Exhibit 16

Kingswood Commercial

Preliminary Drainage Report

Prepared for

KCI Commercial, Inc.

PO Box 6979
Tacoma, WA 98417

Prepared by

LDC Surveying Engineering Planning

1411 State Avenue NE
Olympia, WA 98506
(425) 806-1869

September 2022 **Job No: 22-151**

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

DRAINAGE CONTROL PLAN ATTACHMENTS

PROJECT ENGINEER'S CERTIFICATION

I hereby certify that this Stormwater Site Plan for the Kingswood Commercial Project has been prepared by me or under my supervision and meets the minimum standards of the City of Tumwater and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

Margaret G. Howsden

09/30/2022

Prepared by: Maggie Howsden, EIT — Date
mhowsden@ldccorp.com
(360) 634-2074

09/30/2022

Approved by: Tyrell Bradley, PE — Date
tbradley@ldccorp.com
(360) 634-2066

1.0 PROPOSED PROJECT DESCRIPTION

The following report was prepared for the Kingswood Commercial project in Tumwater, WA. This report was prepared to comply with the minimum technical standards and requirements that are set forth in the *2022 City of Tumwater Drainage Design and Erosion Control Manual (DDECM)*.

Project Proponent:	KCI Commercial, Inc.
Parcel Numbers:	12703240404, 12703240403
Total Parcel Area:	8.70 AC
Current Zoning:	GC (General Commercial)
Required Permits:	Grading, Utility, Paving, Building, etc.
Site Address:	1551 Kingswood Dr SW & 1401 Kingswood Dr SW, Tumwater, WA 98512
Section, Township, Range:	Section 3, Township 17N, Range 2W

The proposed Kingswood Commercial project site is comprised of two parcels that total 8.70 acres in the southeast corner of the intersection of Kingswood Drive and Littlerock Road SW. The proposed construction will develop 6 lots with single story and multi-story commercial businesses, parking areas, drive aisles, electronic vehicle charging stations, landscaped areas and utilities, disturbing roughly the entire parcel, 8.70 acres. The frontage area will not be disturbed as frontage improvements have been completed in separate projects. The proposed drive aisle and parking system will be accessed from both the Kingswood Dr SW and Littlerock Rd SW public right-of-ways (ROW). This development project is designed under the *2022 Tumwater Drainage and Erosion Control Manual*. See Vicinity Map in the following pages and **Appendix 3** for visual representation of the subject property.

1.1 SUMMARY OF COMPLIANCE ON-SITE

This project adheres to the *2022 Tumwater Drainage Design and Erosion Control Manual*. A worksheet for determining the number of Minimum Requirements for this project per the *DDECM* has been prepared and included herein as **Appendix 3**. There is

less than 35% impervious surface on the site; as such, this project will be considered new development. The project proposes to add more than 10,000 square feet of new impervious surface and more than 5,000 SF of new pollution generating impervious surfaces (PGIS), designating the project as New Development. All 11 core requirements apply to the new impervious surfaces and converted pervious surfaces. The requirements are addressed as follows.

Requirement #1: Preparation of Stormwater Site Plans

The Drainage Control Plan has been completed per the *2022 City of Tumwater DDECM*.

Requirement #2: Construction Stormwater Pollution Prevention

The Stormwater Pollution Prevention Plan (SWPPP) will be completed and included herein as **Attachment No. 2** at the time of civil permit submittal. The SWPPP describes the 13 required elements in further detail. An erosion control plan will be prepared and included as part of the engineering construction plan set in **Attachment No. 1**.

Requirement #3: Source Control of Pollution – BMPs listed below are the minimum required for the site, additional BMPs not listed here may need to be implemented to meet the minimum requirements discussed in the *2022 DDECM*.

- Volume IV, Chapter 5, Section S.2 Dispose of Collected Runoff and Waste Materials Properly
- Volume IV, Chapter 5, Section S.6 Pave the Activity Area and Slope to a Sump or Holding Tank
- Volume IV, Chapter 5, Section S.9 Clean Catch Basins

Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Currently, stormwater runoff generated within the site sheet flows toward the north corner of the site. Given the native soil conditions on-site, it is assumed that the stormwater runoff infiltrates on-site. If stormwater does leave the site, it would enter the existing storm drain system within Littlerock Rd or Kingswood Drive. The Littlerock Rd storm system outlets to an infiltration system directly adjacent to the project site.

The Kingswood Drive storm system outlets to an infiltration pond within 300 ft of the site.

After construction, the stormwater runoff from the site will be collected and fully infiltrated on the north half of the site. Stormwater runoff patterns within the vicinity of the project site will remain similar to their current condition. All downstream conveyance systems are not anticipated to be adversely affected at this time.

Requirement #5: On-Site Stormwater Management

In accordance with Minimum requirement #7, this project is not flow control exempt per Volume I, Section 2.4.8. The proposed project will trigger Minimum Requirements #1-11 and therefore the project shall employ the On-Site Stormwater Management BMPs in accordance with the Low Impact Performance Standard or List #2. The project will demonstrate compliance with List #2, as shown below.

Lawn and Landscaped Areas:

- Postconstruction soil quality and depth per volume V, Chapter 6: This BMP will be utilized to the maximum extent practicable for the project. See the landscape plans for more details.

Roofs:

- Full Dispersion in Volume V, Section 7.2, or Downspout Infiltration in Volume V, Section 15.3: Full Dispersion requires that the project protect at least 65% of the site in a forested or native condition. For this reason, Full Dispersion is infeasible. The geotechnical analysis of the site determined that infiltration of stormwater is possible with native soils; however, due to the high groundwater, Downspout Infiltration is infeasible.
- Bioretention in Volume V, Chapter 9: Bioretention is feasible for this project. Due to the site soils supporting infiltration, bioretention can be used to treat stormwater on-site. Bioretention will be utilized on site with a system of interconnected bioretention ponds.

Other Hard Surfaces:

- Full Dispersion in Volume V, Section 7.2: Full Dispersion is not feasible for this project for the reasons mentioned in the section above.
- Permeable Pavement in Volume V, Chapter 11: Based on the proposed use of the site, basic treatment and oil separation are required for the stormwater runoff, prior to infiltration. A permeable pavement system would not allow for the stormwater runoff to be treated prior to infiltration into the soils.
- Bioretention in Volume V, Chapter 9: Bioretention facilities are feasible for the reasons mentioned in the section above. Bioretention will be utilized on site with a system of interconnected bioretention ponds.

Requirement #6: Runoff Treatment

The proposed project will construct over 5,000 S.F. of pollution generating impervious surface; therefore, a stormwater treatment facility is required. The site does not trigger the requirements for enhanced treatment as it is not within the 1-year time-of-travel zone for a wellhead protection area nor does it infiltrate stormwater within one-quarter mile of a body of fresh or salt water designated for aquatic life. However, enhanced treatment will be provided for this project through the use of a bioretention soil mix in each of the bioretention ponds.

Commercial development of the site will include drive through fast food restaurants on Lot 1, Lot 3, and potentially Lot 5, and an auto-mechanic/maintenance business will occupy Lot 2. As such, Oil Control Facilities will be required upstream of infiltration facilities for these areas. Phosphorus control is not required as the system does not discharge to a body of fresh water or to a system tributary to a body of fresh water.

Requirement #7: Flow Control

The proposed project will construct over 10,000 SF of impervious surface and does not discharge to a flow control exempt water body, therefore flow control is required. Flow control will be provided for the site through full infiltration on-site.

Requirement #8: Wetlands Protection

There are no wetlands located on-site or adjacent to the site.

Requirement #9: Operation and Maintenance

A maintenance and source control manual will be completed and included herein the as **Attachment No. 4** at the time of civil permit submittal.

Requirement #10: Financial Liability

In accordance with Tumwater Municipal Code 12.16.080, the project applicant will provide financial guarantees to ensure that:

1. The project will operate according to the design approved by the project engineer, and
2. Operation of erosion control facilities will provide protection against siltation of surface water, erosion, damage to permanent stormwater BMPs, and damage to adjacent properties.

Requirement #11: Offsite Analysis and Mitigation

See Section 3 of this report for the offsite analysis.

2.0 EXISTING CONDITIONS DESCRIPTION

2.1 TOPOGRAPHY

The site generally slopes from south to north, ranging from 0% to 3%, with an overall relief of approximately 10 ft.

2.2 GROUND COVER

The site has remained undeveloped since at least 1990. The existing site is currently undeveloped and covered with short underlying brush and small trees around the perimeter of the site. There are two Bonneville Power Administration (BPA) Transmission Towers on the west edge of the site and a 250 ft wide no-build easement for the associated overhead power lines. There are several piles of imported fill located throughout the site. There is an access drive from Littlerock Rd that services the neighboring Home Depot to the east.

Figure 1: Existing Conditions (1990)

Figure 2: Existing Conditions (2021)

2.3 DRAINAGE

There are currently no known existing drainage structures on-site.

2.4 SOILS

According to the geotechnical report prepared by Insight Geologic, dated April 19th, 2011, the native site soils are classified as hydrologic soil group Type A and generally consist of 1 foot of dark brown silty sand. The central portion of the site consists of 2 to 7 ft of light brown sand with silt and cobbles overlying uncontrolled fill with waste materials consisting of brick, concrete, metal, shingles, wood and other debris to a depth of up to 14 ft. Analysis of native soils determined an infiltration rate of 2.0 inches per hour. The seasonal high groundwater is expected to be at a depth of about 15 feet below ground surface. The historic high groundwater is approximately 11 feet below ground surface. Therefore, in order to maintain 6 ft of separation from the bottom of an infiltration facility and the groundwater, the minimum bottom elevation of all infiltration facilities is 5 ft below present grade. See **Attachment No. 3** for the full geotechnical report.

2.5 CRITICAL AREAS

The project parcel is located within the Federal Emergency Management Agency (FEMA) Flood Insurance Rate map (FIRM) Panel No. 53067C0281E. According to the FIRM Map the project parcel is located within Zone X, which is determined to be an area of minimal flood hazard. See **Appendix 3** for the FIRM Map.

According to City of Tumwater GIS Maps, the project site is located within a Category I Critical Aquifer Recharge Area (CARA) and within a 10-year time-of-travel Wellhead Protection Area. There are no additional requirements or limitations for this project since the proposed infiltration facilities will not cause a violation of groundwater quality standards. See **Appendix 3** for the CARA and Wellhead Protection Areas maps.

2.6 ADJACENT AREAS

The proposed project is located in the southeast corner of the intersection of Kingswood Dr SW and Littlerock Rd SW. The property is bound by a Home Depot parking lot to the east and residential lots to the south.

2.7 REPORTS AND STUDIES

A full geotechnical report was prepared for the subject site by Insight Geologic, dated April 19th, 2011, and can be found in **Attachment No. 3**.

A Mazama pocket gopher and Thurston County regulated prairie absence report was conducted by Land Services Northwest, dated October 15th, 2021. No Mazama pocket gophers, Critical Areas Ordinance prairie plants, or Mima mounds were found on the site. The full report can be found in **Appendix 3**.

A forester's report was conducted by Sound Urban Forestry, dated April 28th, 2022. No trees within the site were considered specimen or 'Landmark' trees. The project requires a 1:1 tree replacement rate. The report can be found in **Appendix 3**.

No other reports were performed or required.

3.0 VICINITY ANALYSIS AND SUBBASIN DESCRIPTON

3.1 QUALITATIVE UPSTREAM ANALYSIS

It does not appear there are any significant areas of upstream runoff flow onto the project site. The Home Depot parking area to the east is developed with its own stormwater system. The other adjacent areas are downhill from the site.

3.2 QUALITATIVE DOWNSTREAM ANALYSIS

Given the native soils and flat nature of the existing site, it is assumed that most stormwater currently infiltrates on-site. All of the stormwater runoff generated on-site by the disturbed area of the proposed project will be collected, treated, and infiltrated on-site. Therefore, there are no anticipated adverse effects to the downstream system.

4.0 FLOW CONTROL AND WATER QUALITY FACILITY SIZING

4.1 IMPERVIOUS AND PERVIOUS AREA TABULATIONS

The proposed project follows the development requirements stated in the *2022 City of Tumwater Drainage Design and Erosion Control Manual*. Following Figure 2.1 (See **Appendix 3**), this project classifies as a new development that triggers all of the minimum requirements. The site does not have 35% or more of existing impervious coverage, and the project will add more than 5,000 S.F. of new impervious surfaces. See **Attachment No. 1** for the proposed stormwater facility locations and details. Table 1: Land Type Designations Existing vs. Proposed below illustrates the existing and proposed impervious and pervious areas of the disturbed areas. See **Appendix 3** for the basin maps.

Table 1: Land Type Designations Existing vs. Proposed

LAND TYPE DESIGNATIONS	AREA (ACRES)	% OF TOTAL AREA
Existing Areas	**8.70**	**100**
Impervious	0.40	4.60
Pervious	8.30	95.40
Proposed Areas	**8.70**	**100**
Impervious	4.93	56.67
Pervious	3.15	36.21
Pond	0.62	7.12

4.2 WATER QUALITY ANALYSIS

Per Minimum Requirement #6, the proposed project requires basic treatment for all on-site pollution-generating impervious surfaces. However, enhanced water quality treatment will be provided by means of an 18" bioretention soil layer in each of the proposed bioretention ponds on-site. All of the stormwater runoff conveyed to each pond will be completely infiltrated, satisfying the treatment requirement. Oil Control facilities will be required for Lots 1, 2, 3, and 5 as they will be developed with drive through businesses. The oil control facilities will be placed on each lot that it is required for and will be sized under a separate permit at the time of lot development.

4.3 FLOW CONTROL ANALYSIS

Flow control is required for the proposed development and will be provided through a system of interconnected bioretention ponds spread out across the site. WWHM was used to size the ponds so that as a system they will infiltrate 100% of the stormwater runoff generated on-site. The design infiltration rate of 2.0 in/hr provided in the geotechnical report from Insight Geologic dated April 19, 2011, was used to size the ponds in WWHM. The site has been divided into three separate basins with three bioretention pond systems. The ponds will be interconnected with a series of underground culverts to provide overflow and an additional factor of safety in case of failure. See Table 3 below for the basin area breakdown.

Table 2: Flow Control Basin Areas

LAND TYPE DESIGNATIONS	BASIN 1 AREA (ACRES)	BASIN 2 AREA (ACRES)	BASIN 3 AREA (ACRES)
BASIN TOTAL	**1.54**	**1.70**	**5.46**
ROOF	0.24	0.12	0.47
ASPHALT / CONCRETE	0.88	0.95	2.27
LANDSCAPE	0.30	0.55	2.30
POND	0.12	0.08	0.42

The runoff from Basin 1 will be collected and conveyed to a bioretention pond with a minimum bottom area of 3,366 SF and total depth of 3.5 ft, including 0.5 ft of freeboard. An infiltration pond with bottom area of 3,370 SF and depth of 3.5 ft has been provided. The stormwater conveyed to this pond is infiltrated 100%. This pond will have a riser at 3 ft above the bioretention soil mix that connects to the Basin 3 bioretention pond as an additional factor of safety in the case of failure.

The runoff from Basin 2 will be collected and conveyed to a bioretention pond with a bottom area of 1,918 SF and total depth of 3.3 ft, including 0.5 ft of freeboard. The bioretention pond only infiltrates 99.91% of the post-developed flow. As such, this pond system is connected to the Basin 3 bioretention pond. The runoff from Basin 3 and the overflow from Basin 2 will be collected and conveyed to an infiltration pond with minimum bottom area of 14,886 SF and total depth of 2.8 ft, including 0.5 ft of freeboard. An infiltration pond with bottom area of 15,286 SF and total depth of 2.8 ft. The stormwater conveyed from Basin 3 as well as the overflow from Basin 2 is infiltrated 100%.

It is important to note that in order to maintain the minimum 3 ft of separation from the historic high groundwater elevation to the bottom of the bioretention soil mix per Volume V, Section 9.3, the minimum elevation of the bottom of the bioretention soil mix for Basin 1 and 2 is 176.2 ft as the historic level of groundwater is 173.2 ft while the minimum elevation of the bottom of the bioretention soil mix for Basin 3 is 175.7 ft as the historic level of groundwater is 172.7 ft.

The drainage plan with the infiltration ponds and conveyance system has been included as **Attachment No. 1**. See **Appendix 1** for the WWHM reports.

5.0 AESTHETIC CONSIDERATIONS FOR FACILITIES

All disturbed soil will be vegetated and landscaped using Best Management Practices. The proposed bioretention ponds will be covered with a variety of plants that will help them blend in with other landscaping features. All conveyance and water quality facilities will be underground.

6.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The proposed conveyance systems have been sized to convey the stormwater runoff from the developed conditions at the 25-year return period within the pipe. With the exception of the rood drainpipes, all on-site conveyance systems will be a minimum 12" in diameter and installed at a minimum slope of 0.5%.

7.0 COVENANTS, DEDICATIONS, EASEMENTS

It is the City of Tumwater policy that the property owner(s) shall maintain their stormwater drainage facilities. Thus, KCI Commercial, Inc. will be responsible for maintaining and ensuring that all installed drainage facilities are functioning in accordance with the design purpose. KCI Commercial, Inc. will keep a copy of the maintenance plan at the project site. The Maintenance and Source Control Manual will be completed and included herein as **Attachment No. 4** at the time of civil permit submittal. Additionally, the Establishment of Maintenance Covenants will be completed and included herein as **Attachment No. 5** at the time of civil permit submittal.

8.0 AGREEMENTS AND GUARANTEES

Maintenance and/or operation bonding or other appropriate financial guarantees are required for all projects to ensure construction and functionality of drainage facilities are in compliance with applicable standards. These guarantees are to be consistent with the most recent edition of the City of Tumwater Development Guidelines and Public Works Standards.

9.0 OTHER PERMITS OR CONDITIONS PLACED ON THE PROJECT

No other permits or conditions have been placed on the project at this time.

Other permits that may be required for the proposed development are as follows:

- Clearing and Grading Permit
- National Pollution Discharge Elimination System (NPDES)
- Right-of-Way permit
- Utility Permit
- Building Permits

APPENDIX 1

DESIGN CALCULATIONS

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Kingswood Commercial_AllBasins2
Site Name:	Kingswood Commerical
Site Address:	
City:	
Report Date:	9/29/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2021/08/18
Version:	4.2.18

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 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	5.46
Pervious Total	5.46

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.46

Element Flows To:

Surface	Interflow	Groundwater

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	1.7
Pervious Total	1.7

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.7

Element Flows To:

Surface	Interflow	Groundwater

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	1.54
Pervious Total	1.54

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.54

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	2.72
Pervious Total	2.72

Impervious Land Use	acre
ROADS FLAT	2.27
ROOF TOPS FLAT	0.47
Impervious Total	2.74
Basin Total	5.46

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 3	Surface retention 3	

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.63
Pervious Total	0.63

Impervious Land Use	acre
ROADS FLAT	0.95
ROOF TOPS FLAT	0.12
Impervious Total	1.07
Basin Total	1.7

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 2	Surface retention 2	

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.42
Pervious Total	0.42

Impervious Land Use	acre
ROADS FLAT	0.88
ROOF TOPS FLAT	0.24
Impervious Total	1.12
Basin Total	1.54

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bioretention 1

Bottom Length: 60.10 ft.
Bottom Width: 56.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW
Material thickness of second layer: 0
Material type for second layer: Sand
Material thickness of third layer: 0
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 2
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 254.498
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 254.498
Percent Infiltrated: 100
Total Precip Applied to Facility: 17.589
Total Evap From Facility: 5.098
Underdrain not used
Discharge Structure
Riser Height: 3 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2
Surface retention 3

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0941	0.0000	0.0000	0.0000
0.0549	0.0939	0.0017	0.0000	0.0000
0.1099	0.0932	0.0034	0.0000	0.0000
0.1648	0.0926	0.0052	0.0000	0.0008
0.2198	0.0920	0.0069	0.0000	0.0040
0.2747	0.0913	0.0087	0.0000	0.0070
0.3297	0.0907	0.0105	0.0000	0.0111
0.3846	0.0901	0.0123	0.0000	0.0164
0.4396	0.0894	0.0141	0.0000	0.0231
0.4945	0.0888	0.0159	0.0000	0.0312
0.5495	0.0882	0.0177	0.0000	0.0408
0.6044	0.0875	0.0195	0.0000	0.0522
0.6593	0.0869	0.0214	0.0000	0.0653
0.7143	0.0863	0.0233	0.0000	0.0802
0.7692	0.0857	0.0252	0.0000	0.0972
0.8242	0.0851	0.0270	0.0000	0.1163
0.8791	0.0845	0.0290	0.0000	0.1376
0.9341	0.0838	0.0309	0.0000	0.1612
0.9890	0.0832	0.0328	0.0000	0.1778
1.0440	0.0826	0.0348	0.0000	0.1791
1.0989	0.0820	0.0367	0.0000	0.1803
1.1538	0.0814	0.0387	0.0000	0.1816
1.2088	0.0808	0.0407	0.0000	0.1829
1.2637	0.0802	0.0427	0.0000	0.1842
1.3187	0.0796	0.0447	0.0000	0.1855

1.3736	0.0790	0.0468	0.0000	0.1867
1.4286	0.0784	0.0488	0.0000	0.1880
1.4835	0.0779	0.0509	0.0000	0.1893
1.5000	0.0773	0.0515	0.0000	0.1897

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.5000	0.0941	0.0515	0.0000	0.4674	0.0013
1.5549	0.0947	0.0567	0.0000	0.4674	0.0026
1.6099	0.0954	0.0619	0.0000	0.5017	0.0039
1.6648	0.0960	0.0672	0.0000	0.5188	0.0052
1.7198	0.0967	0.0725	0.0000	0.5359	0.0066
1.7747	0.0973	0.0778	0.0000	0.5531	0.0079
1.8297	0.0980	0.0832	0.0000	0.5702	0.0092
1.8846	0.0987	0.0886	0.0000	0.5873	0.0106
1.9396	0.0993	0.0940	0.0000	0.6044	0.0119
1.9945	0.1000	0.0995	0.0000	0.6215	0.0133
2.0495	0.1007	0.1050	0.0000	0.6387	0.0146
2.1044	0.1013	0.1106	0.0000	0.6558	0.0160
2.1593	0.1020	0.1161	0.0000	0.6729	0.0173
2.2143	0.1027	0.1218	0.0000	0.6900	0.0187
2.2692	0.1033	0.1274	0.0000	0.7072	0.0201
2.3242	0.1040	0.1331	0.0000	0.7243	0.0214
2.3791	0.1047	0.1389	0.0000	0.7414	0.0228
2.4341	0.1054	0.1446	0.0000	0.7585	0.0242
2.4890	0.1061	0.1504	0.0000	0.7757	0.0256
2.5440	0.1068	0.1563	0.0000	0.7928	0.0270
2.5989	0.1075	0.1622	0.0000	0.8099	0.0284
2.6538	0.1081	0.1681	0.0000	0.8270	0.0298
2.7088	0.1088	0.1740	0.0000	0.8441	0.0312
2.7637	0.1095	0.1800	0.0000	0.8613	0.0326
2.8187	0.1102	0.1861	0.0000	0.8784	0.0340
2.8736	0.1109	0.1922	0.0000	0.8955	0.0354
2.9286	0.1116	0.1983	0.0000	0.9126	0.0368
2.9835	0.1123	0.2044	0.0000	0.9298	0.0382
3.0385	0.1130	0.2106	0.0000	0.9469	0.0397
3.0934	0.1138	0.2169	0.0000	0.9640	0.0411
3.1484	0.1145	0.2231	0.0000	0.9811	0.0426
3.2033	0.1152	0.2294	0.0000	0.9982	0.0440
3.2582	0.1159	0.2358	0.0000	1.0154	0.0454
3.3132	0.1166	0.2422	0.0000	1.0325	0.0469
3.3681	0.1173	0.2486	0.0000	1.0496	0.0484
3.4231	0.1181	0.2551	0.0000	1.0667	0.0498
3.4780	0.1188	0.2616	0.0000	1.0839	0.0513
3.5330	0.1195	0.2681	0.0000	1.1010	0.0528
3.5879	0.1202	0.2747	0.0000	1.1181	0.0542
3.6429	0.1210	0.2813	0.0000	1.1352	0.0557
3.6978	0.1217	0.2880	0.0000	1.1523	0.0572
3.7527	0.1224	0.2947	0.0000	1.1695	0.0587
3.8077	0.1232	0.3015	0.0000	1.1866	0.0602
3.8626	0.1239	0.3082	0.0000	1.2037	0.0617
3.9176	0.1247	0.3151	0.0000	1.2208	0.0632
3.9725	0.1254	0.3219	0.0000	1.2380	0.0647
4.0275	0.1262	0.3289	0.0000	1.2551	0.0662
4.0824	0.1269	0.3358	0.0000	1.2722	0.0677
4.1374	0.1277	0.3428	0.0000	1.2893	0.0692
4.1923	0.1284	0.3498	0.0000	1.3064	0.0708
4.2473	0.1292	0.3569	0.0000	1.3236	0.0723

4.3022	0.1299	0.3640	0.0000	1.3407	0.0738
4.3571	0.1307	0.3712	0.0000	1.3578	0.0754
4.4121	0.1315	0.3784	0.0000	1.3749	0.0769
4.4670	0.1322	0.3856	0.0000	1.3921	0.0785
4.5220	0.1330	0.3929	0.0346	1.4023	0.0800
4.5769	0.1338	0.4002	0.2257	1.4023	0.0816
4.6319	0.1345	0.4076	0.5015	1.4023	0.0831
4.6868	0.1353	0.4150	0.8261	1.4023	0.0847
4.7418	0.1361	0.4225	1.1671	1.4023	0.0863
4.7967	0.1369	0.4300	1.4914	1.4023	0.0878
4.8516	0.1376	0.4375	1.7695	1.4023	0.0894
4.9066	0.1384	0.4451	1.9818	1.4023	0.0910
4.9615	0.1392	0.4527	2.1274	1.4023	0.0921
5.0000	0.1398	0.4581	2.2635	1.4023	0.0000

Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
Surface retention 3	Bioretention 1

Bioretention 2

Bottom Length:	56.00 ft.
Bottom Width:	34.25 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	2
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	238.837
Total Volume Through Riser (ac-ft.):	0.28
Total Volume Through Facility (ac-ft.):	239.117
Percent Infiltrated:	99.88
Total Precip Applied to Facility:	10.871
Total Evap From Facility:	3.058
Underdrain not used	
Discharge Structure	
Riser Height:	2.8 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2
Surface retention 3	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0573	0.0000	0.0000	0.0000
0.0527	0.0571	0.0009	0.0000	0.0000
0.1055	0.0566	0.0019	0.0000	0.0000
0.1582	0.0561	0.0028	0.0000	0.0004
0.2110	0.0556	0.0038	0.0000	0.0021
0.2637	0.0551	0.0048	0.0000	0.0037
0.3165	0.0546	0.0058	0.0000	0.0058
0.3692	0.0541	0.0068	0.0000	0.0086
0.4220	0.0537	0.0078	0.0000	0.0121
0.4747	0.0532	0.0088	0.0000	0.0164
0.5275	0.0527	0.0098	0.0000	0.0215
0.5802	0.0522	0.0108	0.0000	0.0275
0.6330	0.0518	0.0119	0.0000	0.0345
0.6857	0.0513	0.0129	0.0000	0.0425
0.7385	0.0508	0.0140	0.0000	0.0516
0.7912	0.0504	0.0151	0.0000	0.0619
0.8440	0.0499	0.0161	0.0000	0.0733
0.8967	0.0494	0.0172	0.0000	0.0861
0.9495	0.0490	0.0183	0.0000	0.1002
1.0022	0.0485	0.0194	0.0000	0.1063
1.0549	0.0480	0.0206	0.0000	0.1073
1.1077	0.0476	0.0217	0.0000	0.1082
1.1604	0.0471	0.0228	0.0000	0.1092
1.2132	0.0467	0.0240	0.0000	0.1102
1.2659	0.0462	0.0251	0.0000	0.1111
1.3187	0.0458	0.0263	0.0000	0.1121
1.3714	0.0454	0.0275	0.0000	0.1131

1.4242	0.0449	0.0287	0.0000	0.1141
1.4769	0.0445	0.0299	0.0000	0.1151
1.5000	0.0440	0.0304	0.0000	0.1155

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.5000	0.0573	0.0304	0.0000	0.2664	0.0010
1.5527	0.0578	0.0335	0.0000	0.2664	0.0020
1.6055	0.0583	0.0365	0.0000	0.2851	0.0030
1.6582	0.0588	0.0396	0.0000	0.2945	0.0040
1.7110	0.0593	0.0427	0.0000	0.3039	0.0050
1.7637	0.0598	0.0459	0.0000	0.3132	0.0061
1.8165	0.0603	0.0490	0.0000	0.3226	0.0071
1.8692	0.0608	0.0522	0.0000	0.3320	0.0081
1.9220	0.0613	0.0554	0.0000	0.3413	0.0092
1.9747	0.0618	0.0587	0.0000	0.3507	0.0102
2.0275	0.0623	0.0620	0.0000	0.3601	0.0112
2.0802	0.0629	0.0653	0.0000	0.3694	0.0123
2.1330	0.0634	0.0686	0.0000	0.3788	0.0133
2.1857	0.0639	0.0720	0.0000	0.3882	0.0144
2.2385	0.0644	0.0753	0.0000	0.3975	0.0154
2.2912	0.0649	0.0788	0.0000	0.4069	0.0165
2.3440	0.0655	0.0822	0.0000	0.4163	0.0176
2.3967	0.0660	0.0857	0.0000	0.4256	0.0186
2.4495	0.0665	0.0892	0.0000	0.4350	0.0197
2.5022	0.0671	0.0927	0.0000	0.4444	0.0208
2.5549	0.0676	0.0962	0.0000	0.4537	0.0219
2.6077	0.0681	0.0998	0.0000	0.4631	0.0230
2.6604	0.0687	0.1034	0.0000	0.4725	0.0241
2.7132	0.0692	0.1071	0.0000	0.4818	0.0252
2.7659	0.0698	0.1107	0.0000	0.4912	0.0263
2.8187	0.0703	0.1144	0.0000	0.5006	0.0274
2.8714	0.0709	0.1181	0.0000	0.5099	0.0285
2.9242	0.0714	0.1219	0.0000	0.5193	0.0296
2.9769	0.0720	0.1257	0.0000	0.5287	0.0307
3.0297	0.0725	0.1295	0.0000	0.5380	0.0318
3.0824	0.0731	0.1333	0.0000	0.5474	0.0329
3.1352	0.0736	0.1372	0.0000	0.5568	0.0341
3.1879	0.0742	0.1411	0.0000	0.5662	0.0352
3.2407	0.0747	0.1450	0.0000	0.5755	0.0363
3.2934	0.0753	0.1490	0.0000	0.5849	0.0375
3.3462	0.0759	0.1530	0.0000	0.5943	0.0386
3.3989	0.0764	0.1570	0.0000	0.6036	0.0398
3.4516	0.0770	0.1610	0.0000	0.6130	0.0409
3.5044	0.0776	0.1651	0.0000	0.6224	0.0421
3.5571	0.0782	0.1692	0.0000	0.6317	0.0432
3.6099	0.0787	0.1733	0.0000	0.6411	0.0444
3.6626	0.0793	0.1775	0.0000	0.6505	0.0456
3.7154	0.0799	0.1817	0.0000	0.6598	0.0468
3.7681	0.0805	0.1859	0.0000	0.6692	0.0479
3.8209	0.0811	0.1902	0.0000	0.6786	0.0491
3.8736	0.0816	0.1945	0.0000	0.6879	0.0503
3.9264	0.0822	0.1988	0.0000	0.6973	0.0515
3.9791	0.0828	0.2032	0.0000	0.7067	0.0527
4.0319	0.0834	0.2076	0.0000	0.7160	0.0539
4.0846	0.0840	0.2120	0.0000	0.7254	0.0551
4.1374	0.0846	0.2164	0.0000	0.7348	0.0563
4.1901	0.0852	0.2209	0.0000	0.7441	0.0575

4.2429	0.0858	0.2254	0.0000	0.7535	0.0587
4.2956	0.0864	0.2300	0.0000	0.7629	0.0599
4.3484	0.0870	0.2345	0.1127	0.7636	0.0612
4.4011	0.0876	0.2391	0.3390	0.7636	0.0624
4.4538	0.0882	0.2438	0.6273	0.7636	0.0636
4.5066	0.0888	0.2484	0.9487	0.7636	0.0649
4.5593	0.0895	0.2531	1.2742	0.7636	0.0661
4.6121	0.0901	0.2579	1.5750	0.7636	0.0673
4.6648	0.0907	0.2626	1.8269	0.7636	0.0686
4.7176	0.0913	0.2674	2.0158	0.7636	0.0698
4.7703	0.0919	0.2723	2.1459	0.7636	0.0706
4.8000	0.0923	0.2750	2.2779	0.7636	0.0000

Surface retention 2

Element Flows To:

Outlet 1	Outlet 2
Surface retention 3	Bioretention 2

Bioretention 3

Bottom Length:	144.80 ft.
Bottom Width:	102.80 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	2
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	647.538
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	647.538
Percent Infiltrated:	100
Total Precip Applied to Facility:	75.128
Total Evap From Facility:	20.838
Underdrain not used	
Discharge Structure	
Riser Height:	2.3 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.3767	0.0000	0.0000	0.0000
0.0473	0.3758	0.0065	0.0000	0.0000
0.0945	0.3747	0.0130	0.0000	0.0000
0.1418	0.3736	0.0195	0.0000	0.0015
0.1890	0.3724	0.0261	0.0000	0.0120
0.2363	0.3713	0.0327	0.0000	0.0210
0.2835	0.3702	0.0393	0.0000	0.0330
0.3308	0.3691	0.0459	0.0000	0.0486
0.3780	0.3680	0.0525	0.0000	0.0680
0.4253	0.3669	0.0592	0.0000	0.0914
0.4725	0.3658	0.0659	0.0000	0.1191
0.5198	0.3646	0.0726	0.0000	0.1515
0.5670	0.3635	0.0793	0.0000	0.1887
0.6143	0.3624	0.0860	0.0000	0.2310
0.6615	0.3613	0.0928	0.0000	0.2786
0.7088	0.3602	0.0996	0.0000	0.3319
0.7560	0.3591	0.1064	0.0000	0.3909
0.8033	0.3580	0.1132	0.0000	0.4560
0.8505	0.3569	0.1200	0.0000	0.5274
0.8978	0.3558	0.1269	0.0000	0.6053
0.9451	0.3547	0.1338	0.0000	0.6899
0.9923	0.3536	0.1407	0.0000	0.7354
1.0396	0.3525	0.1476	0.0000	0.7376
1.0868	0.3515	0.1546	0.0000	0.7398
1.1341	0.3504	0.1615	0.0000	0.7421
1.1813	0.3493	0.1685	0.0000	0.7443
1.2286	0.3482	0.1755	0.0000	0.7466

1.2758	0.3471	0.1826	0.0000	0.7488
1.3231	0.3460	0.1896	0.0000	0.7511
1.3703	0.3450	0.1967	0.0000	0.7534
1.4176	0.3439	0.2038	0.0000	0.7556
1.4648	0.3428	0.2109	0.0000	0.7579
1.5000	0.3417	0.2162	0.0000	0.7596

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.5000	0.3767	0.2162	0.0000	2.0674	0.0023
1.5473	0.3778	0.2341	0.0000	2.0674	0.0045
1.5945	0.3789	0.2519	0.0000	2.1977	0.0068
1.6418	0.3800	0.2699	0.0000	2.2628	0.0091
1.6890	0.3812	0.2879	0.0000	2.3279	0.0114
1.7363	0.3823	0.3059	0.0000	2.3931	0.0137
1.7835	0.3834	0.3240	0.0000	2.4582	0.0160
1.8308	0.3846	0.3421	0.0000	2.5233	0.0183
1.8780	0.3857	0.3603	0.0000	2.5884	0.0206
1.9253	0.3869	0.3786	0.0000	2.6536	0.0229
1.9725	0.3880	0.3969	0.0000	2.7187	0.0252
2.0198	0.3891	0.4153	0.0000	2.7838	0.0275
2.0670	0.3903	0.4337	0.0000	2.8490	0.0298
2.1143	0.3914	0.4521	0.0000	2.9141	0.0321
2.1615	0.3926	0.4707	0.0000	2.9792	0.0344
2.2088	0.3937	0.4892	0.0000	3.0443	0.0368
2.2560	0.3949	0.5079	0.0000	3.1095	0.0391
2.3033	0.3960	0.5266	0.0000	3.1746	0.0414
2.3505	0.3972	0.5453	0.0000	3.2397	0.0438
2.3978	0.3984	0.5641	0.0000	3.3048	0.0461
2.4451	0.3995	0.5829	0.0000	3.3700	0.0484
2.4923	0.4007	0.6019	0.0000	3.4351	0.0508
2.5396	0.4018	0.6208	0.0000	3.5002	0.0531
2.5868	0.4030	0.6398	0.0000	3.5654	0.0555
2.6341	0.4042	0.6589	0.0000	3.6305	0.0578
2.6813	0.4053	0.6780	0.0000	3.6956	0.0602
2.7286	0.4065	0.6972	0.0000	3.7607	0.0625
2.7758	0.4077	0.7164	0.0000	3.8259	0.0649
2.8231	0.4088	0.7357	0.0000	3.8910	0.0673
2.8703	0.4100	0.7551	0.0000	3.9561	0.0696
2.9176	0.4112	0.7745	0.0000	4.0213	0.0720
2.9648	0.4124	0.7939	0.0000	4.0864	0.0744
3.0121	0.4135	0.8134	0.0000	4.1515	0.0768
3.0593	0.4147	0.8330	0.0000	4.2166	0.0791
3.1066	0.4159	0.8526	0.0000	4.2818	0.0815
3.1538	0.4171	0.8723	0.0000	4.3469	0.0839
3.2011	0.4183	0.8921	0.0000	4.4120	0.0863
3.2484	0.4195	0.9118	0.0000	4.4771	0.0887
3.2956	0.4206	0.9317	0.0000	4.5423	0.0911
3.3429	0.4218	0.9516	0.0000	4.6074	0.0935
3.3901	0.4230	0.9716	0.0000	4.6725	0.0959
3.4374	0.4242	0.9916	0.0000	4.7377	0.0983
3.4846	0.4254	1.0117	0.0000	4.8028	0.1007
3.5319	0.4266	1.0318	0.0000	4.8679	0.1032
3.5791	0.4278	1.0520	0.0000	4.9330	0.1056
3.6264	0.4290	1.0722	0.0000	4.9982	0.1080
3.6736	0.4302	1.0925	0.0000	5.0633	0.1104
3.7209	0.4314	1.1129	0.0000	5.1284	0.1128
3.7681	0.4326	1.1333	0.0000	5.1936	0.1153

3.8154	0.4338	1.1538	0.0203	5.2375	0.1177
3.8626	0.4350	1.1743	0.1660	5.2375	0.1202
3.9099	0.4362	1.1949	0.3835	5.2375	0.1226
3.9571	0.4374	1.2155	0.6467	5.2375	0.1250
4.0044	0.4387	1.2362	0.9350	5.2375	0.1275
4.0516	0.4399	1.2570	1.2276	5.2375	0.1299
4.0989	0.4411	1.2778	1.5036	5.2375	0.1324
4.1462	0.4423	1.2987	1.7445	5.2375	0.1349
4.1934	0.4435	1.3196	1.9373	5.2375	0.1373
4.2407	0.4447	1.3406	2.0789	5.2375	0.1398
4.2879	0.4460	1.3616	2.1805	5.2375	0.1404
4.3000	0.4463	1.3670	2.3041	5.2375	0.0000

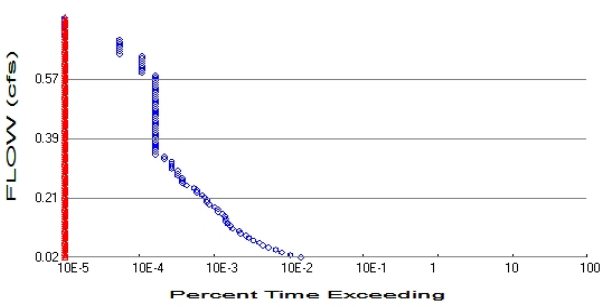
Surface retention 3

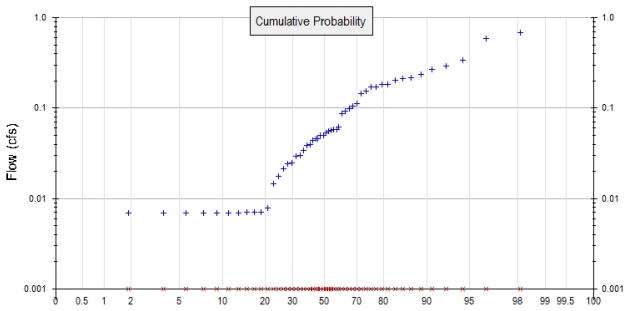
Element Flows To:

Outlet 1	Outlet 2
	Bioretention 3

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.7
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.77
Total Impervious Area: 4.93

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.047618
5 year	0.14735
10 year	0.265941
25 year	0.499168
50 year	0.749721
100 year	1.08093

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.092	0.000
1957	0.050	0.000
1958	0.039	0.000
1959	0.034	0.000
1960	0.204	0.000
1961	0.181	0.000
1962	0.007	0.000
1963	0.268	0.000
1964	0.154	0.000
1965	0.171	0.000

1966	0.087	0.000
1967	0.058	0.000
1968	0.040	0.000
1969	0.008	0.000
1970	0.030	0.000
1971	0.058	0.000
1972	0.143	0.000
1973	0.007	0.000
1974	0.105	0.000
1975	0.062	0.000
1976	0.055	0.000
1977	0.007	0.000
1978	0.053	0.000
1979	0.021	0.000
1980	0.044	0.000
1981	0.056	0.000
1982	0.046	0.000
1983	0.024	0.000
1984	0.112	0.000
1985	0.007	0.000
1986	0.099	0.000
1987	0.584	0.000
1988	0.007	0.000
1989	0.007	0.000
1990	0.336	0.000
1991	0.292	0.000
1992	0.007	0.000
1993	0.015	0.000
1994	0.007	0.000
1995	0.046	0.000
1996	0.172	0.000
1997	0.184	0.000
1998	0.030	0.000
1999	0.212	0.000
2000	0.025	0.000
2001	0.007	0.000
2002	0.050	0.000
2003	0.007	0.000
2004	0.235	0.000
2005	0.007	0.000
2006	0.692	0.000
2007	0.217	0.000
2008	0.017	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6918	0.0000
2	0.5840	0.0000
3	0.3358	0.0000
4	0.2918	0.0000
5	0.2680	0.0000
6	0.2355	0.0000
7	0.2174	0.0000
8	0.2120	0.0000
9	0.2042	0.0000
10	0.1837	0.0000
11	0.1813	0.0000

12	0.1720	0.0000
13	0.1706	0.0000
14	0.1540	0.0000
15	0.1435	0.0000
16	0.1119	0.0000
17	0.1050	0.0000
18	0.0989	0.0000
19	0.0922	0.0000
20	0.0868	0.0000
21	0.0624	0.0000
22	0.0579	0.0000
23	0.0577	0.0000
24	0.0563	0.0000
25	0.0551	0.0000
26	0.0531	0.0000
27	0.0503	0.0000
28	0.0500	0.0000
29	0.0463	0.0000
30	0.0458	0.0000
31	0.0438	0.0000
32	0.0396	0.0000
33	0.0390	0.0000
34	0.0341	0.0000
35	0.0302	0.0000
36	0.0295	0.0000
37	0.0246	0.0000
38	0.0244	0.0000
39	0.0215	0.0000
40	0.0175	0.0000
41	0.0147	0.0000
42	0.0078	0.0000
43	0.0070	0.0000
44	0.0070	0.0000
45	0.0070	0.0000
46	0.0070	0.0000
47	0.0069	0.0000
48	0.0069	0.0000
49	0.0069	0.0000
50	0.0069	0.0000
51	0.0069	0.0000
52	0.0069	0.0000
53	0.0069	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0238	272	0	0	Pass
0.0311	194	0	0	Pass
0.0385	150	0	0	Pass
0.0458	124	0	0	Pass
0.0531	99	0	0	Pass
0.0605	84	0	0	Pass
0.0678	76	0	0	Pass
0.0751	62	0	0	Pass
0.0825	54	0	0	Pass
0.0898	50	0	0	Pass
0.0971	42	0	0	Pass
0.1045	40	0	0	Pass
0.1118	33	0	0	Pass
0.1191	31	0	0	Pass
0.1265	28	0	0	Pass
0.1338	27	0	0	Pass
0.1411	27	0	0	Pass
0.1485	26	0	0	Pass
0.1558	24	0	0	Pass
0.1631	21	0	0	Pass
0.1705	21	0	0	Pass
0.1778	19	0	0	Pass
0.1851	16	0	0	Pass
0.1925	15	0	0	Pass
0.1998	15	0	0	Pass
0.2071	14	0	0	Pass
0.2145	13	0	0	Pass
0.2218	11	0	0	Pass
0.2291	11	0	0	Pass
0.2364	10	0	0	Pass
0.2438	8	0	0	Pass
0.2511	7	0	0	Pass
0.2584	7	0	0	Pass
0.2658	7	0	0	Pass
0.2731	6	0	0	Pass
0.2804	6	0	0	Pass
0.2878	6	0	0	Pass
0.2951	5	0	0	Pass
0.3024	5	0	0	Pass
0.3098	5	0	0	Pass
0.3171	5	0	0	Pass
0.3244	4	0	0	Pass
0.3318	4	0	0	Pass
0.3391	3	0	0	Pass
0.3464	3	0	0	Pass
0.3538	3	0	0	Pass
0.3611	3	0	0	Pass
0.3684	3	0	0	Pass
0.3758	3	0	0	Pass
0.3831	3	0	0	Pass
0.3904	3	0	0	Pass
0.3978	3	0	0	Pass
0.4051	3	0	0	Pass

0.4124	3	0	0	Pass
0.4198	3	0	0	Pass
0.4271	3	0	0	Pass
0.4344	3	0	0	Pass
0.4418	3	0	0	Pass
0.4491	3	0	0	Pass
0.4564	3	0	0	Pass
0.4638	3	0	0	Pass
0.4711	3	0	0	Pass
0.4784	3	0	0	Pass
0.4858	3	0	0	Pass
0.4931	3	0	0	Pass
0.5004	3	0	0	Pass
0.5078	3	0	0	Pass
0.5151	3	0	0	Pass
0.5224	3	0	0	Pass
0.5297	3	0	0	Pass
0.5371	3	0	0	Pass
0.5444	3	0	0	Pass
0.5517	3	0	0	Pass
0.5591	3	0	0	Pass
0.5664	3	0	0	Pass
0.5737	3	0	0	Pass
0.5811	3	0	0	Pass
0.5884	2	0	0	Pass
0.5957	2	0	0	Pass
0.6031	2	0	0	Pass
0.6104	2	0	0	Pass
0.6177	2	0	0	Pass
0.6251	2	0	0	Pass
0.6324	2	0	0	Pass
0.6397	2	0	0	Pass
0.6471	1	0	0	Pass
0.6544	1	0	0	Pass
0.6617	1	0	0	Pass
0.6691	1	0	0	Pass
0.6764	1	0	0	Pass
0.6837	1	0	0	Pass
0.6911	1	0	0	Pass
0.6984	0	0	0	Pass
0.7057	0	0	0	Pass
0.7131	0	0	0	Pass
0.7204	0	0	0	Pass
0.7277	0	0	0	Pass
0.7351	0	0	0	Pass
0.7424	0	0	0	Pass
0.7497	0	0	0	Pass

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
retention 3 POC	☐	589.26			☐	100.00			
retention 1	☐	231.59			☐	100.00			
retention 2	☐	217.60			☐	99.88			
Total Volume Infiltrated		1038.45	0.00	0.00		99.98	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

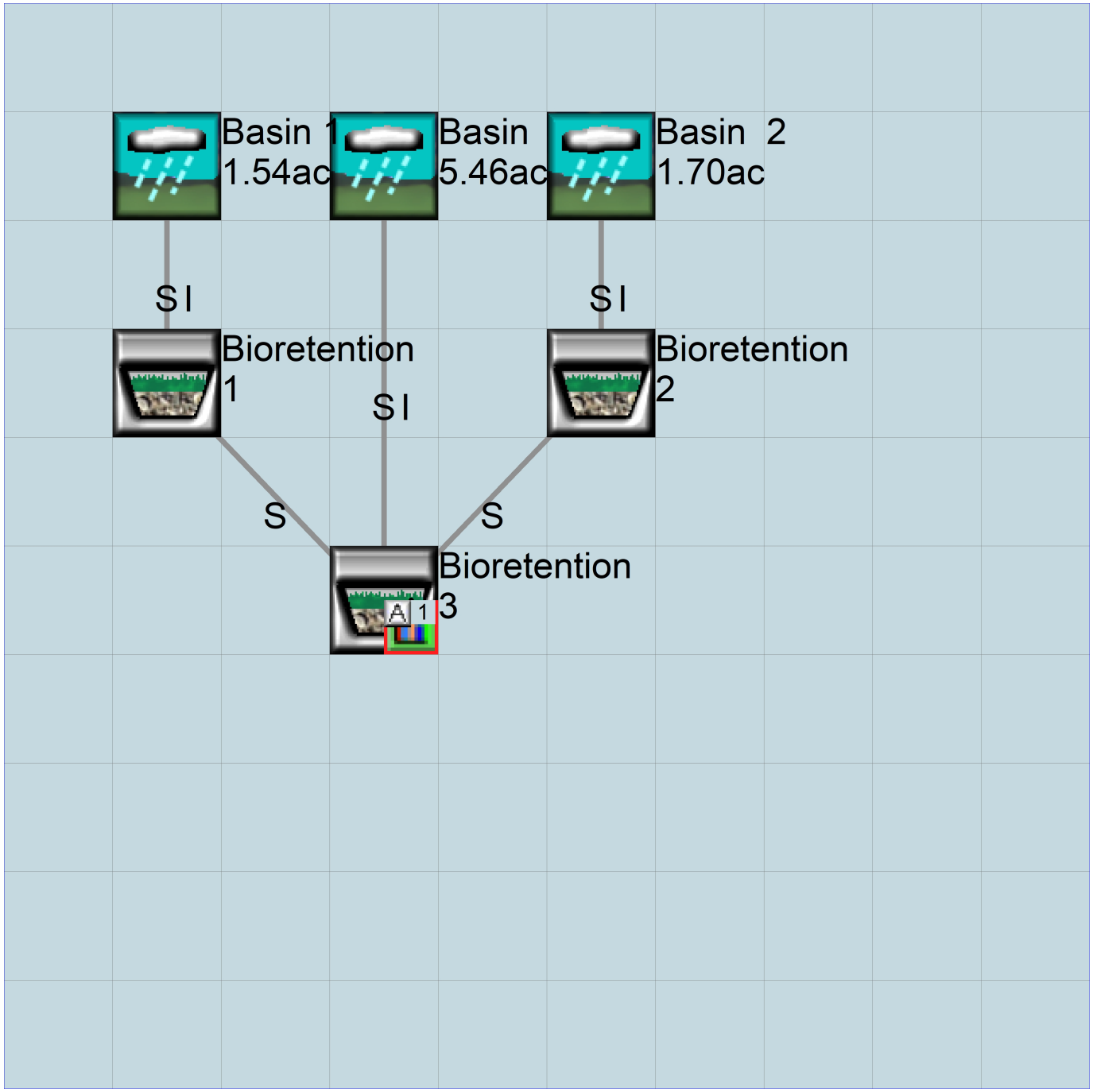
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

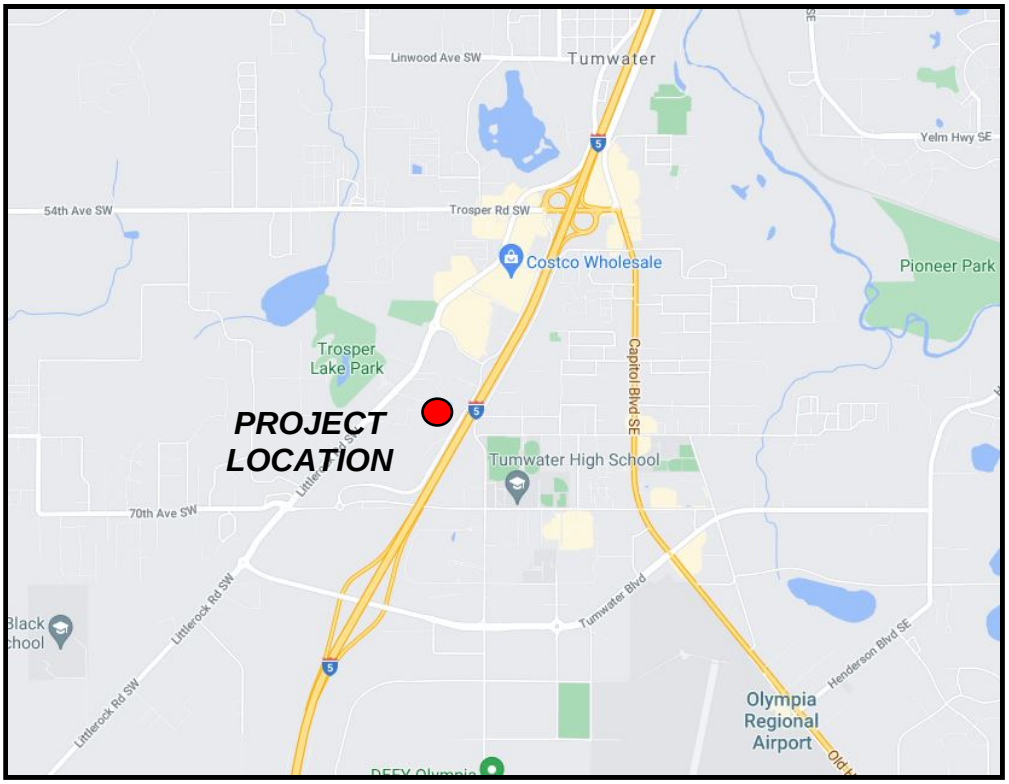
APPENDIX 2

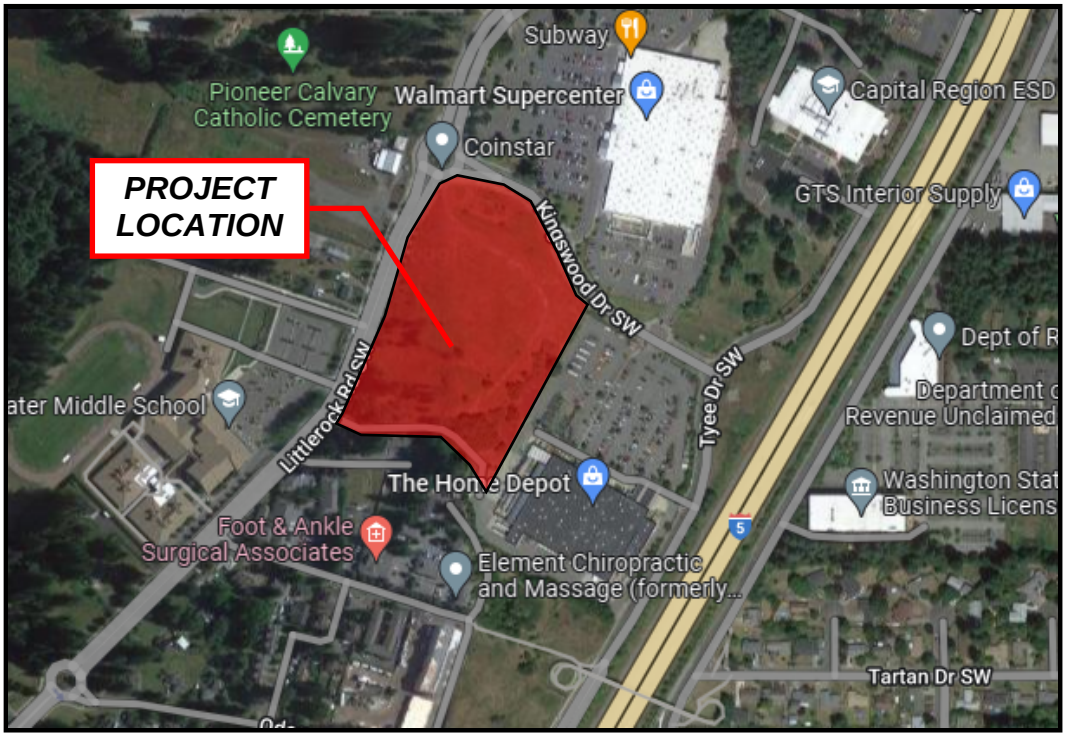
SOIL MANAGEMENT PLAN

TO BE INCLUDED AS PART OF THE CONSTRUCTION DOCUMENT SUBMITTAL

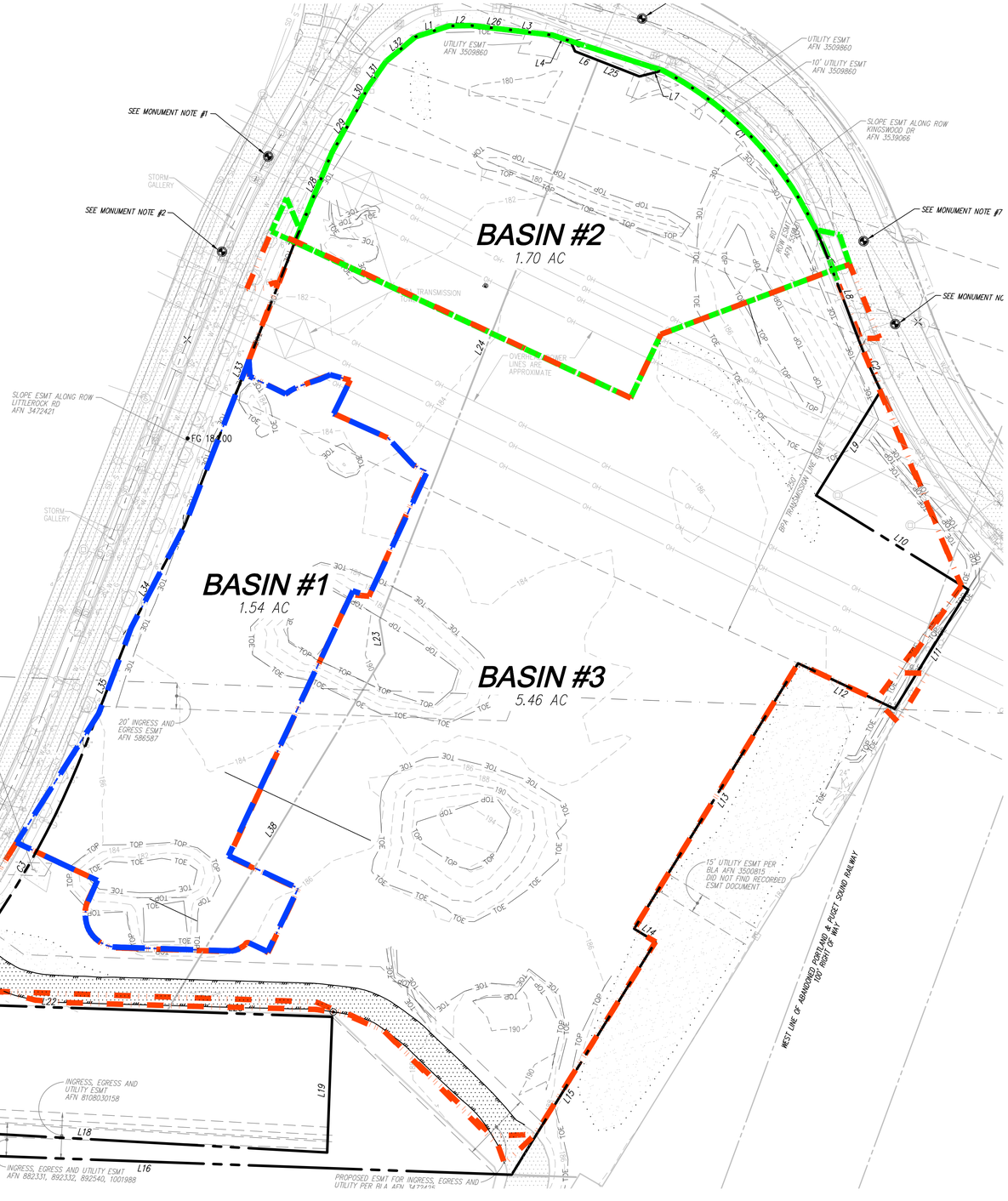
APPENDIX 3

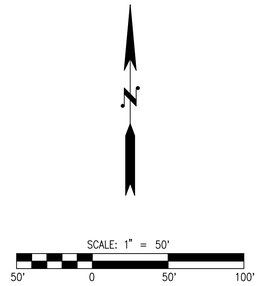
SUPPLEMENTAL REPORTS AND INFORMATION





1411 State Avenue NE, Suite 200 • Olympia, WA 98506 • ph: 425.806.1869 • fx: 425.482.2893 • www.LDCcorp.com





EXISTING AREAS

BASIN 1:

PERVIOUS:	1.54 AC

BASIN 2:

PERVIOUS:	1.70 AC

BASIN 3:

PERVIOUS:	5.06 AC
IMPERVIOUS:	0.40 AC

TOTAL AREA: 8.70 AC

REVISIONS

NO.	DATE	DESCRIPTION	BY

LDC
Surveying
Engineering
Planning
Kent
Woodinville
20210 142nd Avenue NE
Woodinville, WA 98072
Olympia
T 425.806.1869
www.LDCcorp.com
F 425.482.2893

KCI COMMERCIAL, INC.

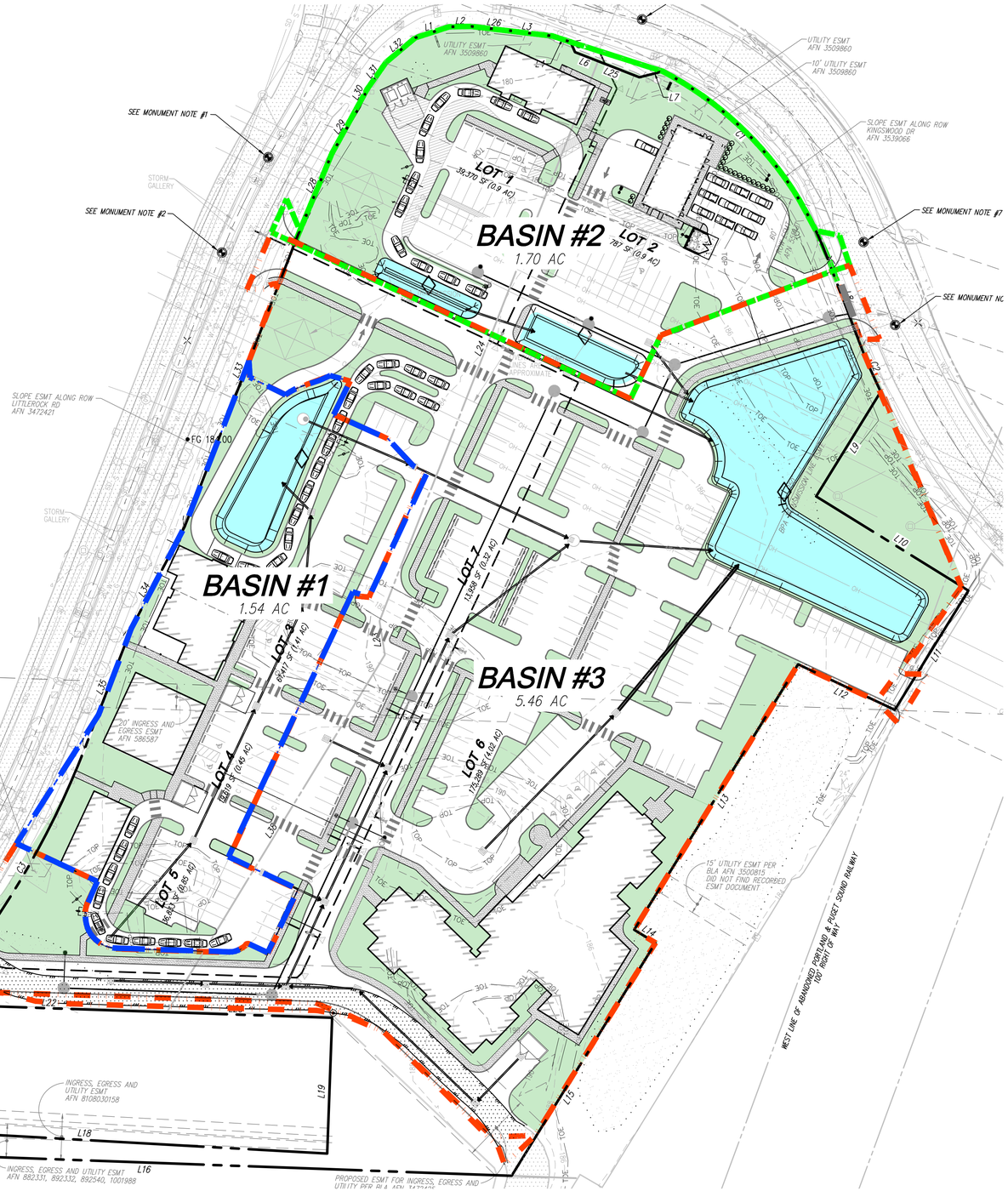
KINGSWOOD COMMERCIAL

EXISTING CONDITIONS MAP

JOB NUMBER:	C22-151
DRAWING NAME:	C22-151 EX CONDITIONS MAP
DESIGNER:	MGH
DRAFTING BY:	EO
DATE:	SEPTEMBER 2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER

EX-01

SHEET **1** OF **2**



SCALE: 1" = 50'

50' 0 50' 100'

CONSTRUCTION AREAS:

BASIN 1:

PERVIOUS:	0.30 AC
IMPERVIOUS:	1.12 AC
POND SIZE:	0.12 AC

BASIN 2:

PERVIOUS:	0.55 AC
IMPERVIOUS:	1.07 AC
POND SIZE:	0.08 AC

BASIN 3:

PERVIOUS:	2.30 AC
IMPERVIOUS:	2.74 AC
POND SIZE:	0.42 AC

TOTAL AREA: 8.70 AC

REVISIONS

NO.	DATE	DESCRIPTION	BY

LDC
Surveying
Engineering
Planning
Kent | Olympia
Woodinville
20210 142nd Avenue NE
Woodinville, WA 98072
T 425.806.1869 | F 425.482.2893
www.LDCorp.com

KCI COMMERCIAL, INC.

KINGSWOOD COMMERCIAL

PROPOSED CONDITIONS MAP

JOB NUMBER:	C22-151
DRAWING:	C22-151PR.CONDITIONS MAP
DESIGNER:	MGH
DRAFTING BY:	EO
DATE:	SEPTEMBER 2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER

EX-02

SHEET 2 OF 2

Drawing: P:\Civil\2022\C22-151 Kingswood Commercial\Drawings\Exhibits\C22-151 Pr Conditions Map.dwg Plotted: Sep 29, 2022 - 1:05pm

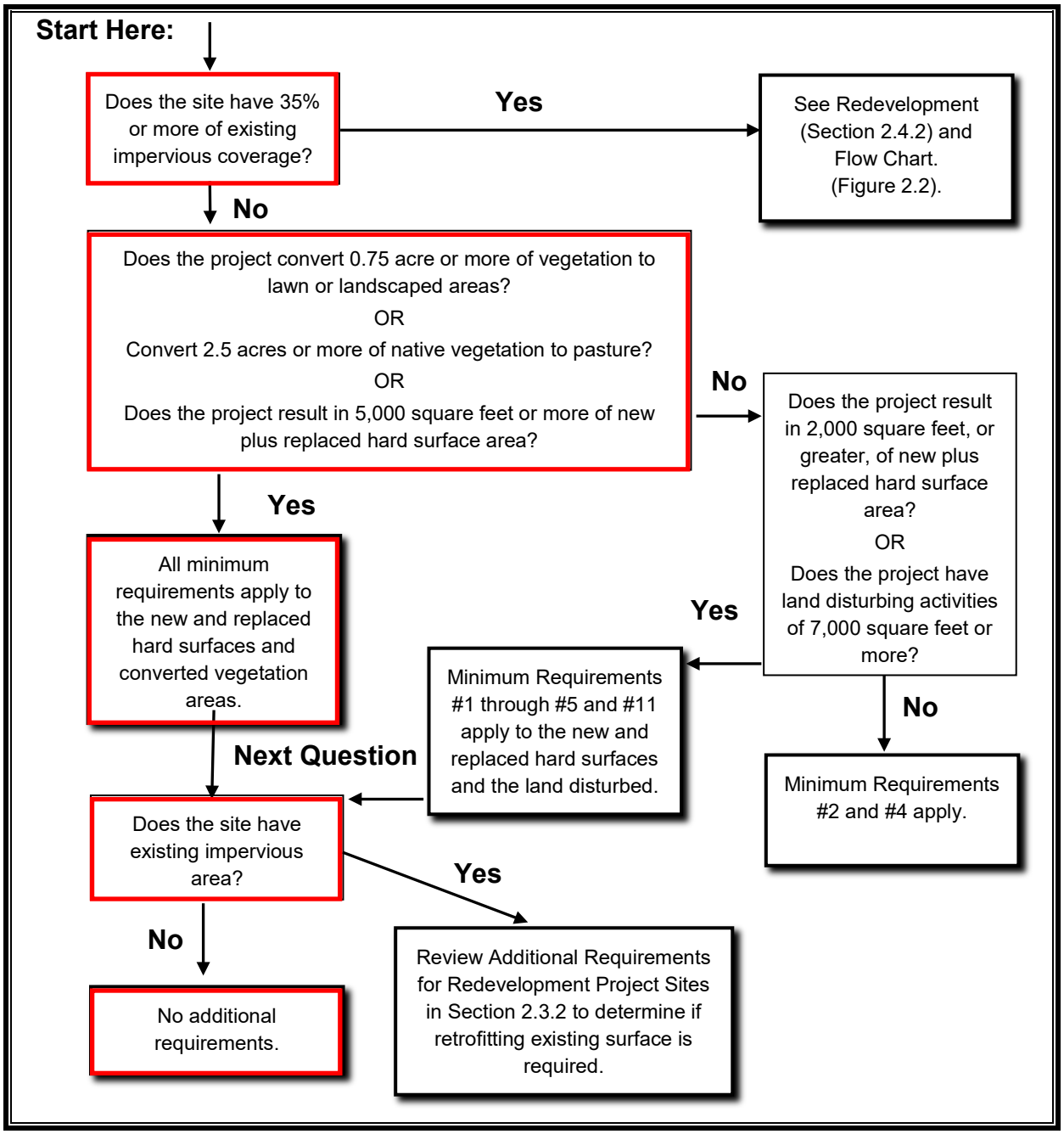


Figure 2.1. Flow Chart for Determining Requirements for New Development.

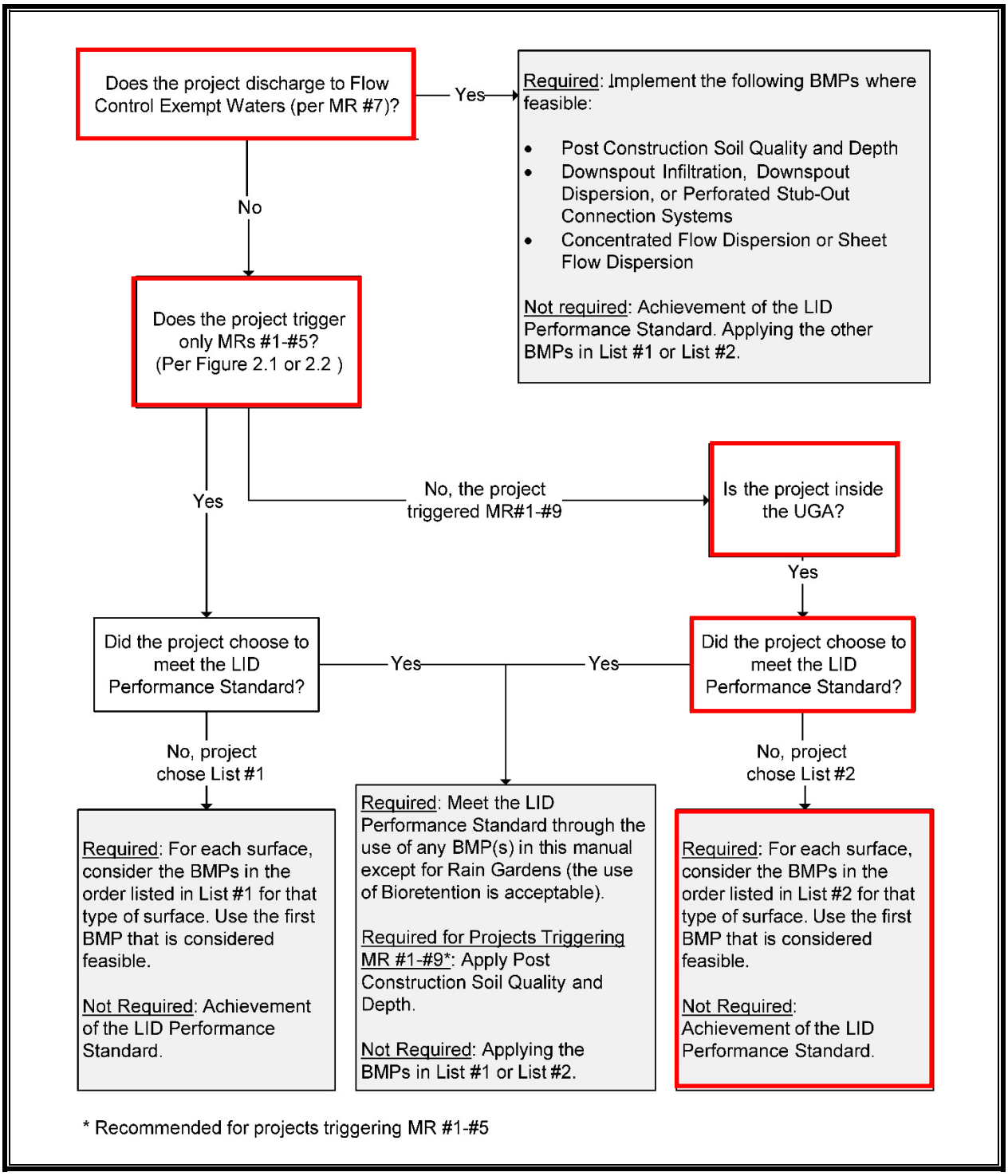


Figure 2.3. Flow Chart for Determining Minimum Requirement #5 Requirements.

National Flood Hazard Layer FIRMette

FEMA

122°55'35"W 46°59'51"N

122°54'58"W 46°59'26"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/18/2022 at 4:54 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Critical Aquifer Recharge Areas

Search by Parcel # or Address...

Home | Find | Identify | Measure | Draw | Map & Layers | Crime | Tool Labels

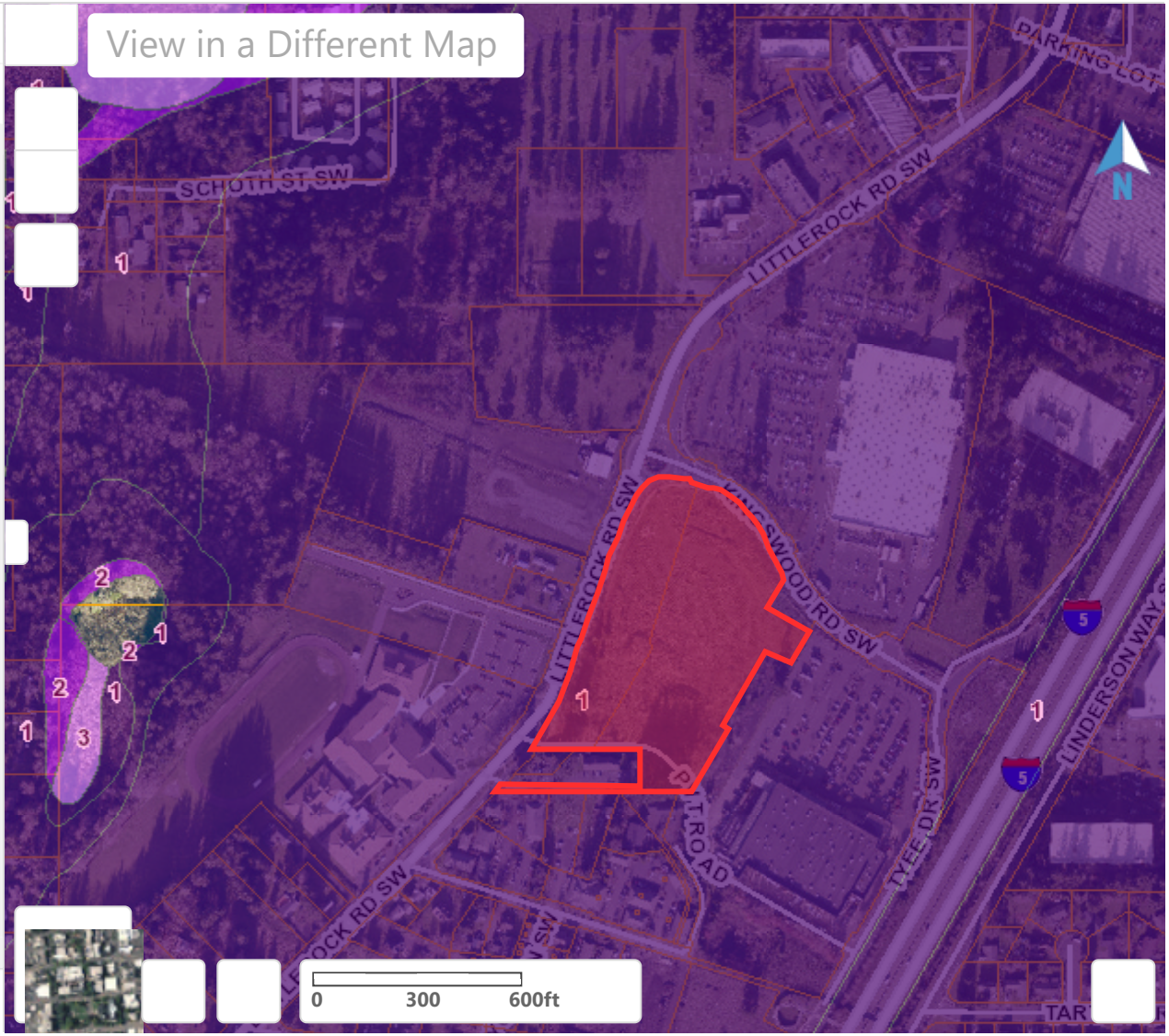
Show Layer List (Layer) | County Base Map | Aerial 2020 (Fast) | Aerials (All) | Hillshades (Basemap) | Add To Favorites | Bookmarks | Reset The Map (Map)

Layers

Filter Layers... Filter

- Carlyon Landslide
- Closed Landfills
- Community Water System Boundaries
- Contaminated Sites
- Critical Aquifer Recharge Areas
  - 1
  - 2
  - 3
- Critical Aquifer Recharge Areas (Agricultural)
- Groundwater Concern Areas

General... | Layers | Identify ... | Snappa...



Wellhead Protection Areas

Search by Parcel # or Address...

Home | Find | Identify | Measure | Draw | Map & Layers | Crime | Tool Labels

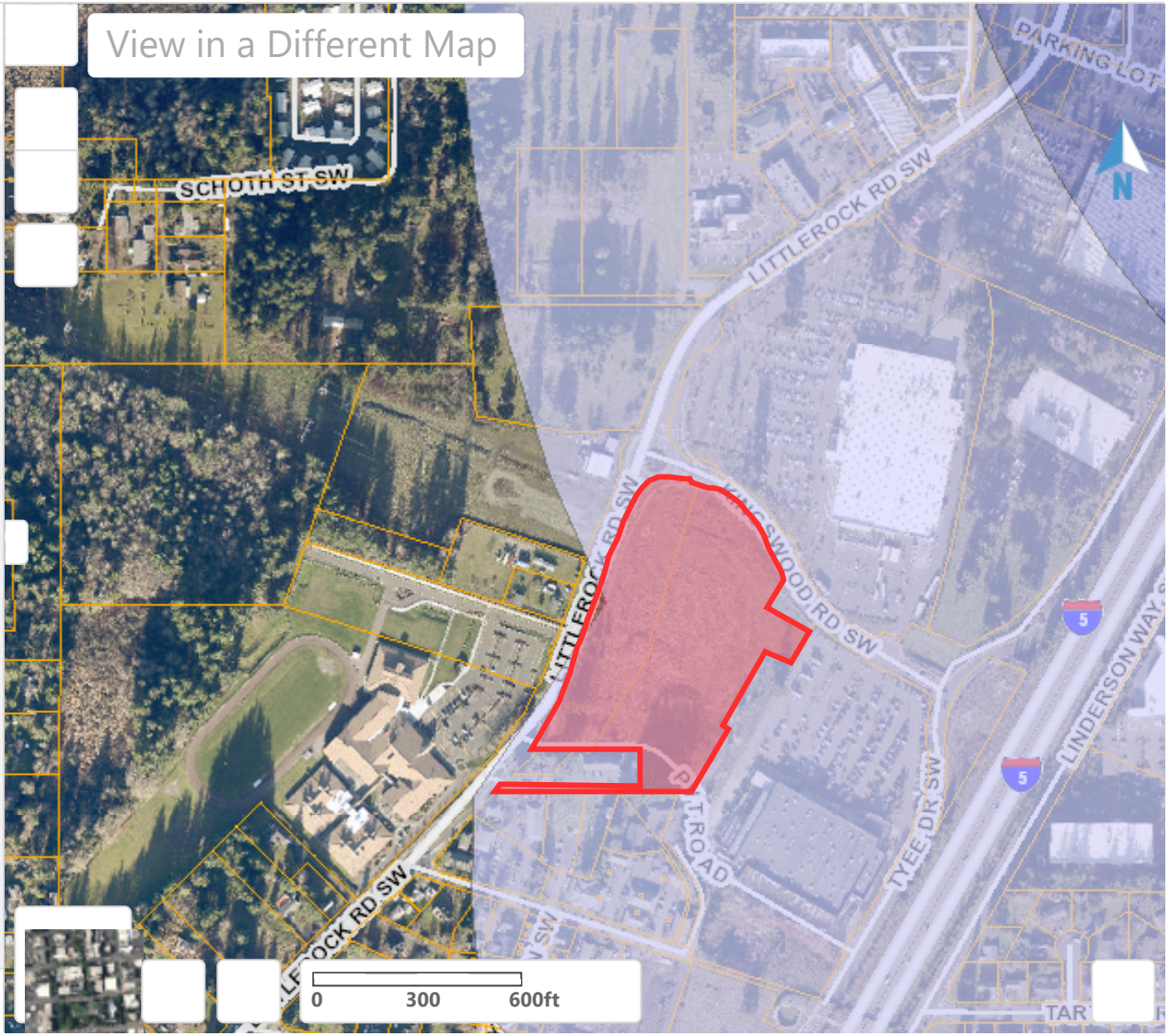
Show Layer List (Layer)
County Base Map | Aerial 2020 (Fast) | Aerials (All) | Hillshades (Basemap)
Add To Favorites | Bookmarks | Reset The Map (Map)

Layers

Filter Layers... Filter

- McAllister Groundwater Sensitive Area
- Watershed Protection Areas
- Wellhead Protection Areas
  - 6 Month
  - 1 Year
  - 2 Year
  - 3 Year
  - 5 Year
  - 10 Year
- Flood & Groundwater Hazard
- Jurisdictions
- Habitat Conservation Plan

General... | Layers | Identify ... | Snappa...



MAZAMA POCKET GOPHER (*Thomomys Mazama)* AND THURSTON COUNTY REGULATED PRAIRIE ABSENCE REPORT

Prepared for Kingswood Capital Inc.

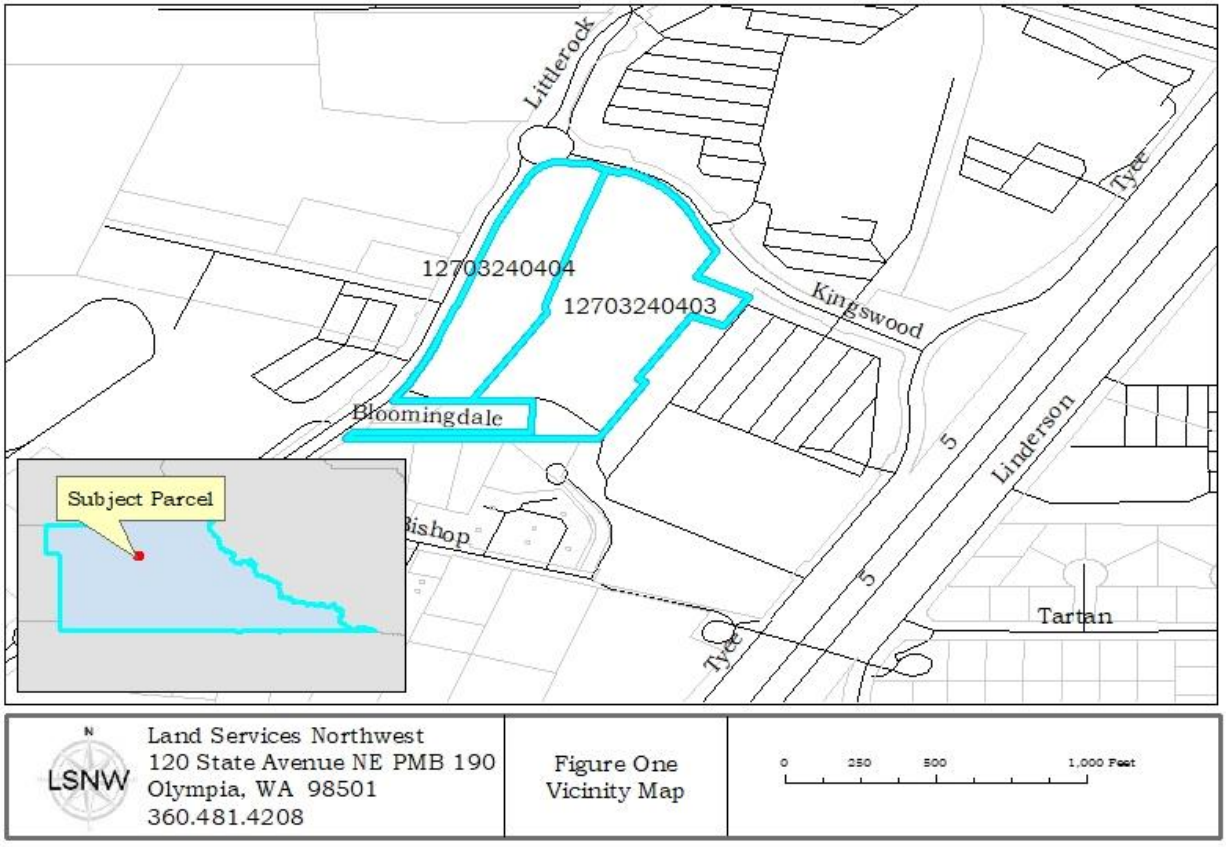
Prepared By:

ALEXANDER CALLENDER, M.S. PWS
LAND SERVICES NORTHWEST
OLYMPIA, WASHINGTON

OCTOBER 15,2021

1.0 INTRODUCTION

This report is the result of a Mazama Pocket Gopher and regulated prairie survey of the 5.76-acre and 3.24-acre parcel numbers 12703240403 and 12703240404 at 1401 KINGSWOOD DR SW and 1551 KINGSWOOD DR SW, with the legal descriptions of Section 03 Township 17 Range 2W Quarter NE NW & SE NW TR B BLA03744 3500815 EXCEPT PTN DEDICATED TO CITY OF TUMWATER PER AFN 3539066 and Section 03 Township 17 Range 2W Quarter NE NW BLA027432 TR D Document 3472425 EXC PTN TO CITY OF TUMWATER PER AFN:3539066; EXC PTN FOR RD PER AFN:3991167; ALSO EXC PTN FOR RD PER AFN:4158266 in the City of Tumwater, WA (**Figure 1**).



The Purpose of this report is to provide a study of the presence or absence of indicators of the Mazama Pocket Gopher (*Thomomys Mazama*) (MPG) and Regulated Prairie Under Tumwater City Code (TCC) Chapter 24**.**

Mazama Pocket Gopher

Four subspecies of Mazama pocket gophers found in Thurston County are listed as threatened under the Endangered Species Act (ESA). Impacts to Mazama pocket gophers should be avoided or addressed through USFWS permitting processes**.** The presence of this species on a property may have regulatory implications that may limit the amount or type of development that can occur on a property in order to avoid "take" of the species. Take is defined under the ESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species.

This study should allow the reader to assess whether the Mazama pocket gopher is likely to be found on site and what the implications of its presence or absence may have with regard to permitting a residence or other structures or development.

Regulated Prairie, Garry Oaks and Mima Mounds

The parcel contains soil types associated with prairies as defined in the Thurston County Critical Areas Ordinance (CAO 24.25). Transects were walked throughout the parcel (or at least throughout the building envelope and 50-foot buffer area). A list of plant species encountered during the survey was recorded and CAO target prairie plants were noted. Regulated prairie can be either wet or dry outwash prairie and is critical habitat for the Taylors checkerspot butterfly and the Mardon skipper butterfly. Prairie habitat is regulated if three indictor species are found within 5 meters (15 feet) of each other with 25 or more of each species in the plot.

2.0 METHODS

2.1 Review of Existing Information

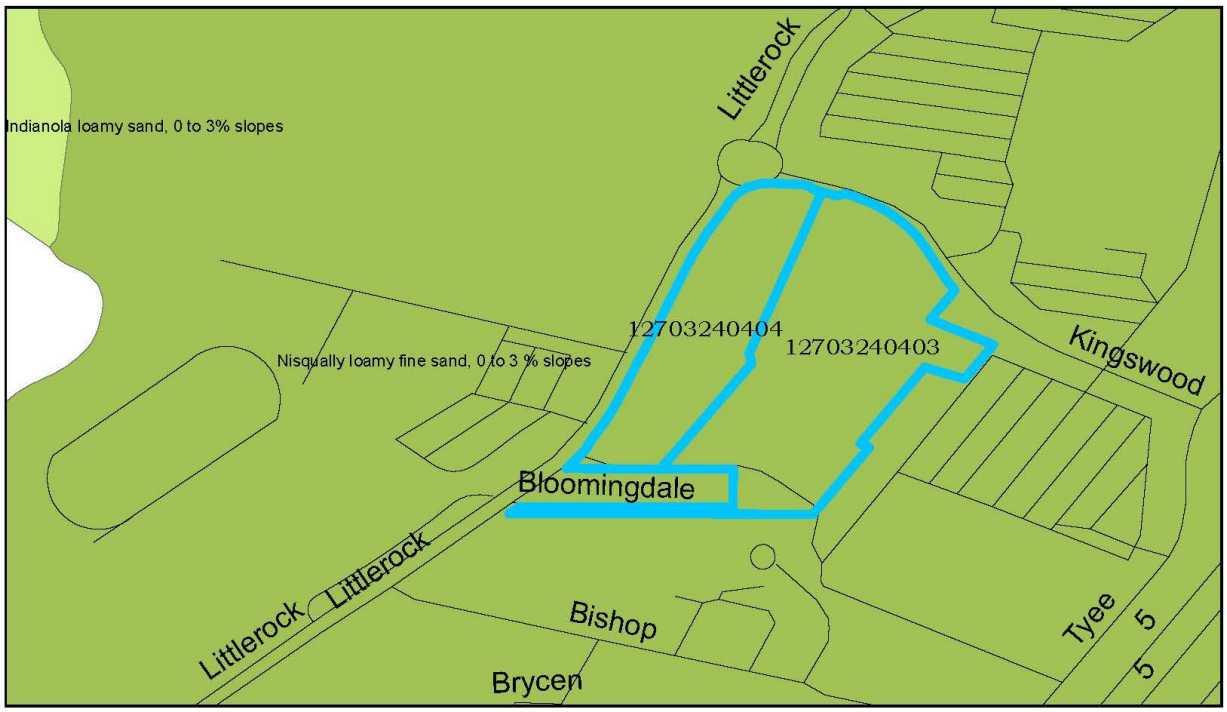
Background Review

Background information on the subject property was reviewed prior to field investigations and included the following:

- Thurston County Geodata Gopher Soils Shapefiles
- WDFW Priority Habitats and Species Information
- USFWS species list information
- WDFW species information

2.2 Summary of Existing Information

The existing information shows Nisqually loamy fine sand, 0 to 3 percent slopes, which is more preferred by the MPG, withing 300 feet of the subject parcel (**Figure 2) and (Attachment A).**



LSNW Land Services Northwest 120 State Avenue NE PMB 190 Olympia, WA 98501 360.481.4208	Figure Two USDA Soil Survey	0 187.5 375 750 Feet

Attachment A

Table 1. Soils known to be associated with Mazama pocket gopher occupancy.

Mazama Pocket Gopher Preference	Soil Type
More Preferred (formerly High and Medium Preference Soils)	Nisqually loamy fine sand, 0 to 3 percent slopes Nisqually loamy fine sand, 3 to 15 percent slopes Spanaway-Nisqually complex, 2 to 10 percent slopes Cagey loamy sand Indianola loamy sand, 0 to 3 percent slopes Spanaway gravelly sandy loam, 0 to 3 percent slopes Spanaway gravelly sandy loam, 3 to 15% slopes
Less Preferred (formerly Low Preference Soils)	Alderwood gravelly sandy loam, 0 to 3 percent slopes Alderwood gravelly sandy loam, 3 to 15 percent slopes Everett very gravelly sandy loam, 0 to 3 percent slopes Everett very gravelly sandy loam, 3 to 15 percent slopes Indianola loamy sand, 3 to 15 percent slopes Kapowsin silt loam, 3 to 15 percent slopes McKenna gravelly silt loam, 0 to 5 percent slopes Norma fine sandy loam Norma silt loam Spana gravelly loam Spanaway stony sandy loam, 0 to 3 percent slopes Spanaway stony sandy loam, 3 to 15 percent slopes Yelm fine sandy loam, 0 to 3 percent slopes Yelm fine sandy loam, 3 to 15 percent slopes

The WDFW Priority Habitats and Species Map shows MPG occupancy in 1995 within 600 feet of the subject parcel. (**Appendix B**).

2.3 2021 Mazama Pocket Gopher Protocol

A. General Information – 2021 Approach

1. The MPG review season will run June 1-October 31, 2021.

2. The protocol described in this memorandum will only apply to properties not known to be occupied by MPG since April 2014, the date of the federal listing.

The property was not known to be occupied by the MPG since April 2014.

3. Negative determinations will be valid for the length of the underlying County permit or approval, per County code.

The determination is negative.

4. Qualified consultants may perform field reviews and submit results for County evaluation, per the CAO. Consultants must have received training from USFWS at one of the two trainings offered in May/June 2021 and is certified to conduct these surveys.

Alex Callender is qualified as a consultant as he received training and certification during the May 2019 class conducted by the United States Fish and Wildlife Service.

B. In-Office Procedures

1. Staff will review land use applications to determine if the MPG field screening protocols described in this memorandum must be initiated for the following:

a. Within 600 feet of a site known to have positive MPG occurrence ; or

The properties are within 600 feet of a site known to have a positive MPG occurrence.

b. On or within 300 feet of a soil type known to be associated with MPG occupancy.

The existing information shows Nisqually loamy fine sand, 0 to 3 percent slopes within 300 feet of the subject parcel.

2. County staff will determine if other factors preclude the need for field screening. See Preliminary assessment below.

3. County staff will notify applicants if their application cannot be excluded from further review.

4. Applicants may hire a consultant to perform field review, or may request that field review be conducted by County staff according to the protocol described in this memorandum.

5. County staff will review critical area reports submitted by consultants.

6. For sites to be screened by the County, staff will coordinate site visits with landowners/applicants, ensure advance notification and property access, and develop site visit schedules.

7. For sites where no MPG activity is observed, the County will provide applicants with a project condition that requires them to stop construction activity and alert the County and USFWS if evidence of MPG occupancy is observed.

N/A - No activity observed

8. Thurston County landowners who know or learn that Mazama pocket gophers are present on their property can move forward with their proposed development by: 1) proposing

mitigation to the County as directed in the County's Critical Areas Ordinance (Title 24 TCC); or 2) contacting USFWS directly to discuss the review, assessment, and mitigation process most appropriate for their site(s) and proposed activities; or 3) waiting to participate in the yet to be completed Thurston County HCP.

C. Preliminary Assessment

As land use applications are received, properties mapped with or within 300 feet of gopher and/or prairie soils undergo the following preliminary assessment in-office.

1. For properties or project areas that appear to meet County criteria below, an internal review is conducted by staff biologist to determine if the project may be released from the full gopher review process. The following criteria may release a project from further gopher review:

- Locations west of the Black River, or on the Steamboat Island or Cooper Point peninsulas.
  N/A
- Sites submerged for 30 consecutive days or more since October 31, 2017.
  N/A
- Sites covered with impervious surfaces (as defined in CAO Chapter 17.15 and Title 24).
  N/A
- Fully forested (>30%) sites with shrub and fern understory.
  N/A
- Sites that consist of slopes greater than 40 percent, or that contain landslide hazard areas (per existing County regulations).
  N/A
- Sites on less preferred MPG soils north of Interstate 5.
  N/A
- Building to take place in the footprint of an existing structure (also mobile home replacements in the same footprint).
  N/A
- Mobile home replacements in existing lots in an existing mobile home park.
  N/A
- Heating oil tank removal
  N/A
- Foundation repair
  N/A
- Projects which lie >300 feet from mapped gopher soils.
  The parcel is within 300 feet of mapped gopher soils.

2. If a property and/or project area do not meet internal review criteria, the project is put on a list to be scheduled for full MPG review during the appropriate seasonal review period.

3. In addition to the in-office preliminary assessment, the County HCP biologist may, if time allows, visit properties prior to the first gopher review in order to screen for prairie habitat. This screening process focuses on the presence or absence of native prairie plants, Oregon white oak trees (Quercus garryana), or Mima mounds protected under the Critical Areas Ordinance (CAO).

The site was evaluated for Regulated prairie plants on August 27 and during the two gopher studies on September 14 and October 14, 2021. No CAO regulated prairie plants were found.

No Mima mounds were found.

Garry oaks were found and locations are shown on the transect maps in Appendix C.

D. Implementation Measures

In order to ensure the review process runs efficiently, the following measures will be implemented as part of the 2021 screening approach. These are intended to reduce costs and staff time, and ensure that MPG screening requests, especially those associated with building permit applications, are screened during the screening season.

1. No soil verification will be required in conjunction with MPG field screening.

2. Site mowing or brushing will be required to initiate first site visits, where necessary and feasible, and completed two to four weeks in advance of the site visit.

   The ground was visible.

3. No further screening will be conducted in 2021 following the detection of MPG mounds on a property. The County will notify landowners that MPG evidence has been detected within two weeks.

   The Mazama pocket gopher mounds were **not** found.

4. At the end of the 2021 season, County staff will provide data regarding MPG occupancy to USFWS.

5. No additional site visit will be required if indeterminate mounds are detected, if the full number of required visits has been completed.

   N/A

6. The County will prioritize project specific applications over non-project applications. This will help ensure that applicants that have projects ready for construction will receive necessary permits and may initiate construction in a timely manner.

E. Site Visit Overview

County field personnel or hired consultants will conduct field observations to determine MPG presence on sites with potential habitat. These site visits will be conducted as follows:

1. All valid site visits must be conducted from June 1 through October 31, 2021. Site visits outside that survey window will not be considered valid.

Site visits were conducted on September 14 and October 14, 2021.

2. A site or parcel is considered to be the entire property, not just the footprint of the proposed project.

A portion of the properties are excluded and is shown on the transect maps in Appendix C.

3. Sites with less preferred soils (see Attachment A) will be visited two (2) times, at least 30 days apart.

The site was visited to two times during the proper study period 30 days apart.

4. Sites with more preferred soils (see Attachment A) will be visited two (2) times, at least 30 days apart.

5. Site conditions must be recorded on a data sheet or similar information documented in narrative form. A template data sheet can be found on the County website at http://www.co.thurston.wa.us/permitting/gopher-reviews/index.html

The data sheets are provided in Appendix C.

6. Document and describe which areas of the parcel cannot be screened due to limited accessibility and/or dense understory. This should be depicted on an aerial or site plan submitted to the County.

The entire parcel was surveyed.

7. The ground must be easily visible to ensure mound observation and identification. Request mowing if necessary to ensure visibility. Wait two to three weeks after mowing before beginning screening.

The ground was visible.

http://www.co.thurston.wa.us/permitting/gopher-reviews/index.html F. Detailed Field Methodology

1. The survey crew orients themselves with the layout of the property using aerial maps, and strategizes their route for walking through the property.

2. Start GPS to record survey route.

3. Walk the survey transects methodically, slowly walking a straight line and scanning an area approximately 2-3 meters to the left and right as you walk, looking for mounds. Transects should be no more than five (5) meters apart when conducted by a single individual.

4. If the survey is performed by a team, walk together in parallel lines approximately 5 meters apart while you are scanning left to right for mounds.

The survey was conducted according to the protocol.

5. At each mound found, stop and identify it as a MPG or mole mound. If it is a MPG mound, identify it as a singular mound or a group (3 mounds or more) on a data sheet to be submitted to the County. (County has developed data sheets for your use on http://www.co.thurston.wa.us/permitting/gopher-reviews/index.html)

No MPG mounds were found. The mounds found on site were typical of moles which are round, clumpy and the show was in a linear fashion.

6. Record all positive MPG mounds, likely MPG mounds, and MPG mound groups in a GPS unit that provides a date, time, georeferenced point, and other required information in County GPS data instruction for each MPG mound. Submit GPS data in a form acceptable to the County. County GPS Data instruction can be found at http://www.co.thurston.wa.us/permitting/gopher-reviews/index.html

N /A

7. Photograph all MPG mounds or MPG mound groups. At a minimum, photograph MPG mounds or MPG mound groups representative of MPG detections on site.

No MPG mounds found.

8. Photos of mounds should include one that has identifiable landscape features for reference. In order to accurately depict the presence of gopher activity on a specific property, the following series of photos should be submitted to the County:
   - At least one up-close photo to depict mound characteristics
     No MPG mounds were found.
   - At least one photo depicting groups of mounds as a whole (when groups are encountered).
     N/A
   - At least one photo depicting gopher mounds with recognizable landscape features in the background, at each location where mounds are detected on a property
     N/A
   - Photos can be taken with the GPS unit or a separate, camera, preferably a camera with locational features (latitude, longitude)
     N/A
   - Photo point description or noteworthy landscape or other features to aid in relocation. Additional photos to be considered.
     N/A
   - The approximate building footprint location from at least two cardinal directions.
     N/A

- Landscape photos to depict habitat type and in some cases to indicate why not all portions of a property require gopher screening.
  Appendix A Photos

9. Describe and/or quantify what portion and proportion of the property was screened, and record your survey route and any MPG mounds found on either an aerial or parcel map.

A portion of the properties is excluded and is shown on the transect maps in Appendix C.

10. If MPG mounds are observed on a site, that day's survey effort should continue until the entire site is screened and all mounds present identified, but additional site visits are not required.

No mounds were found.

11. In order for the County to accurately review Critical Area Reports submitted in lieu of County field inspections the information collected in the field (GPS, data sheets, field notes, transect representations on aerial, etc.) shall be filed with the County. GPS

No mounds were found, the information was submitted in an acceptable format.

2021 Regulated Prairie, Garry Oaks and Mima Mounds Protocol

The parcel contains soil types associated with prairies as defined in the Thurston County Critical Areas Ordinance (CAO 24.25).

Transects were walked throughout the parcel. A list of plant species encountered during the survey was recorded and CAO target prairie plants were noted. Regulated prairie can be either wet or dry outwash prairie and is critical habitat for the Taylors checkerspot butterfly and the Mardon skipper butterfly. Prairie habitat is regulated if three indicator species are found within 5 meters (15 feet) of each other with 25 or more of each species in the plot.

The site was evaluated for Regulated prairie plants on August 27 during the gopher studies on September 14 and October 14, 2021.

No prairie plant species identified in the Thurston County CAO were detected on the parcel.

No Mima mounds were found.

Garry oaks were found and their locations are shown on the transect maps in Appendix C.

If prairie habitat is detected elsewhere on the property, the landowner must be informed in order to avoid future disturbance of this habitat. Target plant species may be hand-drawn on the aerial map or logged using GPS equipment, depending on availability. Existing and ongoing agricultural activities may continue.

The landowner was informed regarding the Garry oaks.

3.0 CURRENT CONDITIONS AND METHODS

Land Services Northwest conducted a survey on September 14 and October 14, 2021, walking the area and looking for signs of the MPG and regulated prairie in accordance with the protocol.

The 5.76-acre and 3.24-acre parcels are undeveloped vacant fields with uneven terrain. There are large retail stores to the north and east, small commercial businesses to the south and a school, single family residences and a commercial business to the west. The surveyed area unmowed prior to the prairie survey and then mowed according to the protocol in this document and left unmowed for three weeks.

4.0 RESULTS

No Mazama pocket gophers were found on site. The mounds found on site were typical of moles which are round, clumpy and the show was in a linear fashion.

No CAO prairie plants were found.

No Mima mounds were found.

Garry oaks were found and their locations are shown on the transect maps in Appendix C.

Appendix A

Photos


Latitude: 46.994115
Longitude: -122.921135
Elevation: 57.91±3 m
Accuracy: 32.4 m
Azimuth: 206° (SW)
Pitch: -1.8° (1.3°)
Time: 10-14-2021 16:07
Note: Kingswood
Powered by AngleCam

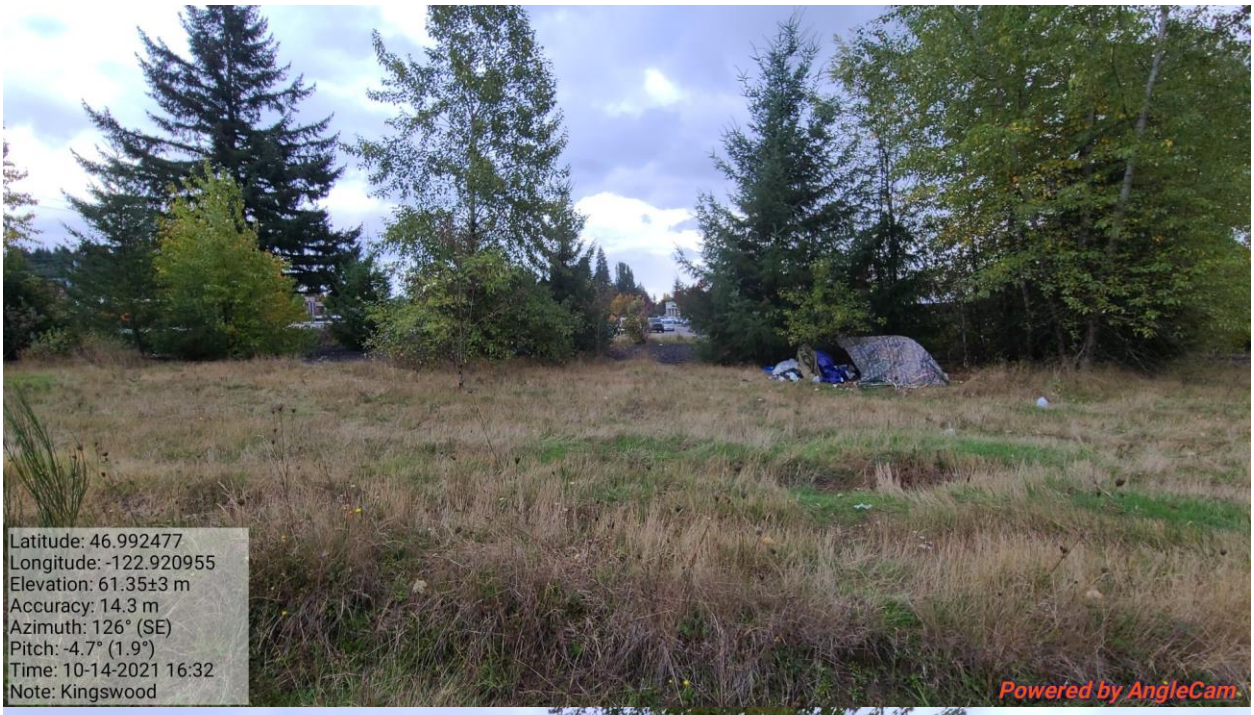

Latitude: 46.99404
Longitude: -122.921697
Elevation: 57.83±3 m
Accuracy: 13.4 m
Azimuth: 128° (SE)
Pitch: -4.5° (0.7°)
Time: 10-14-2021 16:08
Note: Kingswood
Powered by AngleCam


Latitude: 46.993524
Longitude: -122.921235
Elevation: 50.31±5 m
Accuracy: 9.3 m
Azimuth: 260° (W)
Pitch: -48.3° (2.8°)
Time: 10-14-2021 16:15
Note: Kingswood
Powered by AngleCam


Latitude: 46.993951
Longitude: -122.922052
Elevation: 56.05±3 m
Accuracy: 53.5 m
Azimuth: 193° (S)
Pitch: -2.2°
Time: 10-14-2021 16:17
Note: Kingswood
Powered by AngleCam


Latitude: 46.993252
Longitude: -122.922144
Elevation: 56.55±3 m
Accuracy: 9.2 m
Azimuth: 122° (SE)
Pitch: -4.7° (0.6°)
Time: 10-14-2021 16:28
Note: Kingswood
Powered by AngleCam


Latitude: 46.992477
Longitude: -122.920955
Elevation: 61.35±3 m
Accuracy: 14.3 m
Azimuth: 54° (NE)
Pitch: -6.0°
Time: 10-14-2021 16:32
Note: Kingswood
Powered by AngleCam


Latitude: 46.992477
Longitude: -122.920955
Elevation: 61.35±3 m
Accuracy: 14.3 m
Azimuth: 126° (SE)
Pitch: -4.7° (1.9°)
Time: 10-14-2021 16:32
Note: Kingswood
Powered by AngleCam


Latitude: 46.992537
Longitude: -122.921432
Elevation: 58.37±6 m
Accuracy: 12.3 m
Azimuth: 320° (NW)
Pitch: -4.5° (-0.9°)
Time: 10-14-2021 16:39
Note: Kingswood
Powered by AngleCam


Latitude: 46.992876
Longitude: -122.921926
Elevation: 60.04±3 m
Accuracy: 43.2 m
Azimuth: 326° (NW)
Pitch: 0.3° (0.5°)
Time: 10-14-2021 16:40
Note: Kingswood
Powered by AngleCam


Latitude: 46.992391
Longitude: -122.922044
Elevation: 60.15±3 m
Accuracy: 60.5 m
Azimuth: 82° (E)
Pitch: -51.0° (-1.3°)
Time: 10-14-2021 16:42
Note: Kingswood
Powered by AngleCam


Latitude: 46.992604
Longitude: -122.922413
Elevation: 58.99±3 m
Accuracy: 10.6 m
Azimuth: 50° (NE)
Pitch: -5.7° (0.6°)
Time: 10-14-2021 16:46
Note: Kingswood
Powered by AngleCam


Latitude: 46.992599
Longitude: -122.922419
Elevation: 59.72±3 m
Accuracy: 11.1 m
Azimuth: 340° (N)
Pitch: -6.0° (-1.7°)
Time: 10-14-2021 16:46
Note: Kingswood
Powered by AngleCam


Latitude: 46.992581
Longitude: -122.922429
Elevation: 58.99±3 m
Accuracy: 11.4 m
Azimuth: 277° (W)
Pitch: -0.9° (-1.3°)
Time: 10-14-2021 16:46
Note: Kingswood
Powered by AngleCam


Latitude: 46.992478
Longitude: -122.922455
Elevation: 59.02±3 m
Accuracy: 6.2 m
Azimuth: 125° (SE)
Pitch: -2.3° (-2.7°)
Time: 10-14-2021 16:46
Note: Kingswood
Powered by AngleCam


Latitude: 46.991658
Longitude: -122.920941
Elevation: 57.35±3 m
Accuracy: 41.6 m
Azimuth: 118° (SE)
Pitch: -2.0° (2.3°)
Time: 10-14-2021 16:54
Note: Kingswood
Powered by AngleCam

Appendix B

WDFW Priority Habitats and Species Map

Priority Habitats and Species on the Web

Buffer radius: 600 Feet

Report Date: 10/12/2021

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Mazama (Western) pocket gopher	Threatened	Threatened	No
Big brown bat	N/A	N/A	Yes
Townsend's Big-eared Bat	N/A	Candidate	Yes

1/3

PHS Species/Habitats Details:

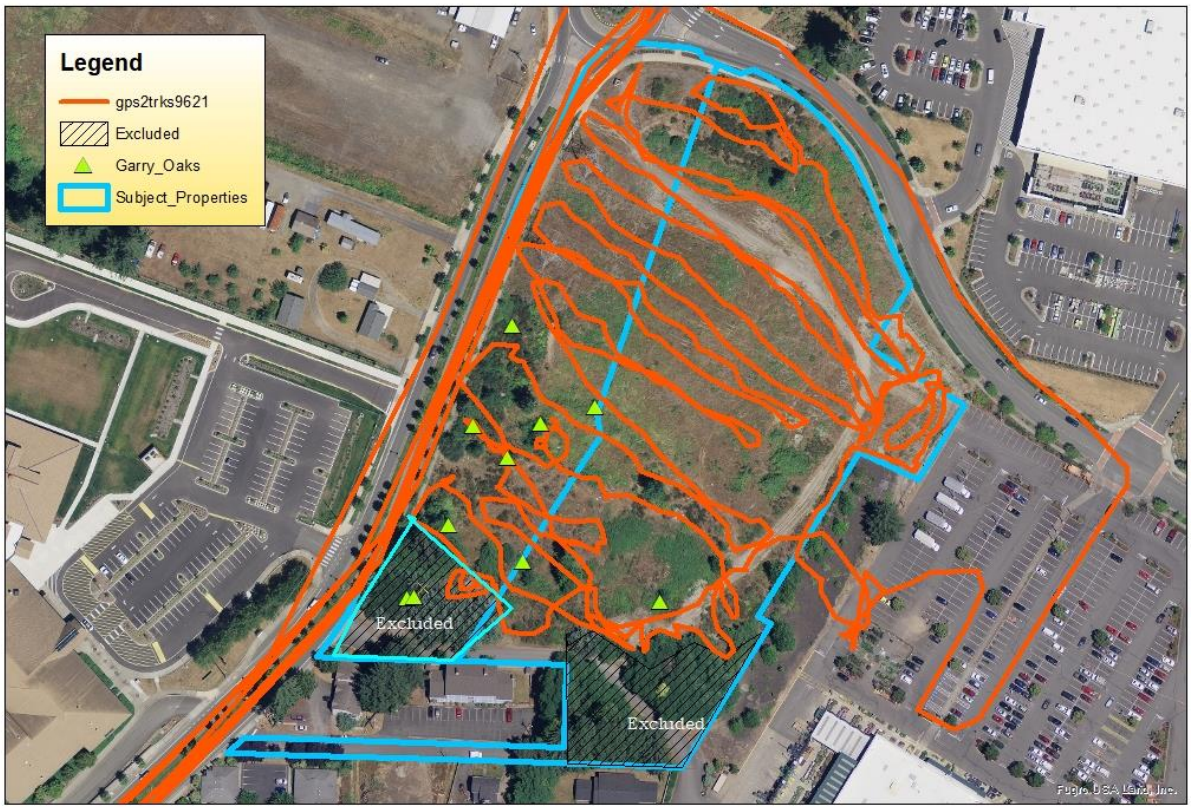
Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	BUSH PRAIRIE
Accuracy	1/4 mile (Quarter Section)
Notes	WESTERN POCKET GOPHER MOUND SYSTEM CROSSING NEWLY CLEARED AREA FOR 3RD SOUTH LANE TO I-5. FINE DARK SOIL WITH V. LITTLE GRAVEL. MOUNDS 1/4 MILE SO. OF TYEE INN ALONG NEW CUT BANK ON W. SIDE OF I-5. LOC UPDATED FROM PHS POLY 2009.
Source Record	3172
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	TAYLOR, DWDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

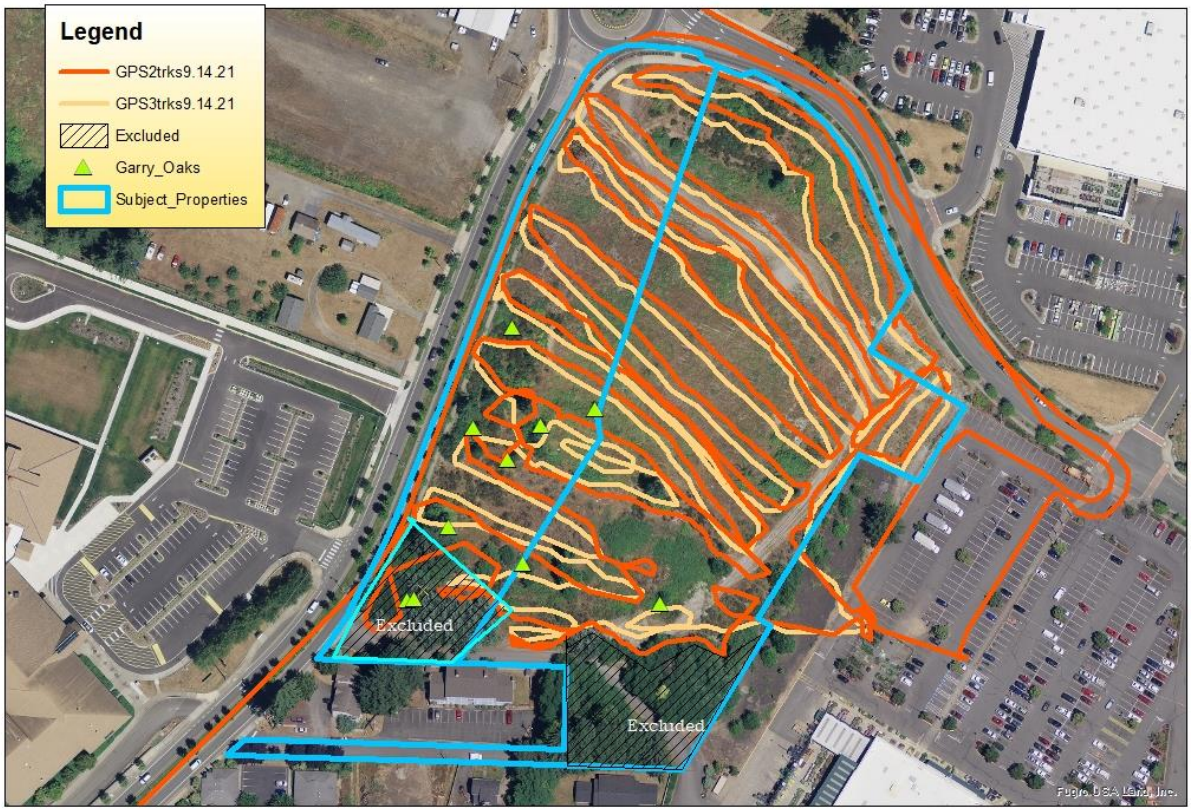
Townsend's Big-eared Bat	
Scientific Name	*Corynorhinus townsendii*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00027

Appendix C

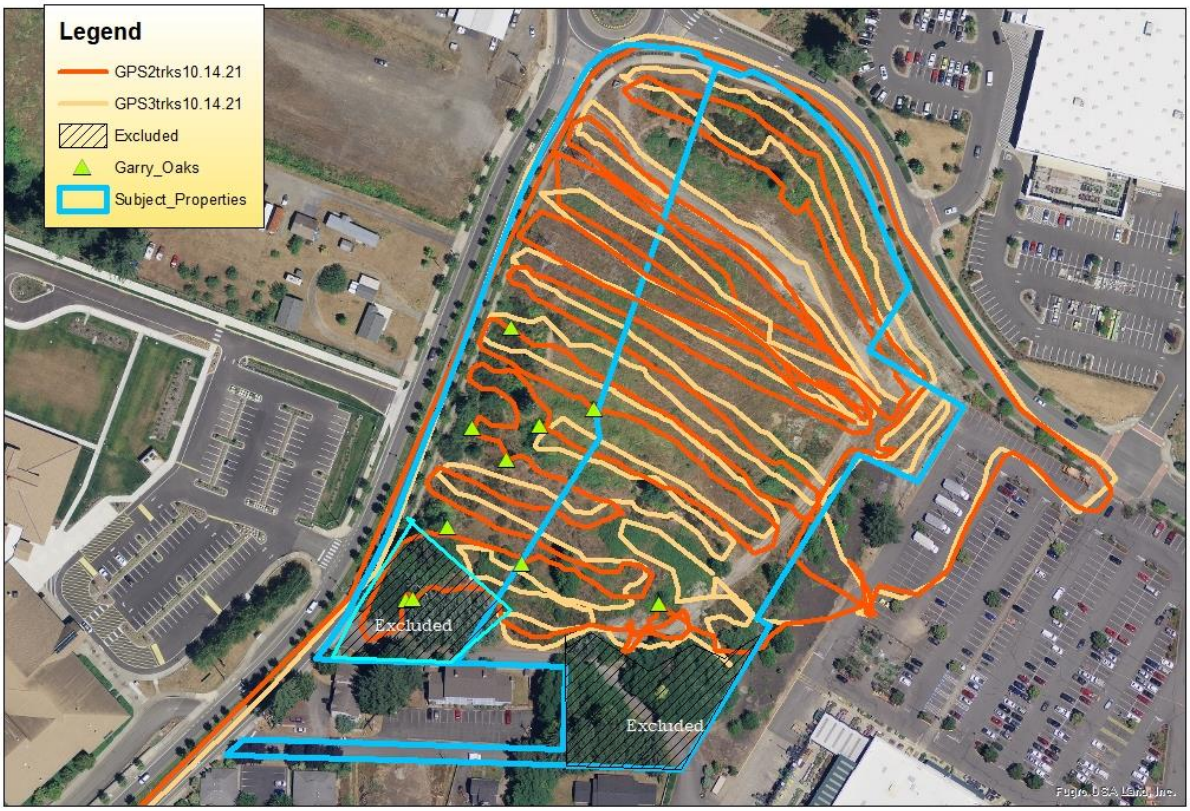
MPG Survey Form and Transect Maps



LSNW Land Services Northwest 120 State Avenue NE PMB 190 Olympia, WA 98501 360.481.4208	SV1 Regulated Prairie Survey 8.27.2021	0 125 250 500 Feet



LSNW Land Services Northwest 120 State Avenue NE PMB 190 Olympia, WA 98501 360.481.4208	SV2 Regulated Prairie Survey 9.14.2021	0 125 250 500 Feet



N LSNW Land Services Northwest 120 State Avenue NE PMB 190 Olympia, WA 98501 360.481.4208	SV3 Regulated Prairie Survey 10.14.2021	0 125 250 500 Feet

2020 Thurston County Mazama Pocket Gopher Screening Field Form Site Visit Date: 9.14.2021

Site Name and Parcel #	**Parcel # 12703240403 and 12703240404** **Project #:** **Site/Landowner: Kingswood Capital Inc.**
How were the data collected? (circle the method for each)	**Transect: Trimble (Garmin) Aerial** **Mounds Trimble Garmin Aerial** **Notes: _____**
Field Team Personnel: **(Indicate all staff present, CIRCLE who filled out form)**	**Name: Alex Callender** **Name: (Susan Callender)** **Name:**
Others onsite (name/affiliation)	
Site visit # **(CIRCLE all that apply)**	**(1st) 2nd Unable to screen** **Notes:**
Do onsite conditions preclude the need for further visits?	**Yes (No)** **Dense woody cover that encompasses the entire site (trees/shrubs) that appears to preclude any potential MPG use.** **Impervious Compacted Graveled Flooded** **Other _____** **Notes:**
Describe visibility for mound detection:	**Poor Fair (Good) Notes:**
Request mowing? **(CIRCLE and DESCRIBE WHERE MOWING IS NEEDED and SHOW ON AERIAL PHOTO**	**(Yes) No N/A Notes:** The area was mowed according to the protocol prior to the MPG surveys.

Mounds observed over the whole site are characteristic of:	MPG Mounds	Likely MPG Mounds	Indeterminate	Likely Mole Mounds	Mole Mounds
Quantify or describe amount of each type and approx. # of mounds *Group = 3 mounds or more*	0	0	0	0	20
	No MPG mounds (circle)				
MPG mounds in GPS? (CIRCLE and DESCRIBE) If MPG mounds present, entered in GPS?	None All Most Some Notes: Yes No N/A				
Does woody vegetation onsite match aerial photo?	Yes No - describe differences and show on parcel map/aerial:				
What portion(s) of the property was screened? (CIRCLE and DESCRIBE)	All Part - describe and show on parcel map/aerial: Portions of the parcels are excluded and shown on the transcect maps in Appendix C				
Notes -	Describe, and show on parcel map/aerial if applicable:				
Team reviewed and agreed to data recorded on form? (CIRCLE, and EXPLAIN if "No")	Yes No Reviewed by initials: AC, SC Notes:				

2020 Thurston County Mazama Pocket Gopher Screening Field Form Site Visit Date: 10.14.2021

Site Name and Parcel #	**Parcel # 12703240403 and 12703240404** **Project #:** **Site/Landowner: Kingswood Capital Inc.**
How were the data collected? (circle the method for each)	**Transect: Trimble (Garmin) Aerial** **Mounds Trimble Garmin Aerial** **Notes: _____**
Field Team Personnel: **(Indicate all staff present, CIRCLE who filled out form)**	**Name: Alex Callender** **Name: (Susan Callender)** **Name:**
Others onsite (name/affiliation)	
Site visit # **(CIRCLE all that apply)**	**1st (2nd) Unable to screen** **Notes:**
Do onsite conditions preclude the need for further visits?	**Yes (No)** **Dense woody cover that encompasses the entire site (trees/shrubs) that appears to preclude any potential MPG use.** **Impervious Compacted Graveled Flooded** **Other _____** **Notes:**
Describe visibility for mound detection:	**Poor Fair (Good) Notes:**
Request mowing? **(CIRCLE and DESCRIBE WHERE MOWING IS NEEDED and SHOW ON AERIAL PHOTO**	**(Yes) No N/A Notes:** The area was mowed according to protocal prior to the gopher surveys.

Mounds observed over the whole site are characteristic of: **Quantify or describe amount of each type and approx. # of mounds** ***Group = 3 mounds or more***	**MPG Mounds** 0	**Likely MPG Mounds** 0	**Indeterminate** 0	**Likely Mole Mounds** 0	**Mole Mounds** 20
	No MPG mounds (circle)				
MPG mounds in GPS? **(CIRCLE and DESCRIBE)** **If MPG mounds present, entered in GPS?**	**None All Most Some** **Notes:** **Yes No (N/A)**				
Does woody vegetation onsite match aerial photo?	**(Yes) No - describe differences and show on parcel map/aerial:**				
What portion(s) of the property was screened? **(CIRCLE and DESCRIBE)**	**All (Part) - describe and show on parcel map/aerial:** Portions of the parcels are excluded and shown on the transcect maps in Appendix C				
Notes -	**Describe, and show on parcel map/aerial if applicable:**				
Team reviewed and agreed to data recorded on form? **(CIRCLE, and EXPLAIN if "No")**	**(Yes) No Reviewed by initials: AC, SC** **Notes:**				

Appendix D

CAO Prairie Data Sheet

2019 Thurston County Critical Areas Ordinance (CAO) Prairie Screening Data Sheet

Parcel Number: 81300800000	**CAO prairie criteria met?** Yes or (No)
Property Owner: Vander Linden Project	**Mima mounds present?** Yes or (No)
Surveyor(s): Alex and Susan Callender	**Oaks (*Quercus garryana*) present?** (Yes) or No
Date: 9.14.21 and 10.14.2021	Mature:
Composition of Vegetation:	Sapling:
	Seedling:

X	Target species	Class* (circle)
	Apocynum androsaemifolium	1 2 3 4 5 N/A
	Balsamorhiza deltoidea	Present / Absent
	Bistorta bistortoides	Present / Absent
	Brodiaea coronaria	1 2 3 4 5 N/A
	Camassia leichtlinii	1 2 3 4 5 N/A
	Camassia quamash	Present / Absent
	Carex densa	Present / Absent
	Carex feta	1 2 3 4 5 N/A
	Carex inops ssp. *inops*	1 2 3 4 5 N/A
	Carex tumulicola	1 2 3 4 5 N/A
	Carex unilateralis	1 2 3 4 5 N/A
	Castilleja hispida	1 2 3 4 5 N/A
	Castilleja levisecta	Present / Absent
	Danthonia californica	1 2 3 4 5 N/A
	Delphinium menziesii	1 2 3 4 5 N/A
	Delphinium nuttallii	1 2 3 4 5 N/A
	Deschampsia cespitosa	1 2 3 4 5 N/A
	Deschampsia danthonioides	1 2 3 4 5 N/A
	Dodecatheon hendersonii	1 2 3 4 5 N/A
	Downingia yina	1 2 3 4 5 N/A
	Erigeron speciosus	1 2 3 4 5 N/A
	Eriophyllum lanatum	Cover: ___ m^2 N/A
	Eryngium petiolatum	Present / Absent
	Festuca roemeri (F. idahoensis)	1 2 3 4 5 N/A
	Fragaria virginiana	Cover: 3 m^2 N/A
	Fritillaria affinis	1 2 3 4 5 N/A
	Hieracium scouleri	1 2 3 4 5 N/A
	Hosackia pinnata *(Lotus pinnatus)*	Present / Absent
	Koeleria macrantha (K. cristata)	1 2 3 4 5 N/A
	Leptosiphon bicolor (Linanthus b.)	1 2 3 4 5 N/A
	Lomatium bradshawii	Present / Absent
	Lomatium nudicaule	1 2 3 4 5 N/A
	Lomatium triternatum	1 2 3 4 5 N/A
	Lomatium utriculatum	Present / Absent

	Lupinus albicaulis	1 2 3 4 5 N/A
	Lupinus lepidus var. *lepidus*	1 2 3 4 5 N/A
	Lupinus polyphyllus	1 2 3 4 5 N/A
	Micranthes integrifolia (Saxifraga i.)	Present / Absent
	Micranthes oregana (Saxifraga o.)	1 2 3 4 5 N/A
	Microseris laciniata	Present / Absent
	Perideridia gairdneri	1 2 3 4 5 N/A
	Plagiobothrys figuratus	1 2 3 4 5 N/A
	Plectritis congesta	Present / Absent
	Polemonium carneum	Present / Absent
	Potentilla gracillis	Present / Absent
	Ranunculus alismifolius	1 2 3 4 5 N/A
	Ranunculus occidentalis	Present / Absent
	Ranunculus orthorhynchus	1 2 3 4 5 N/A
	Sericocarpus rigidus	Present / Absent
	Sidalcea malviflora* var. *virgata	Present / Absent
	Silene scouleri	Present / Absent
	Sisyrinchium idahoense	1 2 3 4 5 N/A
	Solidago missouriensis	1 (2) 3 4 5 N/A
	Solidago simplex (S. spathulata)	1 2 3 4 5 N/A
	Toxicoscordion venenosum var. venenosum (Zigadenus venenosus)	1 2 3 4 5 N/A
	Trifolium willdenowii (T. tridentatum)	1 2 3 4 5 N/A
	Triteleia grandiflora	1 2 3 4 5 N/A
	Triteleia hyacinthina	1 2 3 4 5 N/A
	Veratrum californicum	1 2 3 4 5 N/A
	Veratrum viride	1 2 3 4 5 N/A
	Viola adunca	1 2 3 4 5 N/A
	Viola praemorsa var. *nuttallii*	1 2 3 4 5 N/A

*Species Count Class:
1 = < 25
2 = 25 - 49
3 = 50 - 74
4 = 75 - 100
5 = >100

Prairie Plant Manual: https://www.thurstoncountywa.gov/planning/planningdocuments/cao-prairie-plant-manual-4.23.2018.pdf

Non-CAO vegetation

	Species or codons (i.e. "HYPRAD" for *Hypochaeris radicata*)	Notes	No real density of prairie species
1	Narrow leafed plantain (Plantago lanceolata)		
2	White Clover (Trifolium repens)		
3	Trailing blackberry (Rubus ursinus)		
4	Velvetgrass (*Holcus lanatus*)		
5	Common dandelion *(Taraxacum officinale)*		
6	Ox eye daisey (*Leucanthemum vulgare*)		
7	Himalayan blackberry (Rubus armeniacus)		
8	Red fescue (Festuca rubra)		
9	Orchard Grass (Dactylis glomerata)		
10	Scotch broom *(Cytisus scoparius)*		
11	St. johnswort *(Hypericum perforatum)*		
12	Wild carrot *(Daucus carota)*		
13	Birds-foot trefoil *(Lotus corniculatus)*		
14	Hairy cats ear *(Hypochaeris radicata)*		
15			

Prairie Habitat Criteria: If at any point at least three target species, totaling in general at least 25 plants each are encountered within about 5 meters of each other (WDFW 2015), the area in question meets the criteria to be established as occurrence of prairie. For certain plants such as WNHP rare plants (indicated here in bold), or species which serves as nectar or host plants for both TCB and either SCC or SGCN butterflies (indicated here with underline), presence is enough to meet prairie habitat criteria for such species, even if their count is less than 25 individual plants. CAO wet and dry prairie plant lists can be found in Tables 24.25-7 and 24.25-8, respectively. More info available at: https://www.thurstoncountywa.gov/planning/Pages/hcp-prairie-review.aspx
Mima mounds and oak habitat definitions can be found in TCC 24.03.010

SUF

SOUND URBAN FORESTRY
Appraisals, Planning, Urban Landscape Design and Management

Kingswood Commercial Project
1401 & 1551 Kingswood Drive SW
Tumwater, Washington 98501

Tree Protection Plan

Prepared for: KCI Commercial Inc., Trevor Colby

Prepared by: Kevin M. McFarland, SUF
Consulting Urban Forester/ISA Certified Arborist & Tree Risk Assessor Qualified

Date: 4/28/2022

This report has been developed as part of the proposed 8.97-acre Kingswood commercial project, in Tumwater, Washington. This plan will satisfy the requirements as specified by the Tumwater Protection of Trees and Vegetation Ordinance (TMC 16.08) pursuant to the City of Tumwater Development Guidelines and Standards.

I. Overall Vegetation Description

The majority of the property is field grass with small pockets of trees around the outer edges in the southern portion. The species found are a mix of natives with Douglas fir the dominant, and invasives such as black locust and poplars.

II. Inventory of Trees

A 100% inventory of the trees within the parcels was conducted on April 18, 2022. This information is presented in the table below and the approximate locations are shown on the attached aerial.

Table 1. Inventory of Trees within Property

ID#	Species	DBH	Condition
*1	Cottonwood	20”	Good
2	Douglas Fir	14”	Good
3	Douglas Fir	20”	Good
4	Red Oak	6”	Good
5	Crabapple	16”	Fair
6	Black Locust	12”	Good
7	Black Locust	14”	Good
8	Black Locust	10”	Good
9	Black Locust	16”	Good
10	Douglas Fir	28”	Good
11	Black Locust	16”	Fair
12	Black Locust	20”	Fair
13	Black Locust	16”	Fair
14	Black Locust	20”	Fair
*15	Poplar	18”	Fair
16	Black Locust	14”	Fair
*17	Poplar	12”	Fair
18	Bitter Cherry	15”	Fair
19	Scots Pine	18”	Fair
20	Scots Pine	20”	Fair
21	Douglas Fir	20”	Fair
22	Douglas Fir	25”	Fair
*23	Douglas Fir	24”	Poor
*24	Douglas Fir	22”	Poor
25	Douglas Fir	18”	Fair
*26	Douglas Fir	14”	Poor
27	Douglas Fir	22”	Fair
28	Douglas Fir	17”	Fair
**29	Douglas Fir	26”	Fair
30	Douglas Fir	18”	Fair
31	Douglas Fir	20”	Good

ID#	Species	DBH	Condition
**32	Douglas Fir	24”	Good
33	Douglas Fir	17”	Fair
34	Douglas Fir	22”	Good
**35	Douglas Fir	24”	Good
**36	Western Red Cedar	50”+	Good
**37	Douglas Fir	26”	Fair
*38	Black Locust	26”	Poor
**39	Black Locust	24”	Fair
40	Black Locust	6”	Fair
41	Black Locust	8”	Fair
42	Black Locust	6”	Fair
43	Black Locust	6”	Fair
44	Black Locust	8”	Fair
45	Black Locust	6”	Fair
46	Black Locust	10”	Fair
47	Black Locust	6”	Fair
48	Port Orford Cedar	23”	Good
49-62	Black Locust	6-18”	Poor to Fair
63	Black Locust	8”	Fair
64	Black Locust	10”	Fair
*65	Poplar	26”	Poor
*66	Poplar	12”	Poor
*67	Poplar	14”	Poor
*68	Poplar	16”	Poor
*69	Poplar	16”	Poor
*70	Poplar	20”	Poor
*71	Cottonwood	6”	Fair
72	Black Locust	8”	Fair
*73	Cottonwood	14”	Good
*74	Cottonwood	23”	Fair
*75	Cottonwood	14”	Fair

*Denotes trees subtracted from tree retention calculations due to species or poor condition.
**Denotes trees that are to be retained and count as 2 trees due to their 24”+ diameters.

Landmark Trees

I found no trees within the site that would be considered specimen or ‘Landmark’ trees.

Off-Site & Edge Trees

No offsite trees were identified with the potential of impacts.

III. Tree Retention Calculations

Per TMC 16.08.070, cottonwoods, poplars and trees that do not have a post construction life expectancy greater than 10 years are not considered for the purposes of calculating tree retention standards. Therefore, 17 trees were subtracted from the total of 75 listed in Table 1 (noted *).

Trees to be retained are located within the southeast corner of the project and include #19-47. Of these, 4 trees were subtracted due to their poor conditions (*) and 6 trees are of size that they count as two trees (**). Therefore, this project has a total of 31 tree retention credits.

Table 6. Summary of Tree Retention Calculations

Gross Acreage	8.97
Total Trees Within Site (75 – 17)	58
20% Tree Retention	12 Trees
*12 Trees/ Acre Retention	108 Trees
Proposed Tree Retention	31 Trees
Shortfall on Required Retention	77 Trees
Required Replanting (1:1)	77 Trees

***This is the greater amount and therefore required by TMC**

IV. Replanting

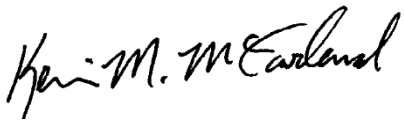
This project falls short of the minimum retention by 79 trees and is therefore required to replant at a rate of 1:1 within the site. This requirement will be met with the landscape plans and will follow the standards as outlined in TMC 16.08.070.3.

IV. Tree Protection

I recommend tree protection fencing be installed along the outer edges of the area of trees to be retained (#19-47). I have indicated approximate location in orange on the attached site plan. Fencing shall meet the City's standards and in place and inspected by myself or another certified arborist prior to any site work. The fencing shall remain in place during the entire construction process with absolutely no equipment or materials allowed beyond the fencing.

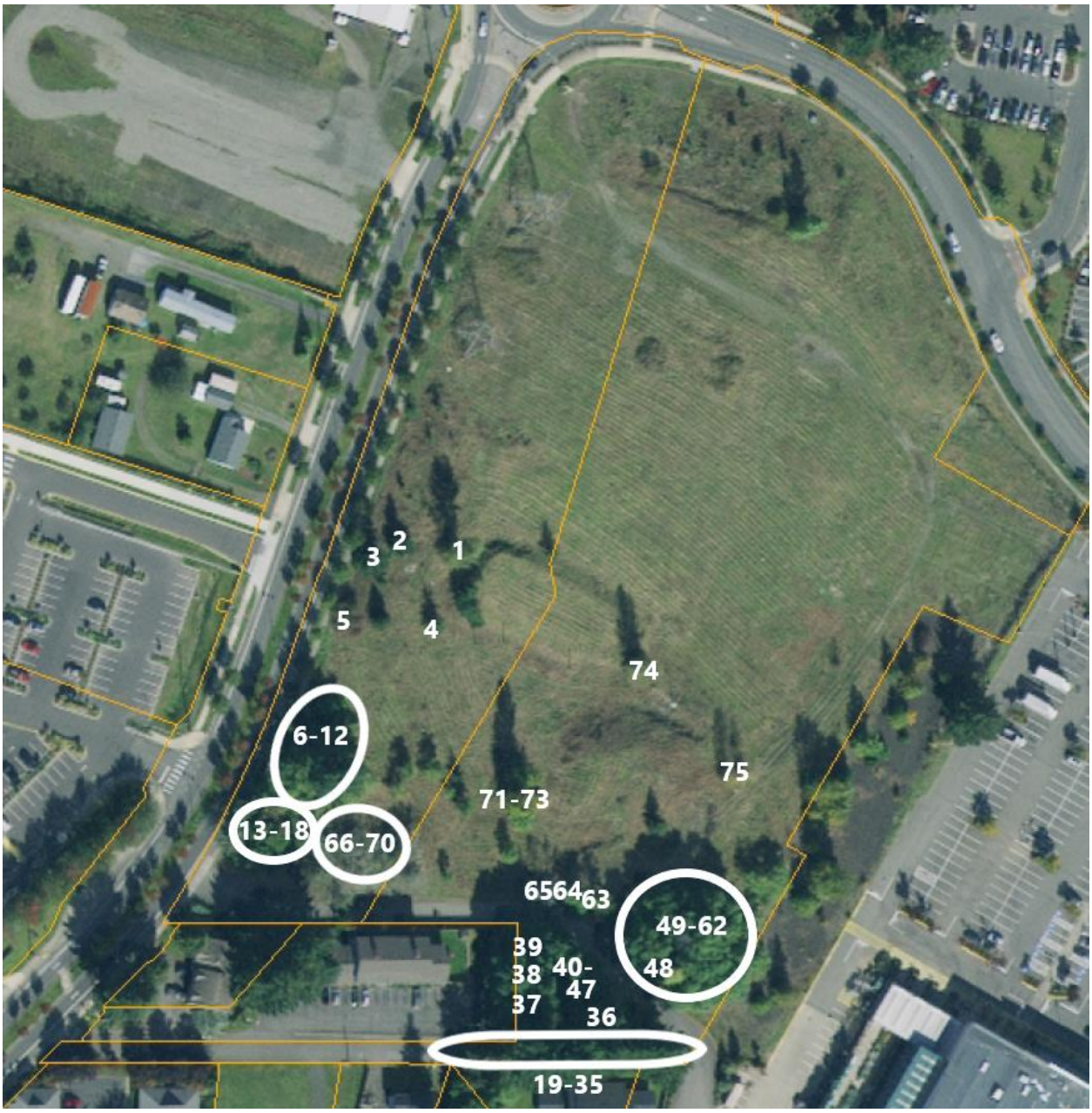
I am also recommending that the English ivy be removed from the trees to be retained. This will start having a negative effect on the condition of the trees.

Professionally Submitted,

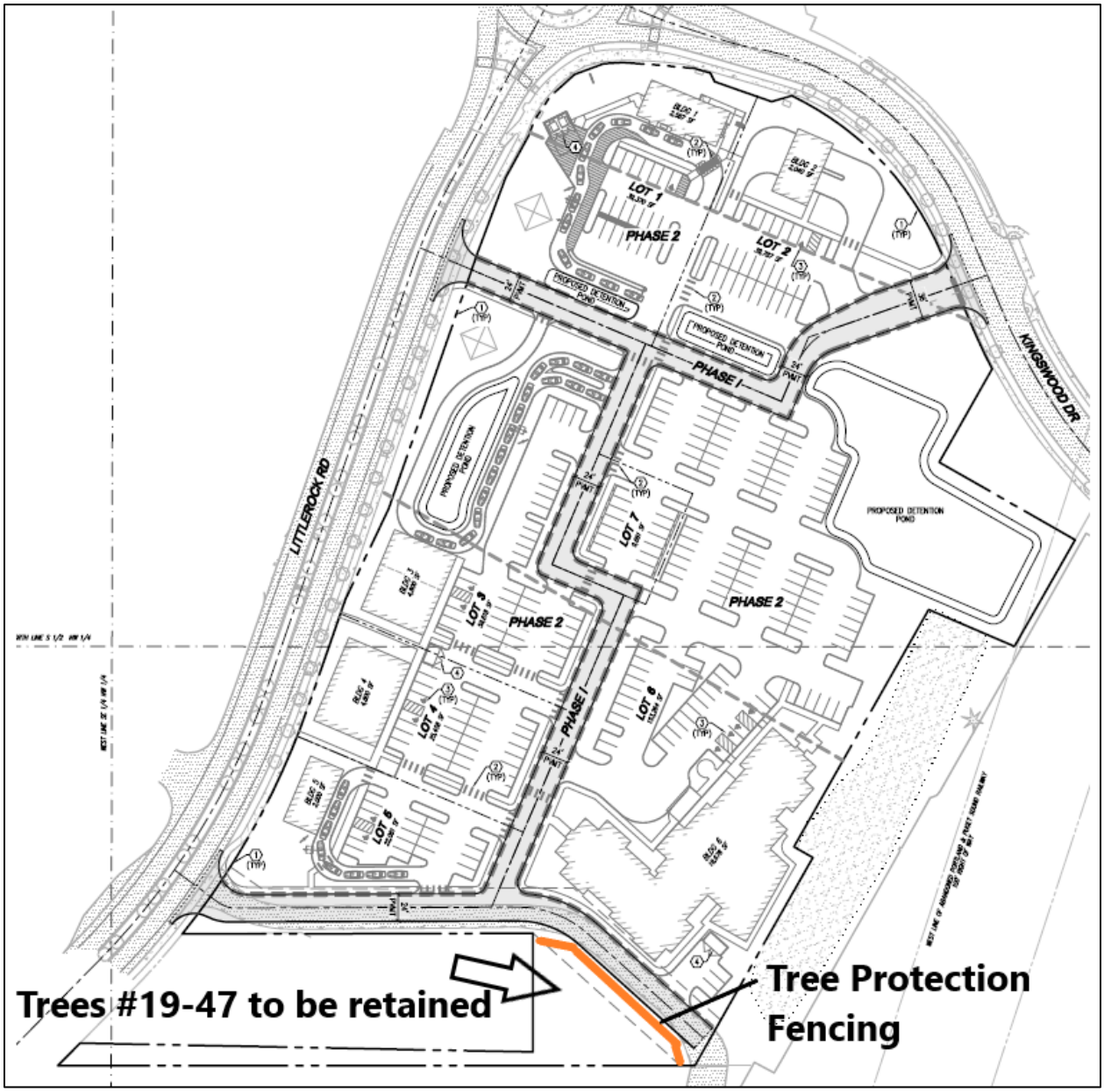


Kevin M. McFarland, Principal
ISA Certified Arborist PN-0373 & ISA Tree Risk Assessment Qualified
Sound Urban Forestry, LLC

Locations of Inventoried Trees



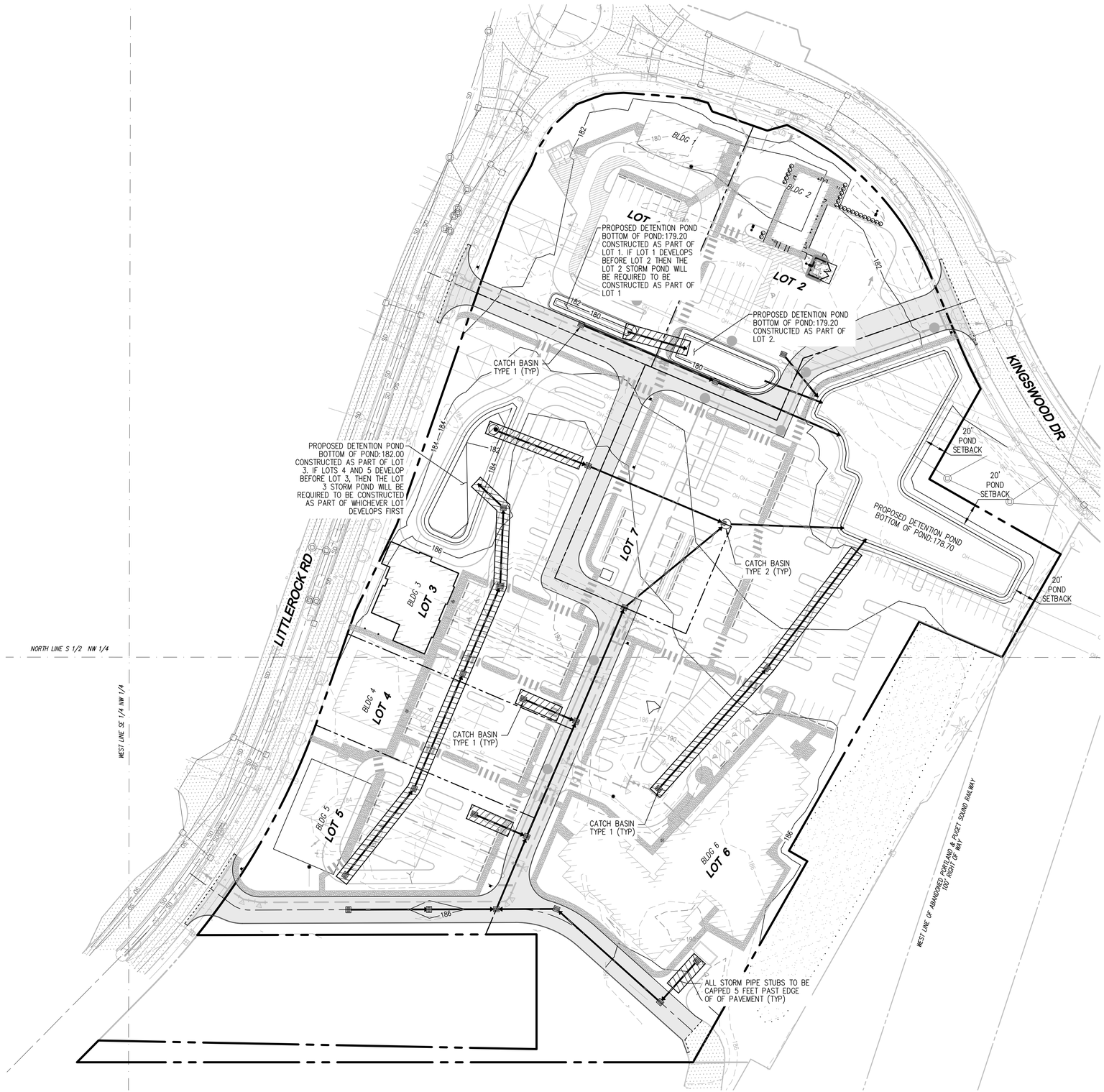
Recommended Tree Protection Fencing

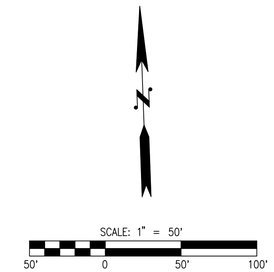


ATTACHMENT 1:

SITE DEVELOPMENT DRAWINGS

A PORTION OF SEC 03, TWN 17, RGE 2W, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON





LEGEND

- TYPE 1 CATCH BASIN, GRATED LID
- TYPE 1 CATCH BASIN, SOLID LID
- TYPE 2 CATCH BASIN, GRATED LID
- TYPE 2 CATCH BASIN, SOLID LID
- STORM PIPE
- SEWER PIPE
- WATER PIPE
- STORM PIPE – DEVELOPED AS PART OF INDIVIDUAL LOTS

GRADING NOTES

THE CITY OF TUMWATER REQUIRES THAT THE FIRM PROVIDING THE SOILS REPORT PERFORM WORK IN ACCORDANCE WITH THE FOLLOWING:

INSIGHT GEOLOGIC, INC. CONDUCT THE SITE INSPECTIONS AS DEFINED IN THE REPORT. THE CITY ALSO REQUIRES THAT IN ADDITION TO THE SOILS ENGINEERING FIRM, A WABO REGISTERED SPECIAL INSPECTOR WITH EXPERIENCE WITH SOIL GRADING BE EMPLOYED, BY THE OWNER, TO CONDUCT COMPACTION TESTING FOR THE BUILDING PADS AND THE REQUIRED FIRE LANES. THE SPECIAL INSPECTOR SHALL NOT BE THE GEOTECHNICAL FIRM, THE CIVIL ENGINEER OF RECORD OR AN EMPLOYEE OF THE CONTRACTOR.

ALL GRADING WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE SOILS REPORT PREPARED BY INSIGHT GEOLOGIC, INC. COMPACTION TESTING OF THE SOILS UNDER THE FIRE LANES AND THE BUILDING FOUNDATIONS AND UTILITY TRENCHES SHALL BE VERIFIED BY INSIGHT GEOLOGIC, INC. AND THE WABO SPECIAL INSPECTOR.

THE OWNER WILL NEED TO SUBMIT THE NAME OF THE WABO REGISTERED FIRM WHO WILL CONDUCT THE SPECIAL INSPECTIONS, TO THE BUILDING OFFICIAL, PRIOR TO ISSUANCE OF THE SITE DEVELOPMENT/GRADING PERMITS.

THAT NO VERTICAL OR COMBUSTIBLE CONSTRUCTION WILL BE ALLOWED ON THE CONSTRUCTION SITE UNTIL THE FIRE HYDRANTS AND PAVED ROADS ARE INSTALLED, TESTED AND APPROVED BY THE CITY OF TUMWATER. NOTE: TESTING WILL ALSO INCLUDE VERIFICATION OF FIRE FLOW BY THE FIRE DEPARTMENT.

DISCLAIMER

TOPOGRAPHIC SURVEY INFORMATION CONTAINED ON THESE PLANS HAS BEEN PROVIDED BY MTN 2 COAST, LLC. LDC, INC. (LAND DEVELOPMENT CONSULTANTS, INC.) ASSUMES NO LIABILITY AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.

REVISIONS			
NO.	DATE	DESCRIPTION	BY

LDC
Surveying
Engineering
Planning
Woodinville
Olympia
Kent
1411 State Avenue NE #200
Olympia, WA 98506
T: 425.806.1869
F: 425.482.2893
www.LDCcorp.com

KCI COMMERCIAL, INC.

KINGSWOOD COMMERCIAL

BINDING SITE PLAN AND PLANNED UNIT DEVELOPMENT

PRELIMINARY GRADING AND DRAINAGE PLAN

TYRELL E. BRAMAN
STATE OF WASHINGTON
51055
REGISTERED
PROFESSIONAL ENGINEER
9-30-22

JOB NUMBER:	C22151
DRAWING NAME:	C22151P-RD-PL
DESIGNER:	REW
DRAFTING BY:	AJW
DATE:	SEPTEMBER, 2022
SCALE:	1"=50'
JURISDICTION:	TUMWATER

CG-01

SHEET 3 OF 5

Drawing: P:\Civil\2022\c22-151 kingswood commercial\Drawings\preliminary\C22151P-RD-PL.dwg Plotted: Sep 30, 2022 - 9:16am

ATTACHMENT 2:

CONSTRUCTION SWPPP REPORT

TO BE INCLUDED AS PART OF THE CONSTRUCTION DOCUMENT SUBMITTAL

ATTACHMENT 3:

SOILS REPORT

INSIGHT GEOLOGIC, INC.

Geotechnical & Stormwater Evaluation

Proposed Retail Development
1401 & 1551 Kingswood Drive SW

Prepared For:

Kingswood Capital, Inc.

INSIGHT GEOLOGIC, INC.

April 19, 2011

Pacland
606 Columbia Street NW, Suite 106
Olympia, WA 98501

Attention: Nick Taylor

Report
Geotechnical and Stormwater Evaluation
Proposed Retail Development
Kingswood Drive
Tumwater, Washington
File No. 519-001-01

INTRODUCTION

Insight Geologic, Inc. is pleased to provide this report of our evaluation of site soil conditions as they relate to geotechnical properties and infiltration and disposal of stormwater from the retail developments to be located at the properties currently identified as 1401 and 1551 Kingswood Drive SW in Tumwater, Washington.

The Kingswood Drive properties consist of two parcels comprising approximately 9 acres. We understand that the proposed development project will include several single-story commercial buildings, paved parking and driveway areas and appurtenant stormwater facilities. No excess loads for the buildings are anticipated. We understand that stormwater from the proposed development is to be infiltrated to the subsurface through an infiltration facility located on the northeastern portion of the property.

Our proposal was requested by Pacland in their Request for Proposal dated February 4, 2011 and authorized by Pacland on March 24, 2011.

SCOPE OF SERVICES

The purpose of our services was to evaluate subsurface soil conditions as they relate to foundation and pavement design as well as the infiltration and disposal of stormwater from the proposed development. The specific tasks performed are outlined below.

1. Conduct a Phase I Environmental Site Assessment for the property in general accordance with ASTM methodology. This report is being provided under separate cover.
2. Conduct a site reconnaissance to evaluate and mark proposed test pit and boring locations at the site.

1015 East 4th Avenue, Olympia, Washington 98506
Phone: 360.754.2128 Fax: 360.754.9299

3. Provide for clearing needed to access the property and test pit locations.
4. Perform utility location at the site to evaluate the presence of subsurface obstructions.
5. Excavate as many as 19 exploratory test pits at the site using a small, track-mounted excavator. The test pits extended to a depth of about 10 feet below ground surface.
6. Drill 3 exploratory borings in the area of the proposed stormwater infiltration pond and underground gallery. The borings were drilled to a depth of 24 feet or five times the depth of the proposed structure as required under the City of Tumwater 2009 Drainage Manual.
7. Collect representative soil samples from the borings for evaluation of grain size distribution.
8. Maintain logs of the soil encountered in the test pits and borings in general accordance with the Unified Soil Classification System.
9. Conduct appropriate laboratory testing on soil samples collected from the test pits and borings to evaluate design infiltration rates and geotechnical properties including bearing capacity and suitability of site soils for use as fill.
10. Prepare a report containing the results of our assessment and including recommendations for site preparation, evaluation of site soils for use as fill, recommended stripping depths, building slab and foundation recommendations, building drainage, cut and fill slope recommendations, and light- and heavy-duty pavement preparation and design as well as design stormwater infiltration rates and identified seasonal high groundwater elevations.

SITE CONDITIONS

GENERAL

The site is located east of Littlerock Road SW and south of Kingswood Drive within the City of Tumwater. The site is shown relative to surrounding physical features in Figure 1. The site is bordered to the east by a Home Depot store and to the north by a WalMart store currently under construction. Properties to the west and south are occupied by single and multi-family housing.

A Bonneville Power Administration (BPA) high-voltage transmission line traverses the northern third of the property within an easement area. Four metal towers are located on the property.

A groundwater monitoring well (MW-1) is located adjacent to Littlerock Road between the western-most power line towers. This groundwater monitoring well appears to have been installed during a previous geotechnical investigation centered on the Walmart Property to the north. Monitoring well MW-1 was used to calculate historic high groundwater elevations for the property and will be discussed later.

Historically a number of residences were located on the western parcel of property fronting Littlerock Road. Additionally, the central portion of the properties was used as a borrow source for topsoil to depth of about 12 feet. The excavation remaining after the borrow operations was filled with a mixture of debris including bricks, concrete, metal, composite shingles and wood waste. This uncontrolled fill material was then covered with soil and moderately compacted. A discussion of this uncontrolled fill is included later in this report.

Several piles of fill material are also located on the property. The origin of the fill is unknown. The soils in the piles appear to be somewhat high in the percentage of fines, but appear to be suitable for use as fill, or in landscape areas at the site.

The property is roughly rectangular in shape and comprises approximately 9 acres. The site is generally flat with an elevation ranging between approximately 188 and 180 feet above mean sea level (MSL) measured to the NGVD 29 datum. The property is currently undeveloped.

SURFICIAL SOIL CONDITIONS

Surficial soil conditions were evaluated by reviewing the U.S. Department of Agriculture Soil Survey of Thurston County, Washington dated 1979. According to the soil survey report, the site is underlain by Nisqually loamy fine sand. This soil exhibits rapid permeability, slow water runoff and a slight hazard of erosion.

SUBSURFACE EXPLORATIONS

GENERAL

Subsurface conditions at the site were explored by advancing 3 borings and 19 test pits at the approximate locations shown in Figure 2 on March 28 and 29 2011. The test pits were excavated using a small, track-mounted backhoe. The test pits were completed to depths ranging between 5 and 11 feet below ground surface. Borings were conducted using a truck mounted probe rig to obtain subsurface samples continuously to the total depth of the borehole.

A geologist from Insight Geologic, monitored the excavation of the test pits and borings and maintained logs of the soils encountered. The soils were visually classified in general accordance with the system described in ASTM D2487-06. Logs of the exploratory test pits and borings are contained in Attachment A of this report.

The exploratory test pits were backfilled using the soil removed from the test pit. Backfilled soil was tamped in place using the bucket of the backhoe. The backfilled soil was not compacted as structural fill and should be expected to settle over time. If structures are intended to be placed over the test pit areas, the soil should be over-excavated and compacted.

SUBSURFACE CONDITIONS

Native soil exposed in the test pits consisted of about 1 foot of dark brown silty fine to medium sand (SM) overlying fine to medium sand (SP) with trace amounts of silt. We encountered fill soil in the middle and north central portions of the site that consisted of between 2 and 7 feet of light brown fine to coarse sand with silt and cobbles overlying waste materials consisting of brick, concrete, metal, composite shingles, wood-waste and other debris that is unsuitable for construction at the site. Our estimate of the volume of unsuitable fill material at the site is approximately 80,000 cubic yards based on a nominal thickness of 14 feet, although it is likely that much of this material may be screened and reused as structural fill. Unsuitable fill materials such as trash and wood debris should be excavated and removed from the site. Overlying material and some material within the fill such as brick and concrete debris may be reused as structural fill provided they meet the requirements of structural fill as detailed later in this report. The general area of unsuitable and uncontrolled fill found at the site is shown in Figure 2.

Groundwater was encountered in the borings at a depth of about 15 feet below existing grade. Given the time of year the borings were drilled, this depth may be considered as the seasonal high groundwater level for the purposes of stormwater system design.

LABORATORY TESTING

Four soil samples from the borings in the area of the proposed stormwater infiltration structure and two soil samples from test pits TP-6 and TP-9 were submitted for gradation analysis in general accordance with ASTM methodology. The results of the gradation analyses are contained in Attachment B.

The gradation analyses indicated that the soils exposed in boring B-2 at depths of between 0 and 10 feet consisted of poorly graded sand with silt and gravel (SP-SM) and silty sand with gravel (SM). This soil appears to be imported fill material and not soil native to the site. The sample from boring B-2 representative of the 10 to 25 foot interval consisted of poorly graded sand (SP). The sample from boring B-3 collected from a depth between 7 and 15 feet also consisted of poorly graded sand (SP). These materials appear to be representative of native soils on the site.

The samples from test pit TP-6 and TP-9 were collected from stockpiled soils on the site. The sample from TP-6 consists of silt (ML) and the sample from TP-9 was classified as silty sand (SM).

Four soil samples collected from native as well as stockpiled soils were tested for moisture-density relationships using the Modified Proctor Method (ASTM D1557). Testing indicates that the maximum dry density of native soils is 114 pounds per cubic foot

at a moisture content of 11 percent. Laboratory results for Proctor tests are included in Attachment B.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

The test pits and borings conducted for our study revealed the presence of native silty sand and poorly graded sand to the maximum depth explored. These soils appear to be suitable for the proposed commercial development planned for the site.

Our explorations also revealed the presence of a large area of uncontrolled, undocumented fill that will be unsuitable for bearing structures or parking areas on. We encountered fill soil in the middle and north central portions of the site that consisted of between 2 and 7 feet of light brown fine to coarse sand with silt and cobbles overlying waste materials consisting of brick, concrete, wood-waste and other debris that is unsuitable for construction at the site. Our estimate of the volume of unsuitable fill material at the site is approximately 80,000 cubic yards based on a nominal thickness of 14feet.

Unsuitable fill materials such as trash and wood debris should be excavated and removed from the site. Overlying material and some material within the fill such as brick and concrete debris may be reused as structural fill provided they meet the requirements of structural fill as detailed later in this report. The general area of unsuitable and uncontrolled fill found at the site is shown in Figure 2.

EARTHWORK

General

We expect that site grading may be accomplished using conventional earthmoving equipment. The soils in the upper 2 feet of the site contain a moderate amount of fines and organics and may be moisture sensitive during wet weather. These materials may be difficult to operate on or compact during wet weather. Operation of heavy equipment at the site under wet conditions or when the soils are above optimum moisture content can be expected to result in considerable disturbance to the exposed subgrade soils. We recommend that earthwork be undertaken during periods of dry weather to reduce grading costs.

Clearing and Site Preparation

All areas to be graded should be cleared of surface and subsurface deleterious materials including trees, sod, brush, debris and other unsuitable or organic materials. We expect that stripping depths of between 6 and 12 inches will be required at the site to remove the surficial soils containing substantial amounts of organic material. Deeper stripping depths

will be required in areas of heavy vegetation or, if the clearing operations cause excessive disturbance to the surficial soils, or if additional unsuitable soils are exposed during stripping operations.

We recommend that any trees be removed by overturning so that a majority of the tree roots are removed. Excavations from tree removal operations should be backfilled with structural fill compacted to the densities indicated in the "Structural Fill" section of this report.

The stripped material may be stockpiled and used later in nonstructural applications (e.g. landscape areas). Materials that cannot be used for landscaping should be removed from the project site and wasted.

Removal of Uncontrolled Fill

Significant quantities of uncontrolled and unsuitable fill were encountered in test pits and borings conducted in the north-central portion of the site extending to depths of 14 feet. The unsuitable fill materials consisted of brick, concrete, wood-waste, construction debris and trash. Uncontrolled fill, particularly fill containing significant quantities of wood and wood-waste such as logs and stumps, can be expected to settle over time as the wood decays. Long-term settlement can result in pavement distress or failure, utility disruption or deflection of floor slabs.

We recommend that the unsuitable fill material be removed and replaced with appropriate structural fill. Properly screened fill soil may be used as structural fill as long as it meets the specifications in the "Structural Fill" section of this report. All organic materials and refuse removed during the remediation process should be hauled from the site and disposed of at an approved facility. Masonry brick and concrete materials encountered during removal may be reused as structural fill provided they are reduced to fragments 3 inches or smaller in diameter. Oversize material that is screened out during the process should be hauled to an approved landfill and disposed of.

It should be noted that during a previous geotechnical investigation focused on the property immediately north of the subject site, soil samples collected and analyzed for the presence of heavy metals indicated the presence of chromium and lead at concentrations exceeding the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A cleanup levels for unrestricted land use (WAC 173-340-740). Therefore, it is possible that other soils imported to the site for use as fill may contain concentrations of hazardous or potentially hazardous materials. We recommend that additional sampling and appropriate laboratory testing be undertaken to evaluate the potential of hazardous materials on the property prior to the commencement of grading efforts.

Subgrade Preparation

We recommend that a representative of Insight Geologic be present to observe and evaluate the exposed subgrade conditions after stripping is completed and prior to placement of any structural fill. The exposed subgrade soil should be evaluated by proof rolling with heavy rubber tired equipment during dry weather or by probing with a ½ inch diameter steel rod during wet weather.

Any soft, loose or otherwise unsuitable areas delineated during proof rolling or probing should be recompacted, if practical, or over-excavated and replaced by structural fill.

After completing the proof rolling, the subgrade areas should be recompacted to a firm and unyielding condition. We recommend that Insight Geologic or a qualified testing firm evaluate the compaction effort and any compacted soils. A full and complete record of all observations and compaction measurements should be retained by the client. We recommend that all subgrade areas beneath roadways be compacted to at least 95 percent of the soil maximum dry density (MDD) in accordance with ASTM D1557 test procedure.

STRUCTURAL FILL

General

All fill that is placed at the site beneath structures and/or pavements should be placed as structural fill. We recommend that structural fill be free of debris, significant organic materials and rock fragments larger than about 6 inches. The workability of materials for use as structural fill depends on the gradation and moisture content of the soil. As the amount of fines increases, soil becomes increasingly more sensitive to small changes in moisture content. Compaction of native soils in accordance with the recommendations provided in this report then becomes difficult or impossible to achieve if the soil is above the optimum moisture content.

All fill and backfill beneath buildings should be compacted to at least 95 percent of soil MDD, based on ASTM D1557 (modified Proctor) testing procedure. Pavement subgrade soils and utility trench backfill should be compacted to at least 90 percent of the MDD up to within 2 feet of design grades; the upper 2 feet should be compacted to at least 95 percent of the MDD.

The lift thickness used during placement and compaction of structural fill will depend on the moisture and gradation characteristics of the soil and the type of equipment being used. If necessary, the material should be moisture conditioned to near-optimum moisture content prior to compaction. During fill and backfill placement, sufficient testing of in-place density should be performed to verify that adequate compaction is being achieved. The required frequency of density testing should be determined by the on-site testing professional. We recommend a lift thickness of no greater than 6 inches be placed and compacted for each compaction run.

Suitability of On-Site Materials as Fill

During dry weather construction, any non-organic (generally less than 30 percent organics) onsite soil may be considered for use as structural fill, provided it meets the criteria described in the Structural Fill section of this report and can be compacted as recommended. If the native material is over optimum moisture content when excavated, it will be necessary to aerate or dry the soil prior to placement as structural fill.

The site soils which contain moderate amounts of silt may be moisture sensitive. These materials may not be suitable for use as fill under wet weather conditions.

Cut Slopes

Temporary cut slopes are anticipated for construction of underground utilities. All temporary cut slopes and shoring must comply with the provisions of Washington Administrative Code (WAC) Title 296, Part N, "Excavation, Trenching and Shoring." The contractor performing the work has the primary responsibility for protection of workers and adjacent improvements, deciding whether to use shoring, and for establishing the safe inclination for open-cut slopes.

Temporary unsupported cut slopes more than 4 feet high may be inclined to 1.5H:1V maximum steepness in the native soils. Cut slopes in the unconsolidated fill should be 2H:1V or flatter. This guideline assumes that all surface loads are kept at a minimum distance of at least one half the depth of the cut away from the top of the slope and that significant seepage is not present in the slope face. Flatter slopes will be necessary where significant seepage occurs. Some sloughing and raveling of the cut slopes should be expected over time. Temporary covering with heavy plastic sheeting should be used to protect these slopes during periods of wet weather.

Cut slopes for long term structures such as stormwater ponds should be inclined to 2H:1V or flatter for long term stability.

FOUNDATION SUPPORT

The soils at the site are generally in a loose condition. Spread footings are appropriate for the soils encountered if anticipated footing loads do not exceed 2,000 pounds per square foot (psf) for combined dead and long-term live loads, exclusive of the weight of the footing and overlying backfill. This value may be increased by one third for transient loads such as those induced by seismic events or wind loadings. If higher loads are anticipated, deep foundations or removal of unsuitable soil and replacement with structural fill should be considered.

We estimate that settlement of footings designed as recommended will be less than 1 inch for the anticipated load conditions, with differential settlements of less than 1 inch

between comparably loaded footings. Most of the settlements should essentially occur as loads are being applied. However, disturbance of the foundation subgrade during construction or the presence of loose or soft soils below the foundation could result in larger settlements than predicted.

Footing Depths and Widths

For frost and erosion protection, the base of all exterior footings should bear at least 24 inches below adjacent outside grades. To limit post-construction settlements, continuous (wall) and isolated (column) footings should be at least 18 and 24 inches wide, respectively.

Bearing Subgrades

At least 12 inches of structural fill, compacted to a density of at least 95 percent (based on ASTM:D-1557), should underlie spread footings on this site that bear on the silty sand (SM) and poorly graded sand (SP) soils.

Lateral Overexcavation

Because foundation stresses are transferred outward as well as downward into the bearing soils, all structural fill placed under footings, up to 3 feet in thickness, should extend horizontally outward from the edge of each footing a distance equal to the depth of placed fill. Fill should extend a minimum of 12 inches below the footing base and should also extend a minimum of 12 inches outward from the footing edges.

Subgrade Observation

All footing subgrades should consist of either firm, unyielding, native soils or suitable structural fill materials. Footings should never be cast atop loose, soft, or frozen soil, slough, debris, existing uncontrolled fill, or surfaces covered by standing water. We recommend that the condition of all subgrades be observed by a representative of Insight Geologic or other qualified testing firm before any concrete is placed.

Bearing Pressures

In our opinion, for static loading, footings that bear on properly prepared, structural fill subgrades can be designed for a maximum allowable soil bearing pressures of 2,000 psf.

Footing Settlement

We estimate that total post-construction settlements of properly designed footings bearing on properly prepared subgrades will not exceed 1 inch. Differential settlements for

comparably loaded elements may approach one-half of this value over horizontal distances of approximately 50 feet.

Footing and Stemwall Backfill

To provide erosion protection and lateral load resistance, we recommend that all footing excavations be backfilled on both sides of the footings, retaining walls, and stemwalls after the concrete has cured. Either imported structural fill or non-organic (generally less than 30 percent organics) on-site soils can be used for this purpose, contingent on a suitable moisture content at the time of placement. Regardless of soil type, all footing backfill soil should be compacted to a density of at least 90 percent (based on ASTM:D-1557).

BUILDING FLOOR SLABS

The maximum allowable soil bearing pressure for site soils is 2,000 psf. We recommend that preparations for the floor slabs for the proposed commercial structures adhere to the subgrade preparation and structural fill recommendations presented in this report. The slab base section should consist of a minimum 6-inch thick layer of crushed base course per WSDOT Standard Specification Section 9-03.9(3). The slab base material should be compacted to a minimum of 95 percent of their modified proctor maximum dry density per ASTM D1557.

To reduce the transmission of water vapor through the floor slab, we recommend the use of suitable vapor retarders such as plastic sheeting placed between the slab base and the floor slab and/or specially formulated concrete mixtures. At a minimum, a sheet of 6-mil polyethylene sheeting should be placed on top of the prepared base course and 2 inches of builders sand be placed atop the plastic sheeting and compacted to 90 percent MDD.

The identification of alternatives to prevent vapor transmission is outside of our expertise. A qualified architect or building envelope consultant can make recommendations for reducing vapor transmission through the slab based on the building use and flooring specifications. Our investigation addresses present subgrade conditions for slab support only and does not evaluate future potential conditions unless specifically stated otherwise.

PAVEMENT

All pavement designs were developed assuming a 20-year design life and a usage factor of 7-days-a-week.

Our pavement design recommendations were developed using the AASHTO method for flexible and rigid pavement designs. Our pavement sections are based on the following assumptions and design information:

- An assumed subgrade CBR of 20

- Standard-Duty Paving Equivalent Single Axle Loading (ESAL) 54,000
- Heavy-Duty Paving ESAL 270,800
- Pavement sections should be placed on a subgrade that has been proof-rolled, determined by a qualified person to be firm and unyielding and is compacted to at least 95 percent of the modified proctor MDD in accordance with ASTM D1557.
- All asphalt edges shall be supported by adjacent structure, curb, or compacted gravel shoulder
- Paved surfaces should be adequately sloped to direct surface water runoff away from the building.

The standard-duty pavement section shall consist of subgrade material compacted to 95 percent MDD overlain by 8 inches of gravel base course conforming to section 9-03.10 of the WSDOT Standard Specifications and compacted to 95 percent MDD. A minimum of 2 inches of crushed surfacing Top Course conforming to Section 9-03.9(3) of the WSDOT Standard Specifications shall be placed atop the prepared base course and compacted to a minimum density of 95 percent MDD. The wearing course shall consist of a minimum of 3 inches of Commercial Hot Mix Asphalt sloped to provide adequate drainage.

Heavy-duty pavement areas shall consist of subgrade material compacted to 95 percent MDD overlain by 8 inches of gravel base course conforming to section 9-03.10 of the WSDOT Standard Specifications and compacted to 95 percent MDD. A minimum of 2 inches of crushed surfacing Top Course conforming to Section 9-03.9(3) of the WSDOT Standard Specifications shall be placed atop the prepared base course and compacted to a minimum density of 95 percent MDD. The wearing course shall consist of a minimum of 5 inches of Commercial Hot Mix Asphalt sloped to provide adequate drainage.

SEISMIC AND GEOLOGIC HAZARDS

IBC Seismic Design Criteria

The subject property is located in an area designated as Site Class D is appropriate for design based on the 2006 IBC. Based on our experience in this area, a 100-foot boring was not required in order to provide a recommended Site Classification.

Seismicity and Faulting

The Puget Lowland is located in an area of frequent earthquakes of moderate to strong intensity. It lies over an active subduction zone, where the oceanic Juan de Fuca plate is being subducted beneath the North American plate. Areas adjacent to subduction zones are capable of generating very high magnitude earthquakes. Three earthquakes within the Puget Sound area in the last 55 years have caused significant damage. The April 13, 1949 earthquake is the largest recorded earthquake in the region having a moment magnitude

(Mm) of 7.1. Other lesser, but still significant earthquakes in 1965 and 2001 were had magnitudes of 6.5 and 6.8, respectively.

Moment magnitude is only one measure of earthquake intensity. Even moderate earthquakes can produce structural damage on poorly consolidated soils.

No mapped active faults are located within 5 miles of the project site; therefore, we estimate the ground rupture hazard at the site to be low.

Liquefaction

The probability of liquefaction occurring on the site during a design-level earthquake is low, based on the granular nature of the soils and on the depth to groundwater beneath the site.

Other Geologic Hazards

No other potential geologic hazards such as landslides or subsidence were identified on, or near the subject site.

DRAINAGE CONSIDERATIONS

The native soils on the site classify as Hydrologic Group A soils to a depth of 60 inches below existing grade. Foundation drains should be used where (1) crawl spaces or basements will be below a structure, (2) a slab is below the outside grade, or (3) the outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock and then wrapped in non-woven, geotextile filter fabric. At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor, and it should be sloped for drainage. All roof and surface water drains must be kept separate from the foundation drain system. Final site grading in areas adjacent to the buildings should slope away at least 2 percent for a distance of at least 10 feet, except where the area is paved.

STORMWATER INFILTRATION

Stormwater runoff from the site is proposed to be infiltrated into a pond or subsurface infiltration structure located in the northeastern portion of the site. Soil samples collected from the exploratory borings in this area and subjected to gradation analysis indicate the presence of fill soils (SP-SM and SM) overlying native SP soils at about 7 feet in depth.

We utilized the “Simple Method” identified in Table A.2 of the City of Tumwater Drainage Design and Erosion Control Manual (2009) to develop the design (long-term) infiltration rate for the proposed infiltration facility. Based on our gradation analyses, the native soils have a D_{10} of about 0.10 millimeters and a corresponding design infiltration rate of 2.0 inches per hour. This infiltration rate includes a safety factor of 2. We

recommend that any fill soils removed from this area as a part of grading efforts be replaced with suitably coarse material having a D_{10} grain size that is 0.10 millimeters or greater.

Seasonal high groundwater can be expected to occur at a depth of about 15 feet below ground surface in this portion of the site based on groundwater observed in the borings. This seasonal high groundwater elevation provides a vertical separation of greater than three feet between the base of the proposed infiltration structure and seasonal high groundwater assuming an infiltration structure depth of 5 feet below existing grade in accordance with Tumwater's design guidelines. The seasonal high groundwater elevation should not be confused with the historic high groundwater elevation, which is discussed in detail below.

HISTORIC HIGH GROUNDWATER ELEVATIONS

The proposed project sites lie within an area designated by the City of Tumwater as an area of high groundwater concern due to flooding in 1996 and 1999. Tumwater promulgated Ordinance No. O2004-003 "Site Development Standards for New Development in the Salmon Creek Basin and other High Groundwater Areas in 2004. These standards outline the steps necessary to evaluate the effect of stormwater infiltration on proposed development prior to beginning construction.

The first step in the evaluation is to estimate the depth to historical high groundwater beneath the site. Sites with historic high groundwater levels within 6 feet of the base of a proposed infiltration facility require further evaluation and modeling. We have reviewed the figure titled "Estimated Depth to Water, Winter 1999" contained in the report "Salmon Creek Drainage Basin Conceptual Hydrogeologic Model" dated June 2001, to evaluate the depth to high groundwater beneath the proposed project site. The estimated depth to the historic groundwater table beneath the site appears to be less than 6 feet below ground surface and therefore requires further evaluation to resolve the high groundwater issue.

A groundwater monitoring well located on the western portion of the property (MW-1) was installed by Kleinfelder and Associates in 2005 as a part of a study that included the WalMart property to the north of Kingswood Drive. As a part of the WalMart project, Pacific Groundwater Group (PGG) conducted an analysis of the groundwater data collected by Kleinfelder to establish the historic high groundwater elevation beneath the property.

While data from MW-1 was not used for the WalMart project, PGG performed the required regression analysis of the collected data and established a historic high groundwater elevation at the location of MW-1 of 173.2 feet (NGVD 29) or approximately 11 feet below ground surface. The regression analysis was performed by plotting groundwater elevation data for the City's reference well (LRS-O1A) against monitoring

data obtained from Kleinfelder for MW-1. A line of best fit was generated for each data set. The equation of the best-fit line and the R-squared value were also generated.

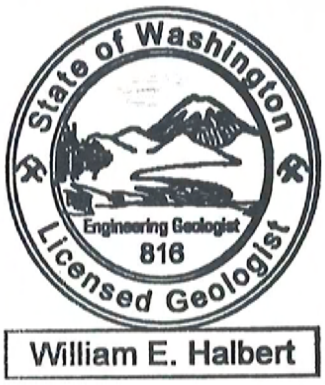
The historic high groundwater elevations for each monitoring well were calculated by using the known 1999 high groundwater elevation for the reference wells in the linear equations generated in the regression analyses. The depth to the calculated historic high groundwater table was obtained by subtracting the calculated groundwater elevation from the surveyed ground surface elevation at each monitoring well. PGG's Technical Memorandum dated March 5, 2010 prepared for the proposed WalMart store immediately north of the subject property and including data for the subject site is included in Attachment C to this report. The data derived by PGG and presented in their technical memorandum will be used to complete the necessary mounding analysis.

LIMITATIONS

We have prepared this geological report for use by Pacland and their client, Kingswood Capital for the proposed commercial development to be located at 1401 and 1551 Kingswood Drive SW in Tumwater, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geological engineering and in accordance with the City of Tumwater's Drainage Manual at the time this report was prepared. No warranty or other conditions express or implied, should be understood.

We appreciate the opportunity to assist you with this project. Please contact us if you have questions regarding the information presented in this report or if we can provide additional services.

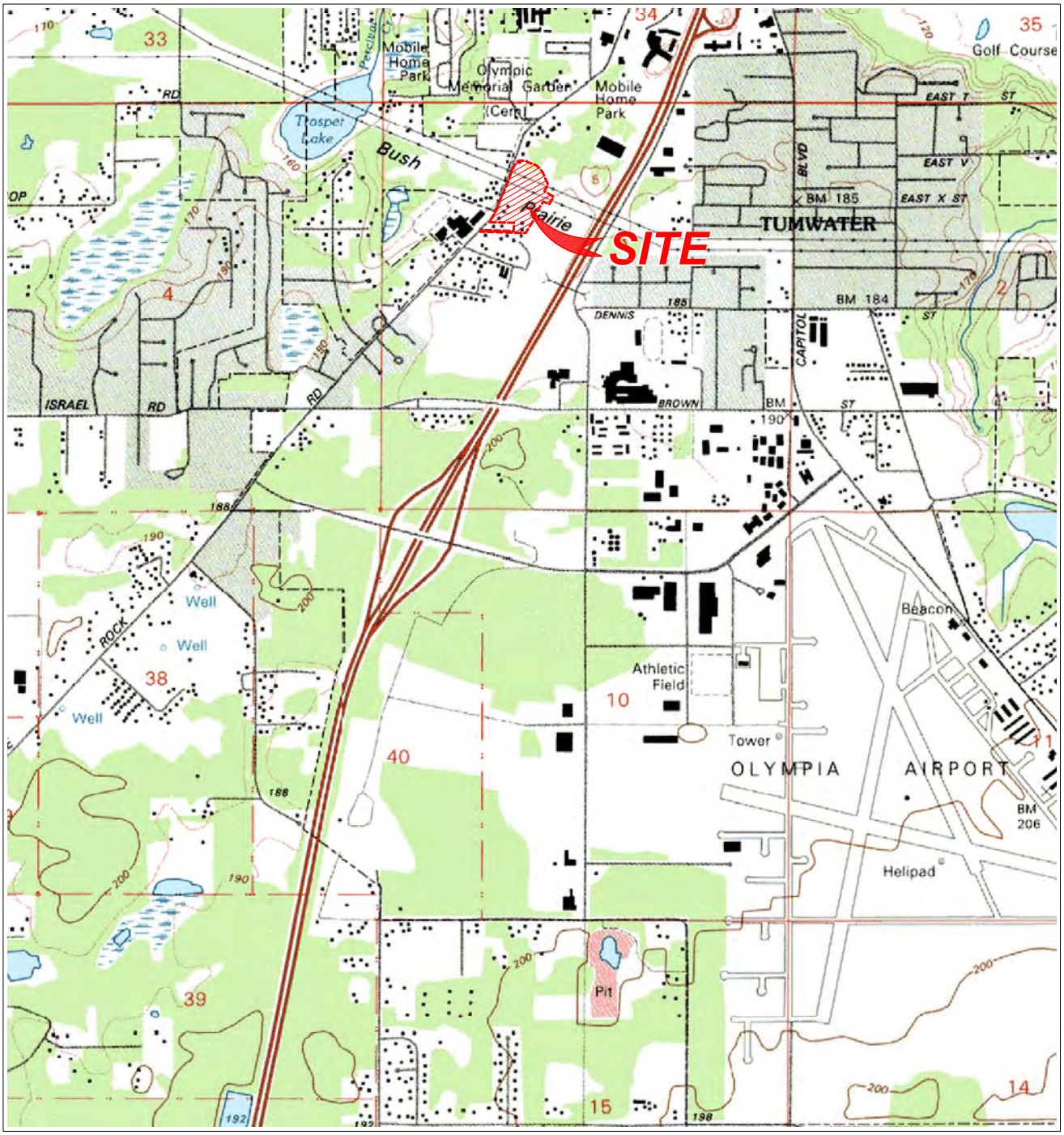


Very truly yours,
INSIGHT GEOLOGIC, INC.

William E. Halbert, L.G., L.E.G.
Principal

Attachments

FIGURES



Source: Maptech, Inc. (C) 1997

MAYTOWN, WASHINGTON
7.5 MINUTE QUADRANGLE
Year Created 1990

SCALE: 1: 24000

KINGSWOOD CAPITAL

TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 1
Vicinity Map

Source: U.S. Geological Survey & PacLand (c) 2011

0 25 50 100

SCALE: 1" = 100'

LEGEND:

- **B-1** — BORING LOCATION
- **TP-1** — TEST PIT LOCATION
- **MW-1** — MONITORING WELL LOCATION
- FILL PILE BOUNDARY
- BURIED FILL BOUNDARY
- PROJECT BOUNDARY

KINGSWOOD CAPITAL

TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 2
Site Plan

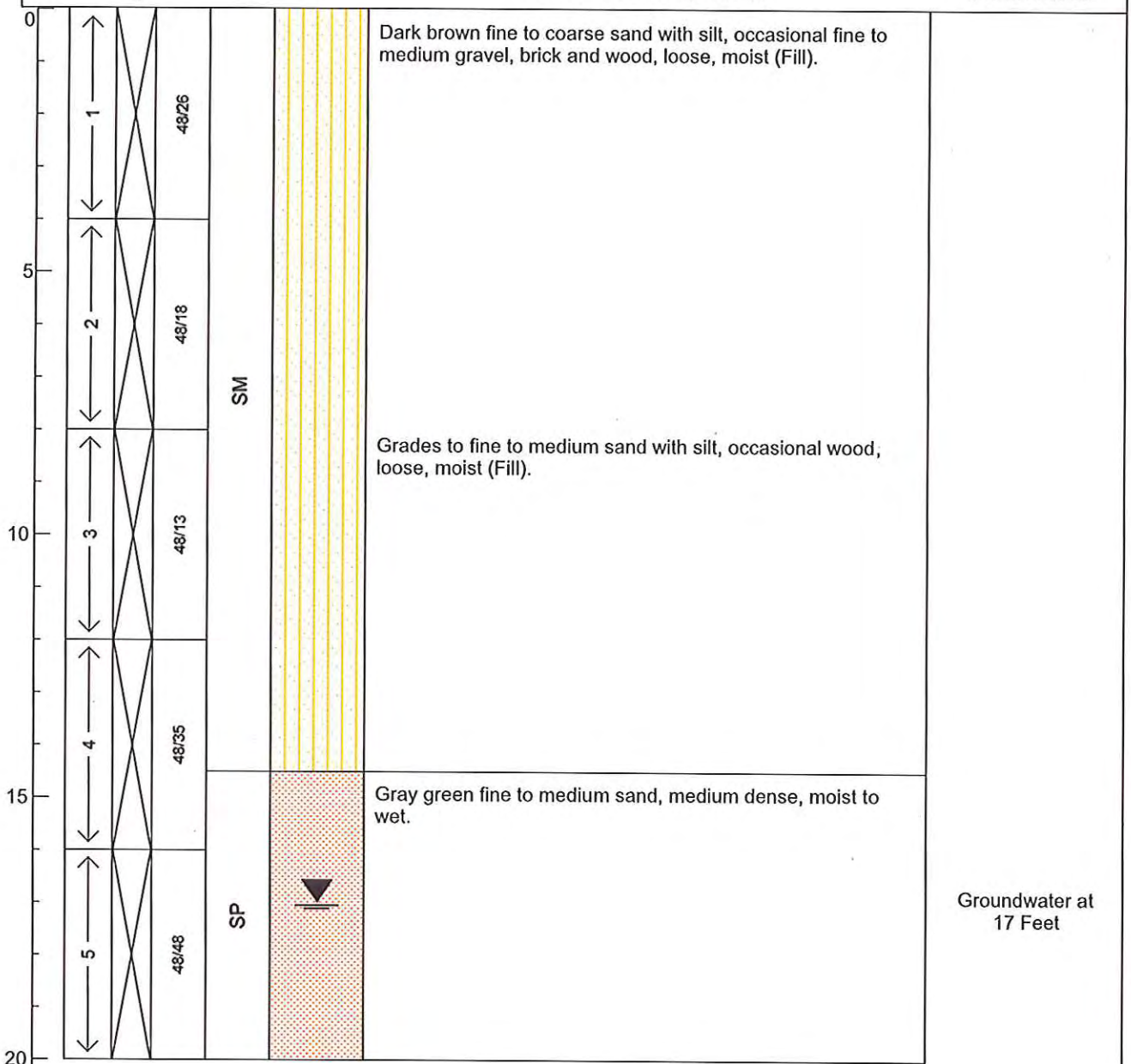
ATTACHMENT A

EXPLORATION LOGS

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

B-1

DATE: **3/28/11**
TOTAL DEPTH:**20 Feet**



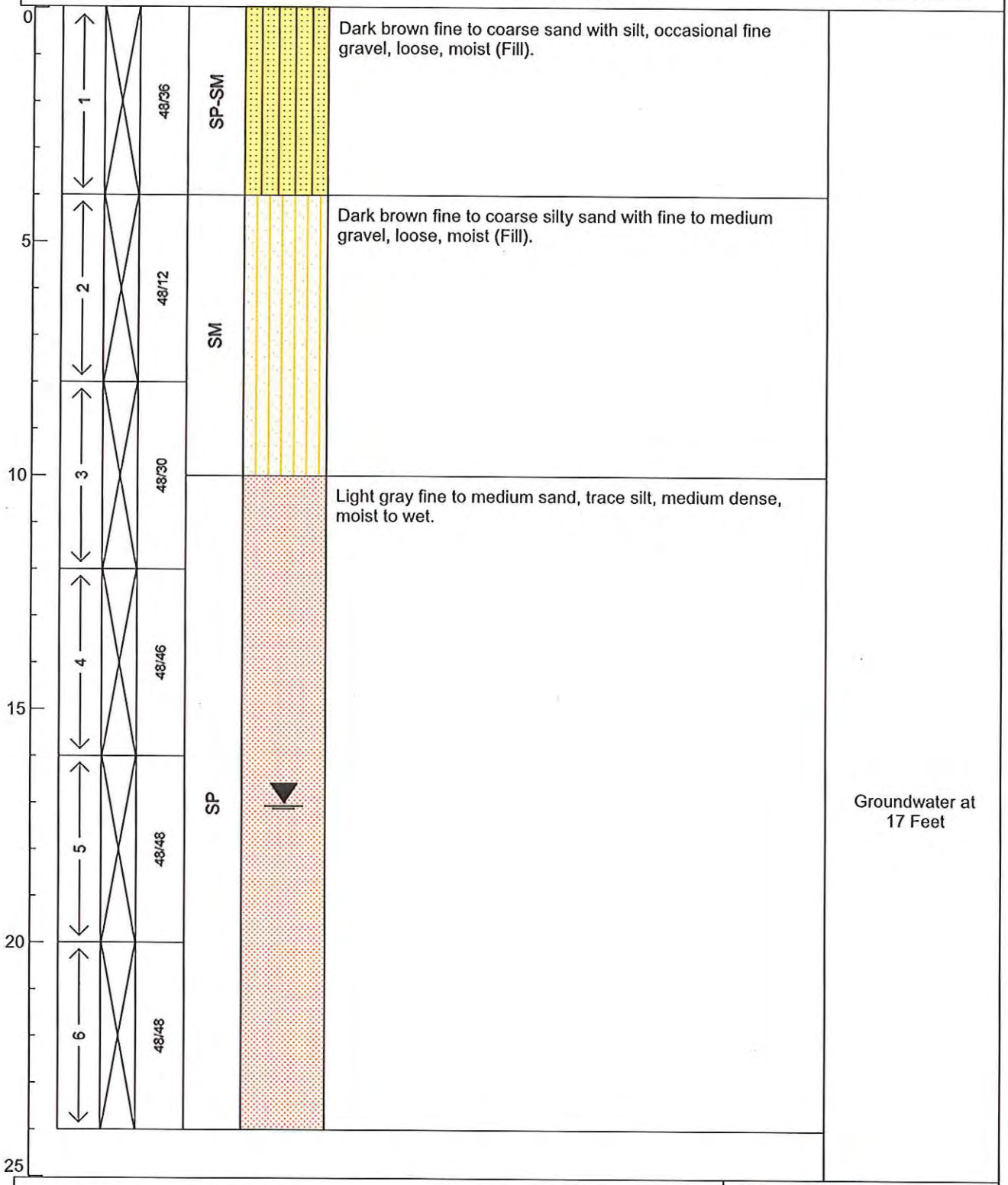
Drilling Contractor: **NW Probe**
Drilling Equipment: **AMS Power Probe 9630**
Logged By: **Kevin V.**
Driller: **Jason R.**
Drilling Method: **Direct Push**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

B-2

DATE: **3/28/11**
TOTAL DEPTH: **24 Feet**



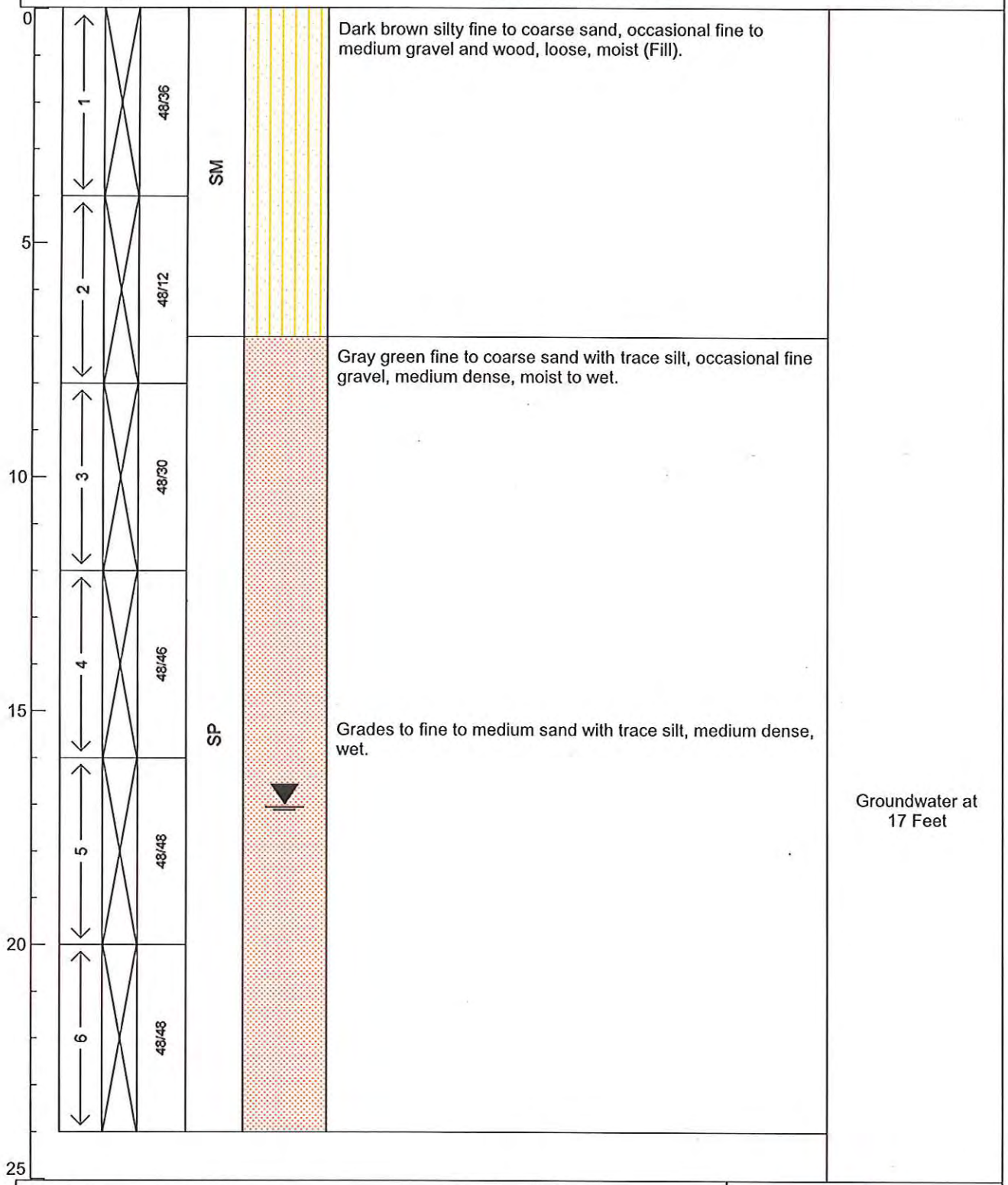
Drilling Contractor: **NW Probe**
Drilling Equipment: **AMS Power Probe 9630**
Logged By: **Kevin V.**
Driller: **Jason R.**
Drilling Method: **Direct Push**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

B-3

DATE: **3/28/11**
TOTAL DEPTH: **24 Feet**



Drilling Contractor: **NW Probe**
Drilling Equipment: **AMS Power Probe 9630**
Logged By: **Kevin V.**
Driller: **Jason R.**
Drilling Method: **Direct Push**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-1

DATE: **3/28/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silt with fine to medium sand, loose, moist.	
	SP		Light brown fine to medium sand with silt, loose, moist.	
5			Grades to light gray fine to medium sand with trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-2

DATE: **3/28/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Light brown fine to coarse sand and silt, occasional cobbles, loose, moist (Fill).	
			Grades to dark brown fine to medium sand and silt, loose, moist.	
5	SP		Light brown fine to medium sand and silt, loose, moist.	
			Grades to light gray fine to medium sand and trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-3

DATE: **3/28/11**
TOTAL DEPTH: **9.5 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Light brown fine to coarse sand and silt with fine to coarse gravel, occasional cobbles, medium dense, moist (Fill).	
			Grades to gray fine to coarse sand and silt with fine to coarse gravel, occasional cobbles, wood and brick debris, medium dense, moist (Fill).	
5				
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-4

DATE: **3/28/11**
TOTAL DEPTH: **6 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Light brown fine to coarse sand and silt with fine to coarse gravel, occasional cobbles, medium dense, moist (Fill).	
5	SP		Gray fine to coarse sand and silt with wood and construction debris, medium dense, moist (Fill).	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-5

DATE: **3/28/11**
TOTAL DEPTH: **8 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Light brown to light gray silty fine to coarse sand and gravel, dense, moist (Fill).	
			Grades to gray silt with fine to coarse sand and fine to coarse gravel with wood debris (Fill).	
5				Groundwater at 8 Feet
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-6

DATE: **3/28/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand with fine to medium gravel, occasional cobbles, loose, moist (Fill).	
	SP		Brown fine to coarse sand with fine to medium gravel, medium dense, moist (Fill).	
5	ML		Gray silt with fine to medium sand, trace fine to medium gravel, occasional wood debris, medium dense, moist (Fill).	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-7

DATE: **3/29/11**
TOTAL DEPTH: **11.5 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand, loose, moist.	
			Grades to light brown silty fine to coarse sand, occasional fine to coarse gravel, medium dense, moist (Fill).	
5	SP		Dark brown silty fine to medium sand, loose, moist.	
			Grades to light brown fine to coarse sand with silt, loose, moist.	
10				
15				

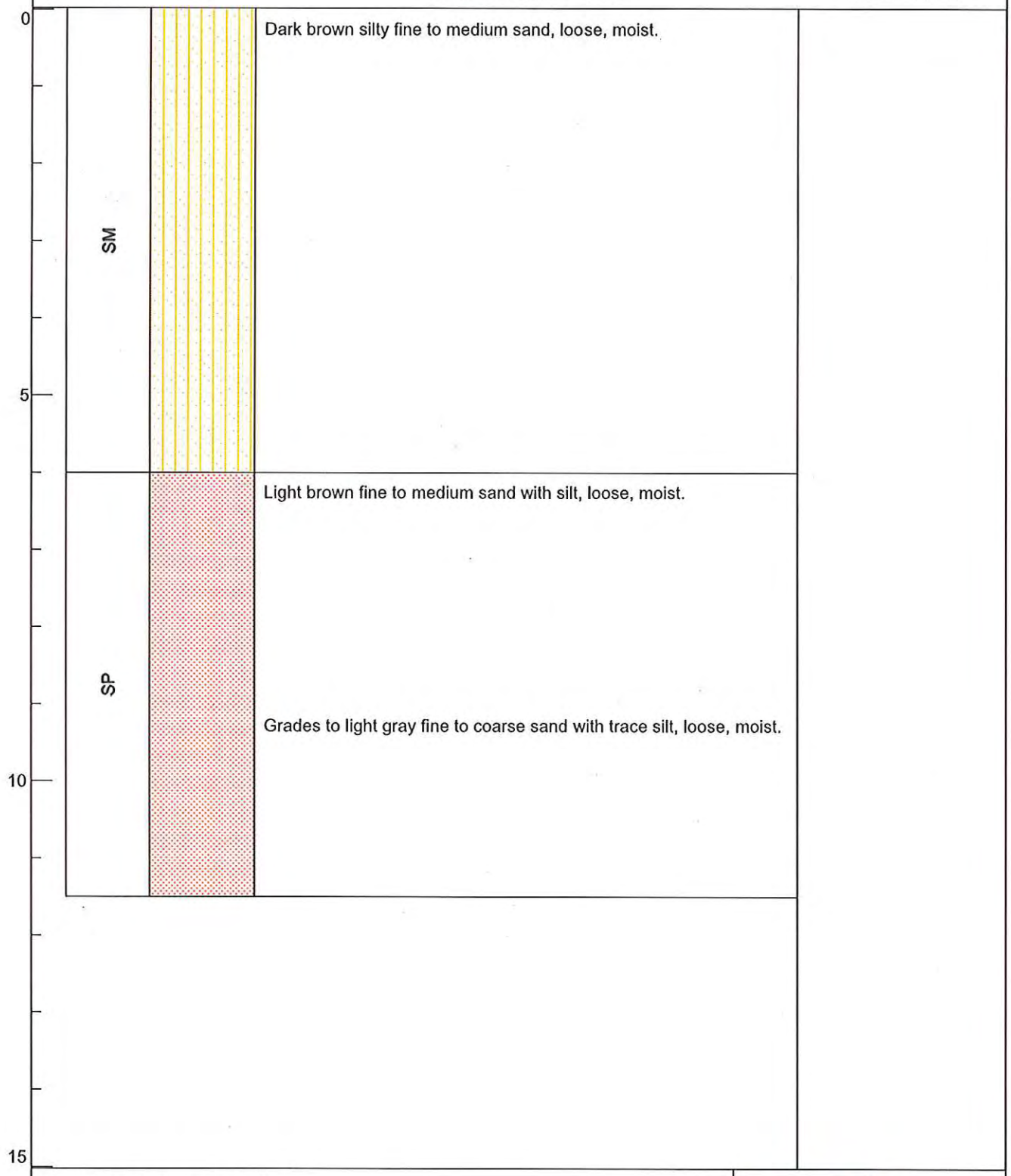
Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-8

DATE: **3/29/11**
TOTAL DEPTH: **11.5 Feet**



Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-9

DATE: **3/29/11**
TOTAL DEPTH: **12 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Brown fine to coarse silty sand with fine to coarse gravel, loose, moist (Fill).	
5			Grades to dark brown silty fine to medium sand, loose, moist.	
10			Grades to light brown fine to coarse sand with silt, loose, moist.	
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-10

DATE: **3/29/11**
TOTAL DEPTH: **11.5 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand, loose, moist.	
5	SP		Light brown fine to coarse sand with trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-11

DATE: **3/29/11**
TOTAL DEPTH: **9 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand, loose, moist.	
5	SP		Light brown fine to coarse sand with trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-12

DATE: **3/29/11**
TOTAL DEPTH: **9 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Brown silty fine to medium sand, occasional fine to medium gravel, loose, moist (Fill).	
	SP		Light brown fine to coarse sand with fine to coarse gravel and silt, occasional cobbles and boulders, medium dense, moist (Fill).	
5			Grades to fine to coarse sand with silt, loose, moist.	
10				
15				

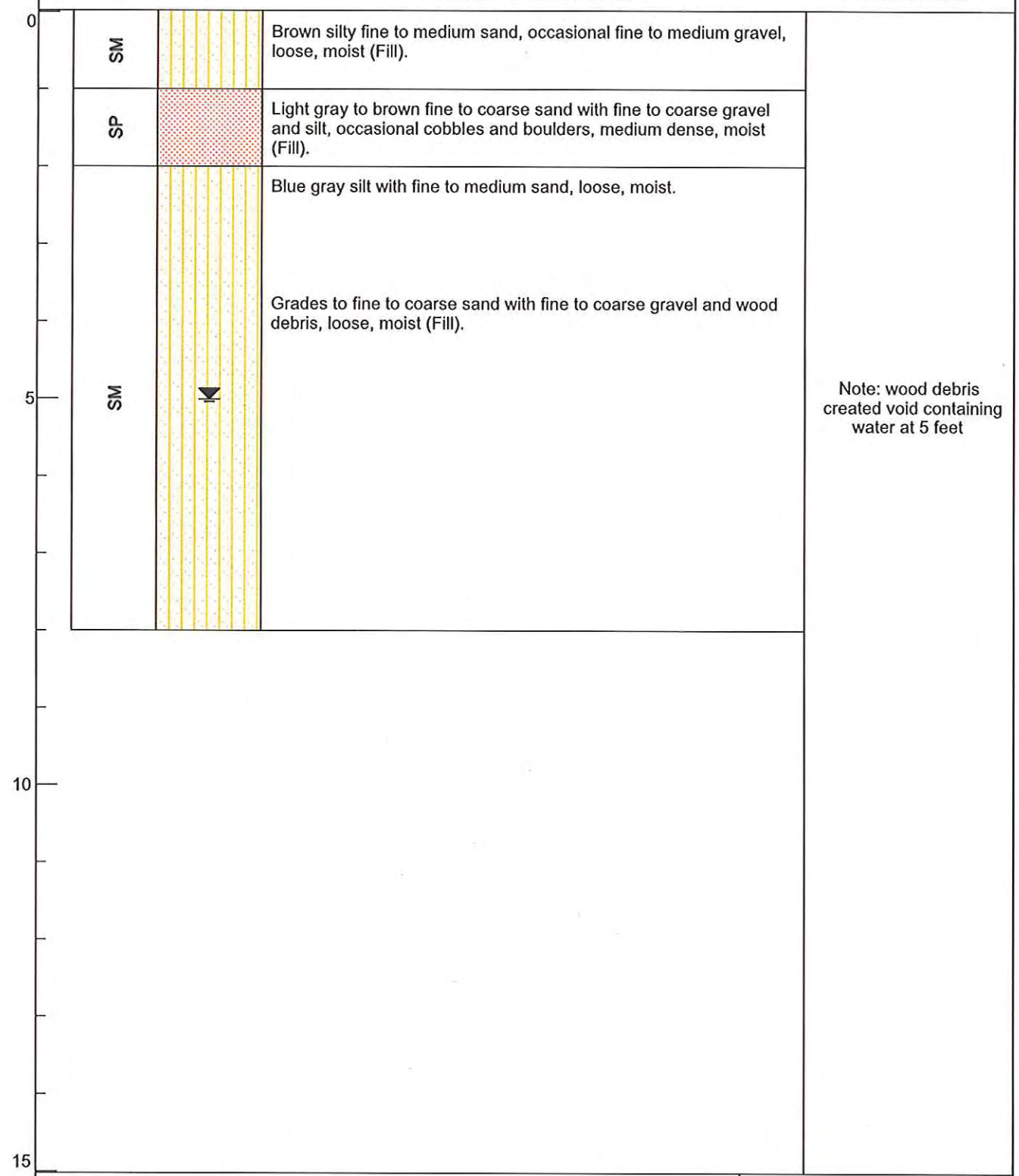
Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-13

DATE: **3/29/11**
TOTAL DEPTH: **8 Feet**



Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-14

DATE: **3/29/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SP		Brown to dark brown fine to coarse sand with fine to coarse gravel and wood, concrete, metal and plastic debris, loose, moist (Fill).	
5				
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-15

DATE: **3/29/11**
TOTAL DEPTH: **9 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SP		Gray fine to coarse sand with fine to coarse gravel and silt, occasional wood, concrete, and boulder debris, medium dense, moist (Fill).	
5				
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-16

DATE: **3/29/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SP		Brown fine to coarse sand with fine to coarse gravel and silt, occasional wood debris, loose, moist (Fill).	
5			Grades to light brown fine to coarse sand with trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-17

DATE: **3/29/11**
TOTAL DEPTH: **10 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand, loose, moist.	
5	SP		Light brown fine to coarse sand with trace silt, loose, moist.	
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-18

DATE: **3/29/11**
TOTAL DEPTH: **6 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SM		Dark brown silty fine to medium sand, loose, moist.	
5				
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

PROJECT: **Kingswood Capital**
PROJECT NO.: **519-001-01**
LOCATION: **1401 & 1551 Kingswood Drive SW, Tumwater, WA**

TP-19

DATE: **3/29/11**
TOTAL DEPTH: **5 Feet**

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND OTHER TESTS
0	SP		Gray brown fine to coarse sand with fine to coarse gravel and silt, occasional wood, brick and concrete debris, loose, moist (Fill).	
5				
10				
15				

Contractor: **Hill Excavating**
Equipment: **Trackhoe**
Logged By: **Kevin V.**

INSIGHT GEOLOGIC, INC.

ATTACHMENT B

LABORATORY ANALYSES

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: B-2
Sample #: B-2 0' - 4'
Depth: 0 - 4 Feet

Moisture Content (%) 14.4%

Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	94.8
3/8 in. (9.5-mm)	85.1
No. 4 (4.75-mm)	79.6
No. 10 (2.00-mm)	75.7
No. 20 (.850-mm)	71.2
No. 40 (.425-mm)	58.8
No. 60 (.250-mm)	34.7
No. 100 (.150-mm)	16.2
No. 200 (.075-mm)	7.9

Size Fraction	Percent by Weight
Coarse Gravel	5.2
Fine Gravel	15.2
Coarse Sand	3.9
Medium Sand	16.9
Fine Sand	50.9
Fines	7.9
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.091
D_{30}	0.230
D_{60}	0.460
D_{90}	15.000
Cc	1.264
Cu	5.055

ASTM Classification
Group Name: **Poorly Graded Sand with Silt and Gravel**
Symbol: **SP-SM**

INSIGHT GEOLOGIC, INC.

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: B-2
Sample #: B-2 4' - 10'
Depth: 4 - 10 Feet

Moisture Content (%) 10.1%

Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	85.5
3/8 in. (9.5-mm)	74.7
No. 4 (4.75-mm)	67.8
No. 10 (2.00-mm)	62.1
No. 20 (.850-mm)	55.4
No. 40 (.425-mm)	42.6
No. 60 (.250-mm)	28.4
No. 100 (.150-mm)	19.3
No. 200 (.075-mm)	12.7

Size Fraction	Percent by Weight
Coarse Gravel	14.5
Fine Gravel	17.7
Coarse Sand	5.7
Medium Sand	19.5
Fine Sand	29.9
Fines	12.7
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.000
D_{30}	0.275
D_{60}	1.600
D_{90}	24.000
Cc	- -
Cu	- -

ASTM Classification
Group Name: **Silty Sand with Gravel**
Symbol: **SM**

INSIGHT GEOLOGIC, INC.

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: B-2
Sample #: B-2 10' - 24'
Depth: 10 - 24 Feet

Moisture Content (%) 14.7%

Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	100.0
3/8 in. (9.5-mm)	100.0
No. 4 (4.75-mm)	100.0
No. 10 (2.00-mm)	100.0
No. 20 (.850-mm)	99.9
No. 40 (.425-mm)	96.3
No. 60 (.250-mm)	61.5
No. 100 (.150-mm)	16.3
No. 200 (.075-mm)	4.9

Size Fraction	Percent by Weight
Coarse Gravel	0.0
Fine Gravel	0.0
Coarse Sand	0.0
Medium Sand	3.7
Fine Sand	91.4
Fines	4.9
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.130
D_{30}	0.180
D_{60}	0.250
D_{90}	0.350
Cc	0.997
Cu	1.923

ASTM Classification
Group Name: **Poorly Graded Sand**
Symbol: **SP**

INSIGHT GEOLOGIC, INC.

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: B-3
Sample #: B-3 7' - 15'
Depth: 7 - 15 Feet

Moisture Content (%) 12.4%

Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	100.0
3/8 in. (9.5-mm)	100.0
No. 4 (4.75-mm)	100.0
No. 10 (2.00-mm)	100.0
No. 20 (.850-mm)	99.7
No. 40 (.425-mm)	93.7
No. 60 (.250-mm)	42.6
No. 100 (.150-mm)	10.4
No. 200 (.075-mm)	3.4

Size Fraction	Percent by Weight
Coarse Gravel	0.0
Fine Gravel	0.0
Coarse Sand	0.0
Medium Sand	6.3
Fine Sand	90.3
Fines	3.4
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.160
D_{30}	0.220
D_{60}	0.299
D_{90}	0.400
Cc	1.012
Cu	1.869

ASTM Classification
Group Name: **Poorly Graded Sand**
Symbol: **SP**

INSIGHT GEOLOGIC, INC.

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: TP-6
Sample #: TP-6 3' - 10'
Depth: 3 - 10 Feet

Moisture Content (%) 18.6%

Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	100.0
3/8 in. (9.5-mm)	100.0
No. 4 (4.75-mm)	99.7
No. 10 (2.00-mm)	99.3
No. 20 (.850-mm)	98.8
No. 40 (.425-mm)	98.5
No. 60 (.250-mm)	97.9
No. 100 (.150-mm)	95.2
No. 200 (.075-mm)	85.5

Size Fraction	Percent by Weight
Coarse Gravel	0.0
Fine Gravel	0.3
Coarse Sand	0.5
Medium Sand	0.7
Fine Sand	13.1
Fines	85.5
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.000
D_{30}	0.000
D_{60}	0.000
D_{90}	0.110
Cc	- -
Cu	- -

ASTM Classification
Group Name: **Silt**
Symbol: **ML**

INSIGHT GEOLOGIC, INC.

Gradation Analysis Summary Data

Job Name: Kingswood Capital
Job Number: 519-001-01
Date Tested: 3/28/11
Tested By: Kevin V.

Boring #: TP-9
Sample #: TP-9 0' - 4'
Depth: 0 - 4 Feet

Moisture Content (%) 17.9%

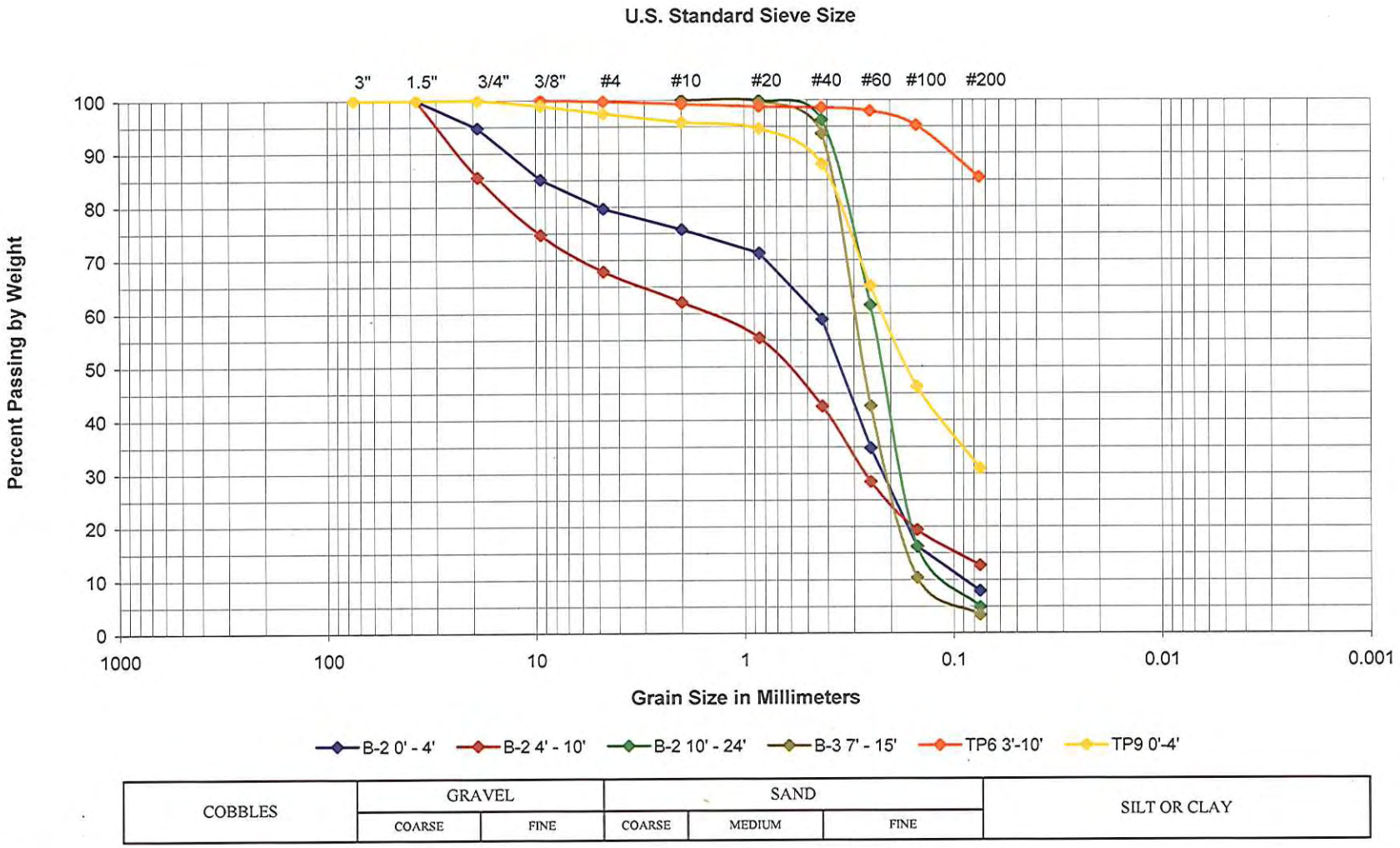
Sieve Size	Percent Passing
3.0 in. (75.0)	100.0
1.5 in. (37.5)	100.0
3/4 in. (19.0)	100.0
3/8 in. (9.5-mm)	99.0
No. 4 (4.75-mm)	97.5
No. 10 (2.00-mm)	95.9
No. 20 (.850-mm)	94.6
No. 40 (.425-mm)	88.0
No. 60 (.250-mm)	65.1
No. 100 (.150-mm)	46.3
No. 200 (.075-mm)	31.0

Size Fraction	Percent by Weight
Coarse Gravel	0.0
Fine Gravel	2.5
Coarse Sand	1.6
Medium Sand	7.9
Fine Sand	57.0
Fines	31.0
Total	**100.0**

LL	- -
PL	- -
PI	- -
D_{10}	0.000
D_{30}	0.000
D_{60}	0.230
D_{90}	0.480
Cc	- -
Cu	- -

ASTM Classification
Group Name: **Silty Sand**
Symbol: **SM**

INSIGHT GEOLOGIC, INC.



INSIGHT GEOLOGIC, INC.

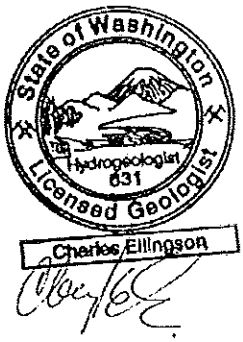
Gradation Analysis Results
Graph 1

ATTACHMENT C

PACIFIC GROUNDWATER GROUP – TECHNICAL MEMORANDUM

PACIFIC groundwater GROUP

Technical Memorandum



To: Nick Tayor, Pacland Engineering

From: Pony Ellingson, Pacific Groundwater Group

Re: Design Groundwater Elevation at proposed Walmart Store 3850

Date: March 5, 2010

This memo summarizes Pacific Groundwater Group's recommended design groundwater elevation for the indicated project, and opinions on the extent to which the hydrogeologic work performed to obtain the water level data conform to the letter, and intent, of Tumwater City Ordinance O2005-003. Our work was authorized by Pacland Engineering on March 1, 2010.

DESIGN GROUNDWATER ELEVATION

Design groundwater elevations were calculated for the following wells and infiltration galleries:

Table 1. Design Groundwater Elevations Compared to Preliminary Gallery Bottoms

Well/Gallery Pair	Recommended design groundwater elevations at wells and nearby galleries, feet NGVD29	Predicted minimum depth to water below proposed infiltration surface in gallery, feet (see note)
MW-2/Gallery 2	171.5 / 171.5	-1.5
MW-3/Gallery 3	170.4 / 169.9	-0.9
MW-4/Gallery 1	172.2 / 173.2	-2.6

Note negative depth to water indicates water is above the bottom of the infiltration gallery.

The elevations are an estimate of the maximum historic groundwater elevation at these locations, based on correlation of the on-site groundwater level data to Thurston County Control wells (Table 2, Figure 1). County control well LRS-01A was the only control well used because it is the closest well (~7000 feet southwest of Walmart) and the only well to have current data, continuous data throughout the 1999 high water event, and to have not been flooded during 1999. The predicted maximum groundwater elevations at the wells are 4.5 to 5.5 higher than the maximum

elevations recorded in on-site wells on February 18, 2006. The calculations indicate that the design groundwater elevations estimated for the gallery locations are 0.9 to 2.6 feet *above* the bottoms of the infiltration galleries based on the preliminary designs provided to us (Grading and Drainage Plan C-20, issued 9/18/09).

The materials provided to PGG indicate that the site survey by ALTA was to the NGVD29 datum, but no specific reference for the datum used for wellheads was provided, thus we assumed the wellheads were also surveyed to NGVD29. The wellhead survey datum should be confirmed.

Table 2. Correlations to County Control Well Data

On-site Well	Correlation Eqn	Max groundwater elevation at LRS-01A (NGVD29)	Predicted max groundwater elevation at site well (NGVD29)	Groundwater elevation adjustment for off-set between well and gallery (ft)		Predicted max groundwater elevation at nearest gallery (NGVD29)	Infiltration surface elevation of nearest gallery (NGVD29)	Minimum depth to groundwater below gallery (ft)
MW-1	y = 0.6485x + 51.782	187.19	173.2	not applicable				
MW-2	y = 0.6515x + 49.551	187.19	171.5	0.0	(gallery 2)	171.5	170.0	-1.5
MW-3	y = 0.6415x + 50.352	187.19	170.4	-0.5	(gallery 3)	169.9	169.0	-0.9
MW-4	y = 0.6674x + 47.303	187.19	172.2	1.0	(gallery 1)	173.2	170.7	-2.6
MW-5	y = 0.6386x + 50.038	187.19	169.6	not applicable				
	y = on-site elevation							
	x = LRS-01A elevation							

CONFIDENCE IN CALCULATIONS

City ordinance O2005-003 refers to well installation, survey, and measurement guidance that should maximize confidence in these calculations. Table 3 below summarizes our comparison of key aspects of the guidance to this project's data, and our opinion on the impact to confidence. Although the letter of the guidance was not met, our opinion is that the data are sufficient to meet the intent of the ordinance. Any model used to calculate groundwater mounding will require the thickness of the upper aquifer to be specified. That information will have to be generated by data from surrounding wells and projects.

Table 3. Comparison of Project Data to City Guidance

Topic (not comprehensive)	City Guidance (not comprehensive)	Project Data	Opinion / Confidence
Well Drilling	Drill to 50 feet depth or to till, whichever is shallower. Screen at the water table.	Numerous borings and test pits. Maximum depth 31.5 ft. No till encountered. Screens at water table.	Good wells. Bottom of upper aquifer not documented (no till). Till can be interpreted from other nearby well logs.
Survey and Precision	Survey to NGVD29 with wellhead precision of 0.01 ft. Measure and record water level data to 0.01 ft precision.	Metadata for wellhead survey not provided. Water level data recorded to 0.1 ft precision but derived water elevation improperly reported to 0.01 ft precision.	Confirm NGVD29 survey of wellheads (monitoring point), and precision. Precision of 0.1 ft is probably OK.
Water Level Monitoring	Twelve monthly measurements or weekly for four months over winter-spring.	Eight measurements over 12 months, not equally spaced.	Documented 4.5 to 5 feet of on-site groundwater fluctuation. Five of eight measurements in generally high water table months although one value much higher than other s (Figure 1). Highly correlated to County data. Conclude data meet intent but not letter of the ordinance.

COMPARISON TO SIMILAR CALCULATIONS NEARBY

As a reality check on the design groundwater elevations, we compared the elevations for this project to those for nearby projects. The Walmart site lies about 1500 feet north of the northernmost well at which previous calculations are known to us (We are not aware of similar calculations performed at Home Depot directly south of Walmart). The elevation at that prior location (Mountain View Church of the Nazarene) is 177.5 ft. or about 4 feet higher than the maximum design elevation calculated at Walmart (Table 2, Well 1). Given the northerly groundwater gradient in this vicinity, the lower elevation at Walmart is expected.

The Thurston County GeoData Center website does not indicate the presence of nearby areas that were flooded with groundwater during the high water table events of 1997 and 1999.

water level memo v1

JE1002

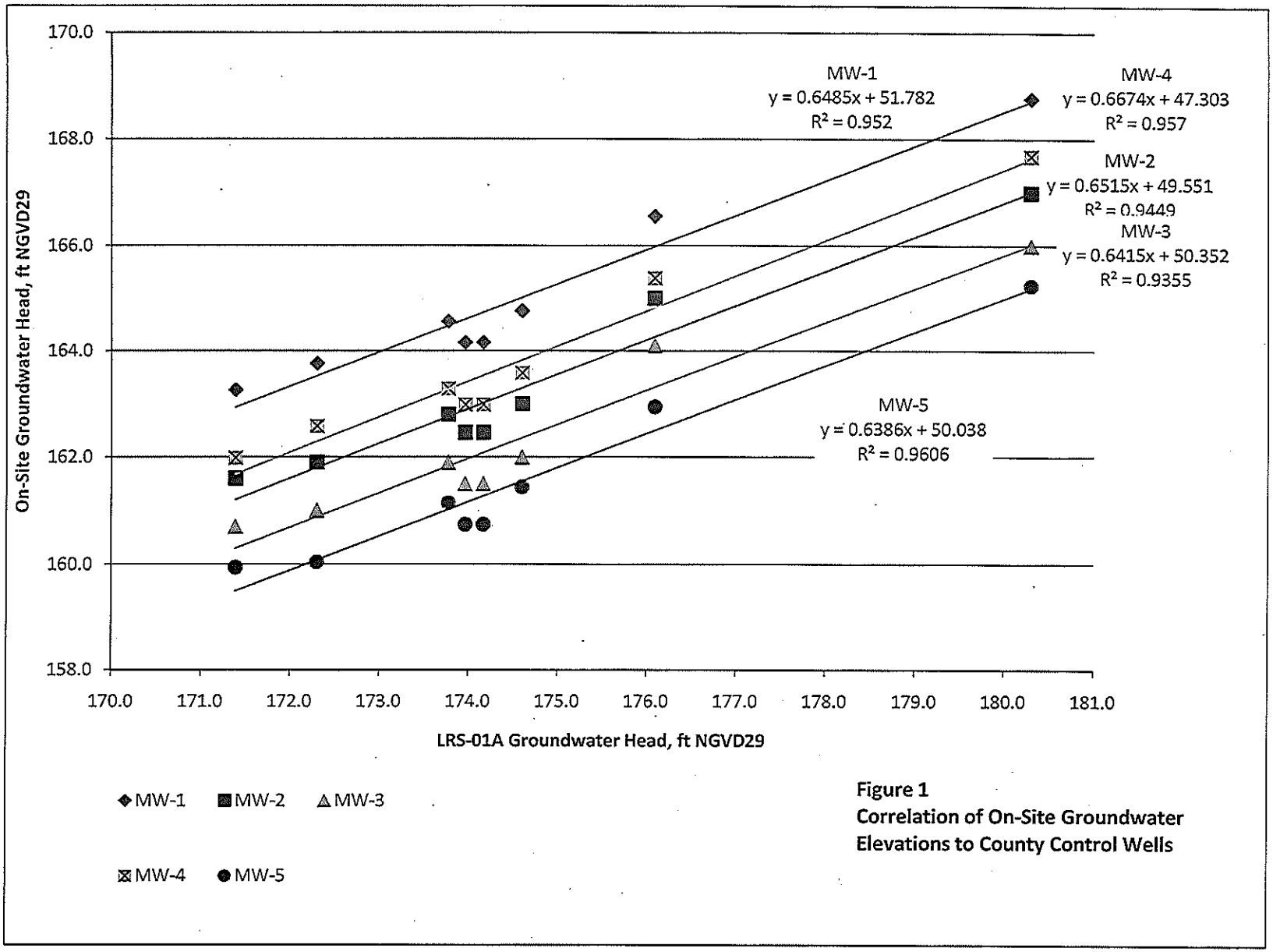
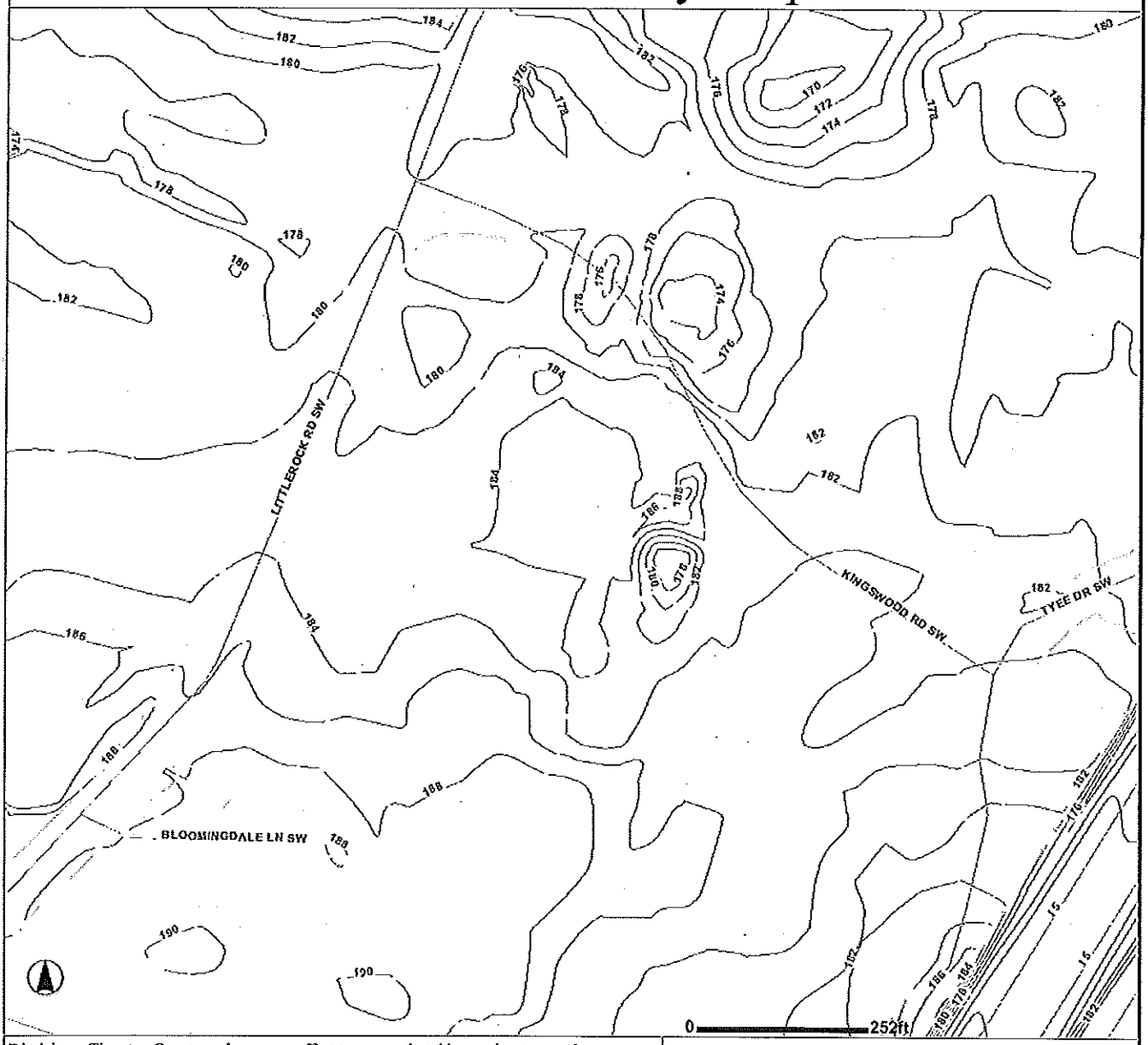


Figure 1
Correlation of On-Site Groundwater Elevations to County Control Wells

Thurston County Map



Thurston GeoData Center
© 2011 - Thurston County GeoData Center
929 Lakeridge Drive SW, Suite 216, 3rd Floor
Olympia, WA 98502-6031

LEGEND

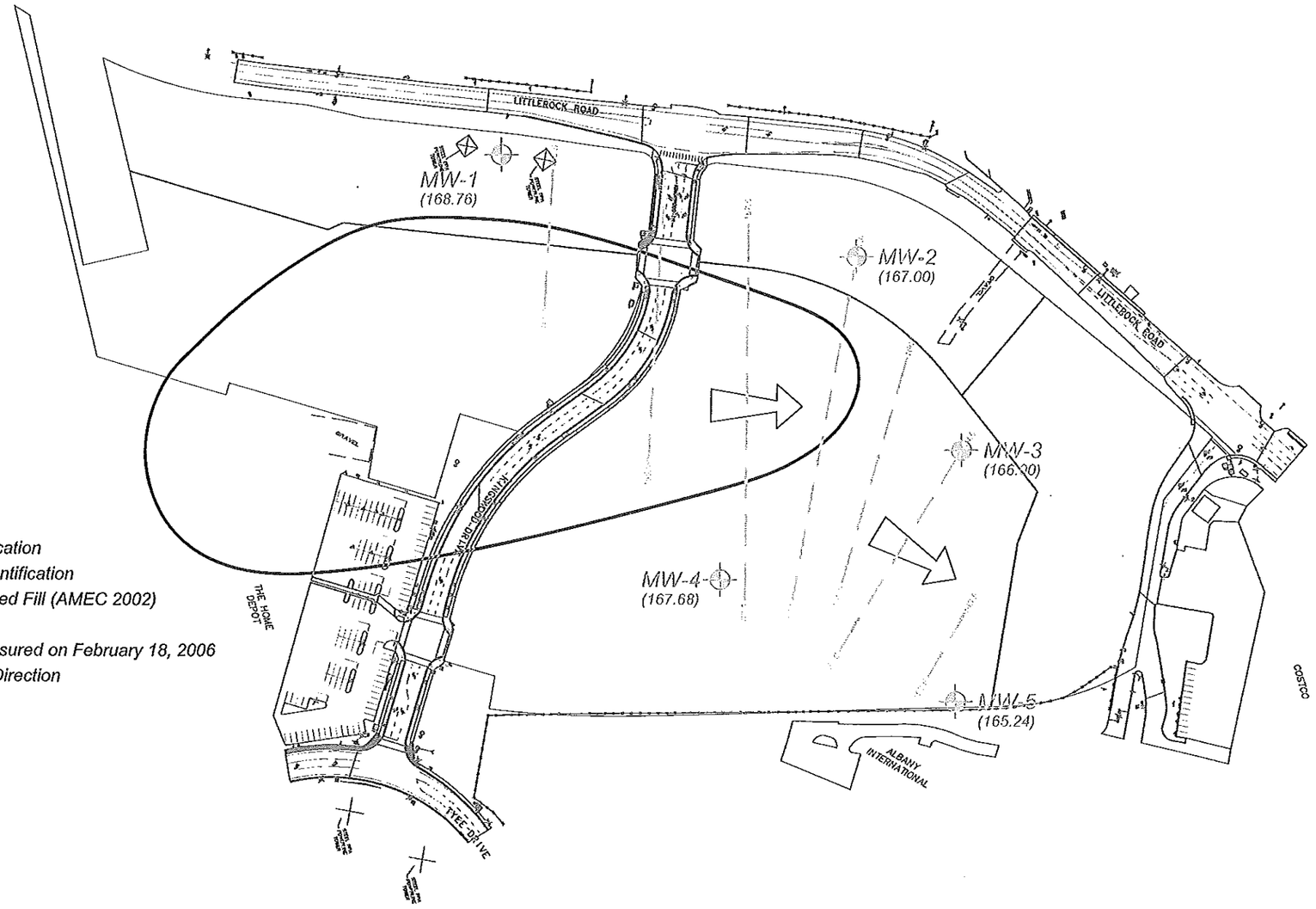
- Major Roads
- Roads
- Streams
- Contours
- Wetlands
- Wetland Buffers
- Flood Zones
- Water Bodies
- Zoning
- Cities
- Parcels

Table 1
Depth to Water Measurements
Proposed Commercial Site
East of Littlerock Road S.W.
Tumwater, Washington

Groundwater Monitoring Well	Well Elevation from Top of PVC Well Casing (Feet)	Dates Water Level Measured	Depth to Water from Below Top of PVC Well Casing (Feet)	Water Level Elevation (Feet)	Groundwater Flow Direction	Comments
MW-1	184.46	3/3/2005	20.3	164.16	Northeast	First Water Level Measurement
		3/10/2005	20.3	164.16	Northeast	Obtained During GPR Investigation
		4/8/2005	19.9	164.56	Northeast	Second Water Level Measurement
		6/8/2005	19.7	164.76	Northeast	Third Water Level Measurement
		8/15/2005	20.7	163.76	North-Northeast	Fourth Water Level Measurement
		12/15/2005	21.2	163.26	Northeast	Fifth Water Level Measurement
		1/19/2006	17.9	166.56	Northeast	Sixth Water Level Measurement
		2/18/2006	15.7	168.76	Northeast	Seventh Water Level Measurement
MW-2	185.30	3/3/2005	22.9	162.46	Northeast	First Water Level Measurement
		3/10/2005	22.9	162.46	Northeast	Obtained Druing GPR Investigation
		4/8/2005	22.5	162.80	Northeast	Second Water Level Measurement
		6/8/2005	22.3	163.00	Northeast	Third Water Level Measurement
		8/15/2005	23.4	161.90	North-Northeast	Fourth Water Level Measurement
		12/15/2005	23.7	161.60	Northeast	Fifth Water Level Measurement
		1/19/2006	20.3	165.00	Northeast	Sixth Water Level Measurement
		2/18/2006	18.3	167.00	Northeast	Seventh Water Level Measurement
MW-3	175.50	3/3/2005	14.0	161.50	Northeast	First Water Level Measurement
		3/10/2005	14.0	161.50	Northeast	Obtained Druing GPR Investigation
		4/8/2005	13.6	161.90	Northeast	Second Water Level Measurement
		6/8/2005	13.5	162.00	Northeast	Third Water Level Measurement
		8/15/2005	14.5	161.00	North-Northeast	Fourth Water Level Measurement
		12/15/2005	14.8	160.70	Northeast	Fifth Water Level Measurement
		1/19/2006	11.4	164.10	Northeast	Sixth Water Level Measurement
		2/18/2006	9.5	166.00	Northeast	Seventh Water Level Measurement
MW-4	184.38	3/3/2005	21.4	162.98	Northeast	First Water Level Measurement
		3/10/2005	21.4	162.98	Northeast	Obtained Druing GPR Investigation
		4/8/2005	21.1	163.28	Northeast	Second Water Level Measurement
		6/8/2005	20.8	163.58	Northeast	Third Water Level Measurement
		8/15/2005	21.8	162.58	North-Northeast	Fourth Water Level Measurement
		12/15/2005	22.4	161.98	Northeast	Fifth Water Level Measurement
		1/19/2006	19.0	165.38	Northeast	Sixth Water Level Measurement
		2/18/2006	16.7	167.68	Northeast	Seventh Water Level Measurement
MW-5	181.54	3/3/2005	20.8	160.74	Northeast	First Water Level Measurement
		3/10/2005	20.8	160.74	Northeast	Obtained Druing GPR Investigation
		4/8/2004	20.4	161.14	Northeast	Second Water Level Measurement
		6/8/2005	20.1	161.44	Northeast	Third Water Level Measurement
		8/15/2005	21.5	160.04	North-Northeast	Fourth Water Level Measurement
		12/15/2005	21.6	159.94	Northeast	Fifth Water Level Measurement
		1/19/2006	18.6	162.94	Northeast	Sixth Water Level Mearuement
		2/18/2006	16.3	165.24	Northeast	Seventh Water Level Measurement

Note: Depth to water measurements were obtained after the monitoring wells were developed on February 28, 2005.

February 18, 2006



Legend

- Groundwater Monitoring Well Location
- MW-1 Groundwater Monitoring Well Identification
- Approximate Limits of Uncontrolled Fill (AMEC 2002)
- Water Level Contour (Ft.)
- (168.76) Groundwater Elevation (Ft.) measured on February 18, 2006
- Generalized Groundwater Flow Direction

N

0 200 400

Scale1" = 200'

Source: PacLand (March 2005)

KLEINFELDER

Proposed Commercial Site
East of Littlerock Road S.W.
Tumwater, Washington

Project: 50431 February 2006

Well Locations with Groundwater Elevations

FIGURE 1

ATTACHMENT D

REPORT LIMITATIONS AND GUIDELINES FOR USE

ATTACHMENT D

REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This attachment provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of our client and their authorized agents. This report may be made available to regulatory agencies for review. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Insight Geologic Inc. structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Insight Geologic, Inc. considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless Insight Geologic specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

---

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, Insight Geologic should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or ground water fluctuations. Always contact Insight Geologic before applying a report to determine if it remains applicable.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Insight Geologic reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from Insight Geologic's professional judgment and opinion. Insight Geologic's recommendations can be finalized only by observing actual subsurface conditions revealed during construction. We recommend that Insight Geologic be retained to perform construction monitoring. Alternatively, if Insight Geologic is not retained for construction observation, a full and complete record of construction activity including compaction measurements by a qualified individual should be retained by the client.

Sufficient monitoring, testing and consultation by Insight Geologic or other qualified individual should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide

recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining Insight Geologic for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Insight Geologic confer with appropriate members of the design team after submitting the report. Also retain Insight Geologic to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Insight Geologic participate in pre-bid and pre-construction conferences, and by providing construction observation.

DO NOT REDRAW THE EXPLORATION LOGS

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with Insight Geologic and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

READ THESE PROVISIONS CLOSELY

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. Insight Geologic includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with Insight Geologic if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

GEOTECHNICAL, GEOLOGIC AND ENVIRONMENTAL REPORTS SHOULD NOT BE INTERCHANGED

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

INSIGHT GEOLOGIC, INC.

1015 East 4th Avenue
Olympia, Washington 98506
Telephone: (360) 754-2128
Fax: (360) 754-9299

MEMORANDUM

TO: Torben Nelson

FROM: William Halbert, L.E.G., L.Hg.

DATE: January 4, 2022

PROJECT: Kingswood Property, Tumwater, Washington

SUBJECT: Fill Evaluation

Insight Geologic conducted an evaluation of deleterious material within the fill area of the Kingswood property located southeast of the intersection between Littlerock Road SW and Kingswood Drive SW in Tumwater, Washington. Based on our previous work on the site, it appears that the northern portion of the property was mined for topsoil. The excavation from the mining operation was subsequently backfilled with imported material of varying quality. Our subsurface investigations at the site encountered woody debris as well as metal and concrete. Our concern is that the woody debris which we encountered is of sufficient size that it would cause subsidence of overlying structures as it decays over time.

The purpose of our evaluation was to locate woody debris in the fill section using ground penetrating radar (GPR). The GPR has the ability to penetrate the 10 foot thick fill section using multiple frequency antennae and identify "targets" which were then subsequently excavated using a track-mounted backhoe.

We subcontracted Mt. View Locating Services, LLC to provide the GPR unit and operator. The fill area was scanned by traversing the site with the GPR in swaths about 5 feet apart. Areas on the site having large soil stockpiles were not scanned. Subsurface targets identified by the operator were located using pin flags and subsequently excavated using the backhoe. Due to time and budget constraints, not all targets were able to be excavated and the 20-30 pin flag locators for those targets remain on site.

The subsurface targets identified by the GPR were generally within 5 feet of ground surface and consisted of large woody debris such as logs and stumps, metal debris including corrugated piping, and concrete debris. The excavated targets were left at the surface for removal and disposal, and the excavations were backfilled using the excavated soil. Photographs of typical debris found during our evaluation are attached.

Based on our evaluation, it appears that the unsuitable materials within the fill can be identified using GPR and excavated and removed using a backhoe. We recommend that all remaining identified targets be excavated. Once the deleterious materials have been removed, the area should be re-scanned using GPR to make sure no previously un-identified targets remain. Areas beneath soil stockpiles located onsite should also be scanned once the stockpiles have been removed.

The fill soil consists of silt, sand and gravel and should be adequate for use as structural fill beneath the parking lot of the proposed development. We recommend that the soil be excavated to a depth of 36 inches, checked for deleterious materials and clasts larger than about 3 inches, then replaced and properly compacted prior to construction of the parking lot.

ATTACHMENT 4:

MAINTENANCE AND SOUCE CONTROL MANUAL

TO BE INCLUDED AS PART OF THE CONSTRUCTION DOCUMENT SUBMITTAL

ATTACHMENT 5:

ESTABLISHMENT OF MAINTENANCE COVENANT

TO BE INCLUDED AS PART OF THE CONSTRUCTION DOCUMENT SUBMITTAL