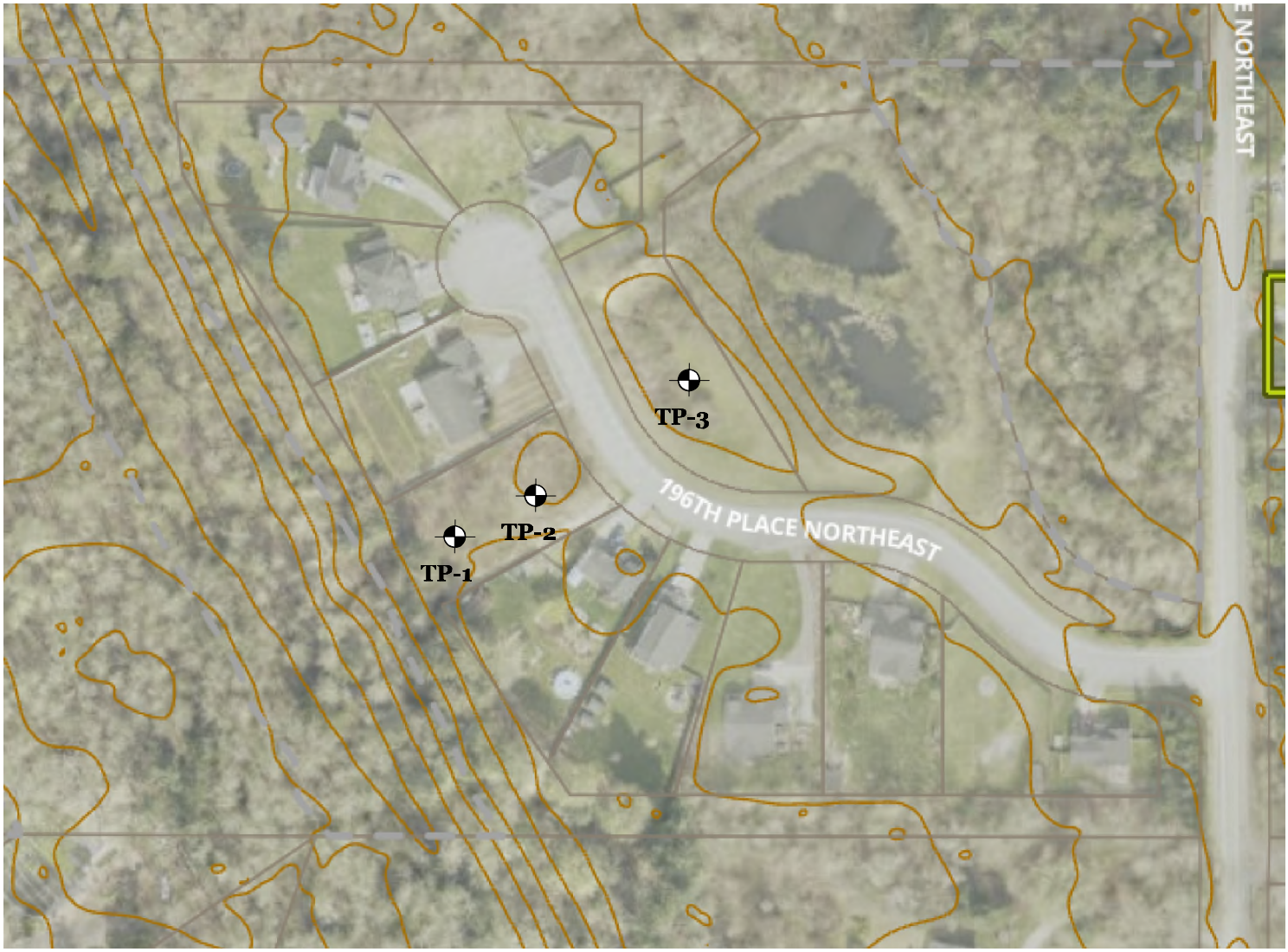
BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Cobalt Geosciences present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Cobalt Geosciences is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Cobalt Geosciences at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Cobalt Geosciences must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Cobalt Geosciences will not be responsible to any party for damages incurred as a result of failing to notify Cobalt Geosciences that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Cobalt Geosciences, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Cobalt Geosciences cannot be responsible for site work carried out without being present.



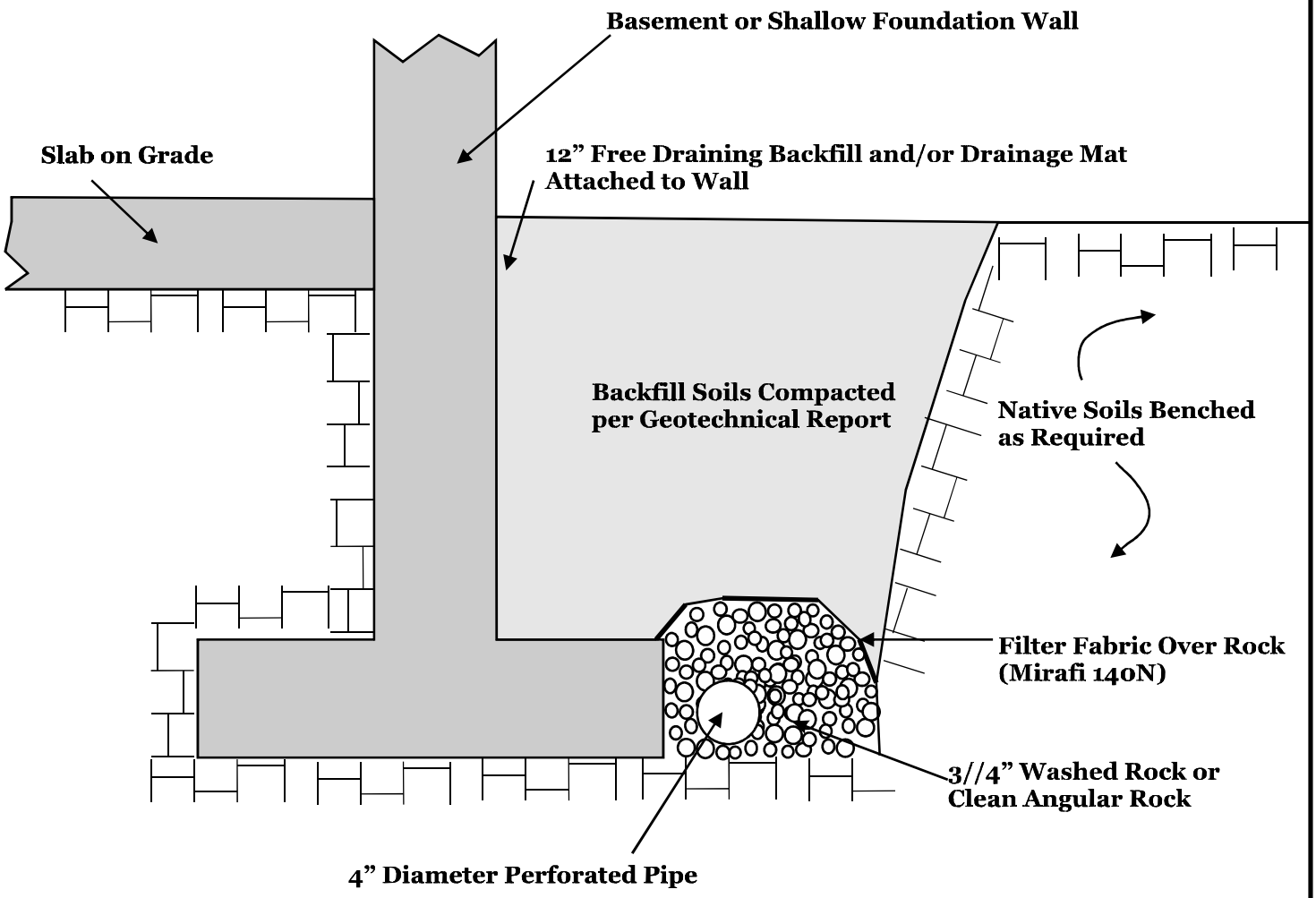
Approximate Test Pit Location

TP-1

Sno. Co. GIS Map

N

COBALT GEOSCIENCES	Proposed Development Quail Ridge 196th Place NE Arlington, Washington	**Site Image** **Figure 1**	Cobalt Geosciences, LLC P.O. Box 82243 Kenmore, WA 98028 (206) 331-1097 www.cobaltgeo.com cobaltgeo@gmail.com



Not to Scale

COBALT GEOSCIENCES	**Typical Foundation Drain Detail**	**Attachment**	Cobalt Geosciences, LLC PO Box 1792 North Bend, WA 98045 (206) 331-1097 www.cobaltgeo.com phil@cobaltgeo.com

Unified Soil Classification System (USCS)

MAJOR DIVISIONS			SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS (more than 50% retained on No. 200 sieve)	Gravels (more than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels with Fines (more than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (50% or more of coarse fraction passes the No. 4 sieve)	Clean Sands (less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly graded sand, gravelly sands, little or no fines
		Sands with Fines (more than 12% fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (50% or more passes the No. 200 sieve)	Silts and Clays (liquid limit less than 50)	Inorganic	ML	Inorganic silts of low to medium plasticity, sandy silts, gravelly silts, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays silty clays, lean clays
		Organic	OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays (liquid limit 50 or more)	Inorganic	MH	Inorganic silts, micaceous or diatomaceous fine sands or silty soils, elastic silt
			CH	Inorganic clays of medium to high plasticity, sandy fat clay, or gravelly fat clay
		Organic	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT	Peat, humus, swamp soils with high organic content (ASTM D4427)

Classification of Soil Constituents

MAJOR constituents compose more than 50 percent, by weight, of the soil. Major constituents are capitalized (i.e., SAND).

Minor constituents compose 12 to 50 percent of the soil and precede the major constituents (i.e., silty SAND). Minor constituents preceded by "slightly" compose 5 to 12 percent of the soil (i.e., slightly silty SAND).

Trace constituents compose 0 to 5 percent of the soil (i.e., slightly silty SAND, trace gravel).

Grain Size Definitions

Description	Sieve Number and/or Size
Fines	<#200 (0.08 mm)
Sand	
-Fine	#200 to #40 (0.08 to 0.4 mm)
-Medium	#40 to #10 (0.4 to 2 mm)
-Coarse	#10 to #4 (2 to 5 mm)
Gravel	
-Fine	#4 to 3/4 inch (5 to 19 mm)
-Coarse	3/4 to 3 inches (19 to 76 mm)
Cobbles	3 to 12 inches (75 to 305 mm)
Boulders	>12 inches (305 mm)

Relative Density (Coarse Grained Soils)

N, SPT, Blows/FT	Relative Density
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium dense
30 - 50	Dense
Over 50	Very dense

Consistency (Fine Grained Soils)

N, SPT, Blows/FT	Relative Consistency
Under 2	Very soft
2 - 4	Soft
4 - 8	Medium stiff
8 - 15	Stiff
15 - 30	Very stiff
Over 30	Hard

Moisture Content Definitions

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

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Soil Classification Chart

Figure C1

Test Pit TP-1

Date: July 2025	Depth: 5'	Groundwater: None
Contractor: Cobalt	Elevation:	Logged By: KK Checked By: PH

Depth (Feet)	Interval	Graphic Log	USCS Symbol	Material Description
				Topsoil/Vegetation
1			SM	Loose to medium dense, silty-fine to medium grained sand with gravel, dark yellowish brown to grayish brown, dry to moist. (Weathered Glacial Till)
2				
3				Locally mottled
4			SM	Dense to very dense, silty-fine to medium grained sand with gravel grayish brown, moist. (Glacial Till)
5				End of Test Pit 5'
6				
7				
8				
9				
10				

Groundwater

Moisture Content (%)
Plastic Limit — Liquid Limit

DCP Equivalent N-Value
0 10 20 30 40 50

COBALT GEOSCIENCES

Proposed Development
Quail Ridge 196th Place NE
Arlington, Washington

Exploration Logs

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Test Pit TP-2

Date: July 2025	Depth: 5'	Groundwater: None
Contractor: Cobalt	Elevation:	Logged By: KK Checked By: PH

Depth (Feet)	Interval	Graphic Log	USCS Symbol	Material Description
				Topsoil/Vegetation
1			SM	Loose to medium dense, silty-fine to medium grained sand with gravel, dark yellowish brown to grayish brown, dry to moist. (Weathered Glacial Till)
2				
3				Locally mottled
4				
			SM	Dense to very dense, silty-fine to medium grained sand with gravel grayish brown, moist. (Glacial Till)
5				
				End of Test Pit 5'
6				
7				
8				
9				
10				

Groundwater

Moisture Content (%)
Plastic Limit — Liquid Limit

DCP Equivalent N-Value
0 10 20 30 40 50

COBALT GEOSCIENCES

Proposed Development
Quail Ridge 196th Place NE
Arlington, Washington

Exploration Logs

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Test Pit TP-3

Date: July 2025	Depth: 8'	Groundwater: None
Contractor: Cobalt	Elevation:	Logged By: KK Checked By: PH

Depth (Feet)	Interval	Graphic Log	USCS Symbol	Material Description
				Topsoil/Vegetation
1			SM	Loose to medium dense, silty-fine to medium grained sand with gravel, dark yellowish brown to grayish brown, dry to moist. (Fill)
2				
3				
4				
5				
6			SM	Loose to medium dense, silty-fine to medium grained sand with gravel, dark yellowish brown to grayish brown, dry to moist. (Weathered Glacial Till)
7			SM	Dense to very dense, silty-fine to medium grained sand with gravel grayish brown, moist. (Glacial Till)
8				End of Test Pit 8'
9				
10				

Groundwater

Moisture Content (%)
Plastic Limit — Liquid Limit

DCP Equivalent N-Value
0 10 20 30 40 50

COBALT GEOSCIENCES

Proposed Development
Quail Ridge 196th Place NE
Arlington, Washington

Exploration Logs

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