FACILITIES
UNIVERSITY of WASHINGTON
Campus Architecture & Planning

January 5, 2021

City of Bothell
Community Development
18415 101st Avenue NE
Bothell, WA 98011

RE: SEPA Lead Agency
Husky Village Redevelopment
Building Permit # PRE2020-16957

Per RCW 43.21C, WAC 197-11 and WAC 478-324-020 through 210, the University of Washington is the Lead Agency responsible for compliance with the State Environmental Policy Act (SEPA) for projects which the University initiates or delegated authority by Cascadia College for projects which the College initiates on the shared campus. These rules state that when an agency initiates a proposal, it is the lead agency for the proposal and defines lead agency as the agency with the main responsibility for complying with SEPA's procedural requirements.

Per the SEPA Guidelines, as the SEPA lead agency, the University of Washington has the authority to prepare determinations of exemption, threshold determinations, scoping, preparing and issuance of environmental impact statements, etc.

The SEPA review has been completed for the Husky Village Redevelopment project as noted in the attached consistency memo stating how the project site has been reviewed with the 2017 Campus Master Plan Final EIS.

We look forward to working with the City of Bothell on this project.

Sincerely,

Julie Blakeslee

Julie Blakeslee, AICP
University Environmental & Land Use Planner
SEPA Responsible Official

FACILITIES
UNIVERSITY of WASHINGTON
Campus Architecture & Planning

SEPA Consistency Memorandum for the Husky Village Redevelopment Project

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The *August 2017 Final EIS for the Campus Master Plan for the University of Washington Bothell and Cascadia College* reviewed the potential environmental effects for developing the campus over time. The following elements of the environment were studied per scoping and comments received on the Draft EIS:

- Earth
- Air Quality and Greenhouse Gases
- Wetlands/Plants and Animals
- Energy Resources
- Environmental Health
- Land use
- Population and Housing
- Aesthetics/Views
- Recreation and Open Space
- Historic and Cultural Resources
- Public Services and Utilities
- Transportation

Project Definition

The Husky Village Redevelopment project is being proposed in Development Area D of the campus to provide residence halls, apartments, dining, gathering, and office space. The four proposed buildings are anticipated to be approximately 300,000 gross square feet (GSF). Demolition of the existing Husky Village buildings will result in a reduction of 74,152 existing GSF. Sound Transit, Community Transit and King County Metro will be adding a new bus stop in front of the project on Beardslee Boulevard by 2024. This new bus stop and the redevelopment will include widening Beardslee Boulevard to two lanes, undergrounding of power lines, creation of a shared bike and pedestrian path, new stormwater system, and incorporation of the transit platform and shelter.

Project Consistency with the Campus Development Agreement

The project is consistent with the allowed uses and development regulations as set forth in the Campus Master Plan and BMC 12.64.108. The allowed use is consistent with the use of the campus as defined in BMC 12.64.201.F. The project will not exceed the 65’ maximum height and is within the allowed 295,900 GSF net new GSF allowed in Development Area D.

Project Consistency with the EIS

The following provides review of the proposed project by element of then environment:

Earth – Grading will be required for the building. A geotechnical study was conducted in support of the building permit and describes the current surface, subsurface and groundwater conditions; proposed construction practices; and structural requirements for the facility to ensure seismic hazard areas are avoided or mitigated. No liquefaction soils exist onsite and ground rupture or land sliding is anticipated. See **Attachment A** for the geotechnical report.

Air Quality and Greenhouse Gases – The construction and operation of the building are within the projects considered in the EIS.

Wetlands and Plants/Animals – As identified in the Campus Master Plan, an existing wetland is located in a narrow area between the Husky Village site and 110th Avenue NE. It has been rated as a Category III wetland per Ecology standards. The proposed project would have sidewalk encroach the wetland buffer area in order to provide an accessible pathway from the Campus Gateway and transit stop on Beardslee Boulevard through the project site and connecting to the Campus Promenade pathway to the Campus Core. An equivalent area of wetland buffer and wetland enhancement is proposed to the north. Trees removed onsite will be replaced on a 1:1 ratio on campus. No significant impact to plants or animals is anticipated. See **Attachment B** for a wetland delineation report.

Energy – The construction and operation of the building are within the projects considered in the EIS for energy consumption.

Environmental Health – The construction and operation of the buildings are within the projects considered in the EIS. No noise impacts from the project are anticipated due to the nature of its use and location along Beardslee Boulevard and the campus. A Phase II Environmental Assessment was conducted to evaluate and characterize environmental soil and building materials. This document also summarizes and references a Phase I Environmental Assessment conducted in 2011. No evidence of recognized environmental conditions (RECs) were found including the presence of current or historic underground storage tanks. Low levels of petroleum, thought to be from imported soil, were detected at three boring sites below MTCA cleanup levels. Much of the soil is anticipated to be unregulated or “clean” material. Any petroleum-impacted soil excavated will be disposed of at an approved disposal site. See **Attachment C** for the Phase II assessment.

Land Use – The building is an allowed use and is consistent with the use of the campus as defined in BMC 12.64.201.F.

Population and Housing – The construction and operation of the project will not increase the population on campus.

Aesthetics – No aesthetic impacts from the project are anticipated due to the building being consistent with the Campus Master Plan, proposed planting, and being within the 65’ height limit.

Recreation and Open Space – No recreation or open space impacts are anticipated. See the Campus Master Plan and EIS for recreational opportunities and significant open space provided.

Historic and Cultural Resources – No historic or cultural resource impacts are anticipated.

Public Services and Utilities – Utilities in the area are documented and are incorporated into the project; no significant impacts are anticipated. Short-term, local and temporary interruption of service may occur for any utility connections to the project site.

Transportation – The construction and operation of the buildings are within the projects considered in the EIS. Due to the shift from student commuters to an increase in student residents on the site, the number of auto trips is anticipated to decrease. A traffic concurrency analysis was prepared that reviewed traffic safety, transit service, non-motorized, parking, and trip generation. Based upon the City's criteria, the project trip generation, no City of Bothell concurrency corridors are effected by 10 or more average weekday PM peak hour trips. The project meets City of Bothell concurrency requirements. See **Attachment D** for the Transportation Impact Analysis.

The UW Bothell and Cascadia College adopts the *August 2017 Final EIS for the Campus Master Plan for the University of Washington Bothell and Cascadia College* for the Husky Village Redevelopment project for purposes of SEPA. The relevant content has been briefly described above. The EIS may be reviewed at the following website address: https://www.uwb.edu/getattachment/campusplanning/master-plan/UW-Bothell-Cascadia-Campus-Master-Plan-Final-EIS-8-7-17-Vol-1.pdf

Julie Blakeslee

Julie Blakeslee, AICP

1.5.21
Dated

Appendix A - Geotechnical Engineering Services, Husky Village Student Housing, December 18, 2020
Appendix B – Wetland Delineation Report, December 31, 2020
Appendix C - Phase II Environmental Site Assessment, UW Bothell Husky Village Site, December 9, 2020
Appendix D - Memorandum of the Husky Village Redevelopment Transportation Impact Analysis, January 4, 2021

Husky Village Redevelopment

SEPA Consistency Memo Appendices

Appendix A

Geotechnical Engineering Services

Husky Village – Student Housing
University of Washington
Bothell, Washington

for
Capstone Development Partners

December 18, 2020

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services

Husky Village – Student Housing
University of Washington
Bothell, Washington

for
Capstone Development Partners

December 18, 2020

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Geotechnical Engineering Services

Husky Village – Student Housing
University of Washington
Bothell, Washington

File No. 0183-141-01

December 18, 2020

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Table of Contents

1.0 INTRODUCTION 1

1.1. Project Description 1
1.2. Scope of Services 1

2.0 FIELD EXPLORATIONS AND LABORATORY TESTING 1

2.1. Field Explorations 1
2.2. Laboratory Testing 2
2.3. Previous Studies 2

3.0 SITE DESCRIPTION 3

3.1. Site Geology 3
3.2. Surface Conditions 3
3.3. Subsurface Conditions 4
3.4. Groundwater Conditions 5

4.0 CONCLUSIONS AND RECOMMENDATIONS 5

4.1. Earthquake Engineering 6
    4.1.1. 2018 IBC Seismic Design Information 6
    4.1.2. Liquefaction Potential 7
    4.1.3. Ground Rupture 8
    4.1.4. Lateral Spreading 8
    4.1.5. Landslides 8
4.2. Detention Pond Filling and Embankment Reconstruction 8
    4.2.1. Pond Subgrade Preparation 8
    4.2.2. Filling the Detention Pond 8
    4.2.3. Embankment Reconstruction 9
4.3. Earthwork 9
    4.3.1. Clearing and Site Preparation 10
    4.3.2. Subgrade Preparation 10
    4.3.3. Subgrade Protection 11
    4.3.4. Structural Fill 11
    4.3.5. Permanent Cut and Fill Slopes 15
    4.3.6. Utility Trenches 15
    4.3.7. Erosion and Sediment Control 16
4.4. Excavation Considerations 16
    4.4.1. Temporary Cut Slopes 16
    4.4.2. Cantilever Soldier Pile Walls 17
    4.4.3. Shoring Wall Performance 19
4.5. Shallow Foundations 19
    4.5.1. Foundation Design 20
    4.5.2. Foundation Settlement 20
    4.5.3. Lateral Resistance 21
    4.5.4. Footing Drains 21
    4.5.5. Construction Considerations 21

4.6. Ground Improvement 22
  4.6.1. Stone Columns 22
4.7. Slab-On-Grade Floors 23
4.8. Below-Grade Walls and Retaining Walls 23
  4.8.1. Cast-In-Place Walls 23
  4.8.2. Wall Drainage 24
  4.8.3. Waterproofing 24
  4.8.4. Other Considerations 25
4.9. Surface Water Drainage Considerations 25
4.10. Infiltration Considerations 25
4.11. Pavement Recommendations 25
  4.11.1. Subgrade Preparation 25
  4.11.2. New Hot-Mix Asphalt Pavement 26
  4.11.3. Portland Cement Concrete Pavement 26
  4.11.4. Asphalt-Treated Base 26
4.12. Recommended Additional Geotechnical Services 27

5.0 LIMITATIONS 27

6.0 REFERENCES 27

LIST OF FIGURES

Figure 1. Vicinity Map
Figure 2. Site Plan
Figure 3. Cross Section A-A’
Figure 4. Cross Section B-B’
Figure 5. Cross Section C-C’
Figure 6. Cross Section D-D’
Figure 7. Bearing Soil Contours
Figure 8. Earth Pressure Diagram – Temporary Cantilever Soldier Pile Wall
Figure 9. Recommended Surcharge Pressure
Figure 10. Wall Drainage and Backfill
Figure 11. Compaction Criteria for Trench Backfill

APPENDICES

Appendix A. Field Explorations
  Figure A-1 – Key to Exploration Logs
  Figures A-2 through A-16 – Log of Borings
Appendix B. Laboratory Testing
  Figures B-1 through B-5 – Sieve Analysis Results
  Figures B-6 through B-8 – Atterberg Limits Test Results
Appendix C. Exploration Logs from Previous Studies
Appendix D. Report Limitations and Guidelines for Use

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed Husky Village Student Housing project on the University of Washington (UW)/Cascadia College co-located campus in Bothell, Washington. The site for the proposed Husky Village development is shown relative to existing campus buildings and other physical features on the Vicinity Map and Site Plan on Figures 1 and 2, respectively.

1.1. Project Description

The proposed Husky Village Student Housing project is located on the north side of the UW Bothell Campus, where the existing Husky Village currently resides. We understand that the project will include construction of three multi-story student housing buildings (Buildings A through C), a dining hall (Building D), and supporting infrastructure including underground utilities, stormwater treatment facility, hardscape, and landscape elements. Currently, the finished floor elevation for Building A steps up from Elevation 70 feet on the east side of the building to Elevation 82.75 feet on the west side of the building. The finished floor elevation for Building B steps up from Elevation 82 feet at the northeast wing of the building to Elevations 84 and 86 feet in the central portion and southwest wing of the building, respectively. Building C finish floor steps up from Elevation 70 feet at the northeast wing of the building to Elevation 82 feet at the southwest wing of the building. Building D has a finish floor elevation at Elevation 70 feet. We anticipate that cuts may extend up to 10 feet below existing site grades along the east side of Building A. Removal of existing undocumented fill may be required under localized areas of the buildings where deeper fill exists. We understand that a stormwater treatment facility will be located in the area of the existing detention pond, which will be filled, in the east-central area of the site.

The site is currently owned by the UW and is occupied by eight three-story wood-frame apartment buildings used for student housing and an associated community center building. Asphalt drive lanes and parking areas are present throughout the existing student housing complex as well as sidewalks and associated landscaping. The site slopes down from west to east. A 6- to 8-foot-high rockery exists along the east side of Aspen Hall. A geomembrane-lined stormwater pond exists in the east-central area of the site between Cotton Hall, Dogwood Hall, and Oak Hall. A vegetated fill slope at the east side of site provides the grade transition down to 110th Avenue NE.

1.2. Scope of Services

The purpose of our geotechnical engineering services is to evaluate soil and groundwater conditions as a basis for developing design criteria for the geotechnical aspects of the proposed Husky Village Student Housing project. Our services were performed in general accordance with our proposal dated August 17, 2020 and subsequent Contract Amendment Nos. 1 and 2, dated August 25 and November 24, 2020.

2.0 FIELD EXPLORATIONS AND LABORATORY TESTING

2.1. Field Explorations

The subsurface soil and groundwater conditions were evaluated by reviewing existing geotechnical information in the project vicinity and drilling fifteen borings (B-1 through B-15). Borings B-1 through B-9 were completed from August 12 through 14, 2019, and were drilled to depths ranging from 26½ to 51½ feet below the existing ground surface. Borings B-10 through B-15 were completed on August 27 and 28, 2020, and were drilled to depths ranging from 21 to 31½ feet below the existing ground surface. The borings were completed using track-mounted, continuous-flight, hollow-stem auger drilling equipment. Two-inch-diameter monitoring wells were installed in borings B-1, B-3, B-5, B-7 and B-9 to monitor groundwater conditions.

The approximate locations of the explorations are shown on Figure 2. Descriptions of the field exploration program and the boring logs are presented in Appendix A.

2.2. Laboratory Testing

Soil samples were obtained during the exploration program and taken to our laboratory for further evaluation. Selected samples were tested for the determination of moisture content, fines content (material passing the U.S. No. 200 sieve), Atterberg Limits (plasticity characteristics) and sieve analysis tests (particle size distribution). A description of the laboratory testing and the test results are presented in Appendix B.

2.3. Previous Studies

Earth Consultants and Cascade Testing Laboratory completed test pits on and in the immediate vicinity of the site in 1985 and 1984, respectively. GeoEngineers included one test pit in our report from Earth Consultants and nine test pits from Cascade Testing Laboratory. The test pits were reviewed in the following documents:

- North Creek Valley Development, Bothell, Washington," by Earth Consultants dated April 1985.
- Beardslee Road Property, Beardslee Road at 108th NE, Bothell, Washington," by Cascade Testing Laboratory dated June 1, 1984.

In addition, GeoEngineers has conducted numerous geotechnical and geologic services for design and construction of the existing UW Bothell/Cascadia College Co-located Campus including existing buildings and site work. The results of relevant previous geotechnical projects are summarized in the following documents:

- "Report, Geotechnical Engineering Services, UWB/CCC Co-Located Campus, Phase 2a Design Development, Bothell, Washington," dated June 25, 1999.
- "Report, Geotechnical Engineering Services, UWB/CCC Co-Located Campus Phase 1 Design Development, Uplands Development and Off-site Improvements, Bothell, Washington," dated May 5, 1998.
- "Report, Geotechnical Engineering Services, UWB/CCC Co-Located Campus, Phase 1 Design Development, Lowland Stream and Wetlands, Bothell, Washington," dated May 4, 1998.

The approximate locations of relevant explorations completed for the studies listed above are shown on Figure 2. Logs of the relevant explorations from these studies as well as studies completed by others are also included in Appendix C.

3.0 SITE DESCRIPTION

3.1. Site Geology

Our review of the geologic map for the area (Minard 1985) and our previous geotechnical reports for the campus indicate that the proposed building site is underlain by dense to very dense glacial till, stiff to hard glaciolacustrine deposits, and alluvial deposits at relatively shallow depths. Fill associated with past grading activities exists throughout the site.

Alluvium/colluvium deposits associated with the North Creek wetland area are mapped near 110th Avenue NE and extend under the road. The alluvial/colluvial deposits were observed on the east side of the site below the fill slope. Alluvium/colluvium generally consists of loose/soft to medium dense/stiff sands and silts and are associated with the North Creek floodplain and weathered surficial soils generated by mass wasting processes. The material represents poor bearing soils for foundations.

Glacial till was observed in most of the explorations completed at the site, especially those to the north and center portions of the site. Glacial till commonly consists of a very compact, poorly-sorted, non-stratified mixture of clay, silt, sand, gravel and cobbles. Glacial till commonly appears gray or blue on a fresh surface, while weathered glacial till may be brown to yellow in color. Till may include cobbles and large boulders.

Glaciolacustrine deposits were observed underlying the glacial till in the north and central portions of the site, and was observed directly below the ground surface and shallow surficial fill on the southeast and southwest corners of the site. Glaciolacustrine deposits are glacially consolidated deposits commonly consisting of stiff to hard clay/silt.

3.2. Surface Conditions

The Husky Village project site is located on the north side of the UW Bothell campus adjacent to the south side of Beardslee Boulevard. Eight student housing buildings and a community center occupy the property with associated lawn and asphalt pavement parking areas between the buildings. Other site features include a detention pond in the east-central area and a rockery along the northeast fill slope. The detention pond is lined with a geomembrane. The rockery is approximately 6- to 8-feet-high and is located on the east side of Aspen Hall.

The ground surface slopes gently down from the west property line to the Community Center near the center of the site and to the existing buildings in the southeast area. The entire site slopes gently inward towards the east-central detention pond. The ground surface varies from approximate Elevation 92 feet in the southwest area of the site to about Elevation 70 feet in the northeast area above the rockery. The east side of the site slopes steeply down through a wooded area to 110th Avenue NE, from about Elevation 62 feet to about Elevation 45 feet.

Vegetation around the existing buildings generally consists of grass, shrubs and large conifer and deciduous trees. Numerous underground utilities associated with the existing apartments and campus development are located around the site.

The east-central detention pond appears to have a permanent water level and has overflow storm drain structures. Chain-link fencing surrounds the detention pond and exists along the east property line.

3.3. Subsurface Conditions

Subsurface materials encountered in the explorations include asphalt pavement and base course, topsoil, fill, alluvium/colluvium, glacial till and glaciolacustrine deposits. The approximate depth to glacially consolidated soils (glacial till or glaciolacustrine deposits) is shown on borings and test pits in the proposed student housing area on Figure 2. Interpreted subsurface profiles are presented in Cross Sections A-A', B-B', C-C', and D-D' (Figures 3 through 6).

For the purpose of this report, bearing soils include glacial till and glaciolacustrine deposits. Approximate bearing soil elevation contours are presented on Figure 7. Mixed bearing conditions are anticipated at the proposed foundation elevations for the planned buildings. In general, the bearing soils slope down from west to east. Evidence of an old ravine opening towards the North Creek wetland to the east is manifested in the bearing soil contours on the east side of the site near proposed building D and under the existing lined stormwater detention pond.

The subsurface soil conditions are summarized below:

- **Asphalt and Base Course:** Asphalt pavement encountered in the borings ranges from 2 to 2½ inches thick. The base course consists of sand and gravel directly below the asphalt pavement and was typically 2 to 3 inches thick.
- **Topsoil:** Topsoil observed in borings completed in the grass and forested areas generally consists of loose dark brown sandy silt and silty sand. The topsoil typically ranges from 2 to 4 inches thick.
- **Fill:** Fill was encountered in all of the borings, except for borings B-6 through B-8 and B-14 in the southwestern portion of the site. The fill generally consists of loose to medium dense silty sand with varying amounts of gravel and organic matter. Oxidation staining was present in many of the fill samples. Silty gravel was encountered within the fill in borings B-1, B-3, and B-4. Sandy silt was encountered within the fill in borings B-5, B-9, B-10, and B-15. Lean clay with sand was encountered in the fill in boring B-13. The fill ranges between 6½ and 13 feet thick. Fill associated with the east detention pond embankment was 12½ to 13 feet thick (borings B-3 and B-11). The fill included a piece of the geomembrane pond liner in boring B-3 near the surface immediately below the topsoil.
- **Alluvial/Colluvial Deposits:** Alluvium/colluvium was encountered in borings B-3, B-11, and B-15 underlying the fill soils. The alluvium/colluvium consisted of soft to stiff/loose to medium dense, interbedded silt with sand, sandy silt and silty fine to coarse sand with gravel. The material ranges from approximately 5 to 10½ feet thick and is associated with the North Creek floodplain, as well as weathered surficial soils overlying slopes of the buried ravine in this area.
- **Glacial Till:** Glacial till was observed below the fill and topsoil in borings B-1, B-2, B-4, B-6, B-8, B-10, B-13, and B-14. Glacial till was also observed below fill and the alluvium/colluvium in boring B-15 and observed to the depth explored. The glacial till generally consists of dense to very dense silty sand with gravel. Hard sandy silt was also observed within the till in some of the borings. Weathered glacial till was observed in borings B-6 and B-12 directly beneath the ground surface. The glacial till ranges from 6 to 17 feet thick. Although not encountered in our borings, glacial till often contains cobbles and boulders.
- **Glaciolacustrine Deposits:** Glaciolacustrine deposits generally consist of stiff to hard gray silt/clay with variable sand content. Medium dense to very dense silty fine sand with gravel and silty fine to medium sand with gravel were observed within the glaciolacustrine deposits in boring B-12. Glaciolacustrine

deposits were encountered in all of the borings, except boring B-15. The depth at which the glaciolacustrine deposits were encountered varies from near the ground surface in the southwest corner of the site to up to 23 feet below the ground surface in the northeast portion of the site.

3.4. Groundwater Conditions

Perched groundwater was encountered above the glaciolacustrine deposits and within permeable layers of the glacially consolidated soils in most of the borings. Groundwater monitoring wells were installed in borings B-1, B-3, B-5, B-7, and B-9. The depth to groundwater was measured in each of monitoring wells approximately 1 month after the monitoring wells were installed. Well measurements are presented in Table 1.

TABLE 1. GROUNDWATER – MONITORING WELL MEASUREMENTS

Boring	Ground Surface Elevation[1] (feet)	Monitoring Well Top of Casing Elevation (feet)	Well Screen Elevation Range (feet)	Groundwater Depth[2] (feet)	Groundwater Elevation[2] (feet)
B-1	69.2	68.8	30 to 40	14.8	54.0
B-3	62.1	61.8	39 to 49	18.3	43.5
B-5	72.0	71.5	43 to 53	5.3	66.2
B-7	86.8	86.5	61 to 71	3.7	82.8
B-9	75.5	75.2	45 to 55	7.5	67.7

Notes:

[1] The elevations are based on the site survey by David Evans and Associates completed on October 30, 2019.

[2] Groundwater measurement for B-3 were recorded on September 9, 2019. Groundwater measurements for B-1, B-5, B-7, and B-9 were recorded on August 28, 2020.

The groundwater measured in the monitoring wells is interpreted to be perched water and does not represent the regional groundwater table. A water bearing zone was observed in the alluvial soils between the depths of 15 to 23 feet in borings B-3, B-11, and B-15, which are located in the vicinity of the existing stormwater pond.

Groundwater observations represent conditions observed at the time of readings and may not represent the groundwater conditions throughout the year. We anticipate that perched groundwater will exist at the contact between the glacial till or glaciolacustrine deposits and the overlying looser weathered till, alluvium and fill soils, and within more permeable layers within the native glacial soils. Groundwater seepage is expected to fluctuate as a result of season, precipitation, and other factors.

4.0 CONCLUSIONS AND RECOMMENDATIONS

A summary of the key geotechnical considerations is provided below. The summary is presented for introductory purposes only and should be used in conjunction with the complete recommendations presented in this report.

- The site is best classified as Site Class D, in accordance with the 2018 International Building Code (IBC). The low risk liquefaction hazard in the detention pond area will be mitigated under Building D with ground improvement consisting of stone columns.

- The detention pond will need to be backfilled with imported structural fill to achieve future site grades. Existing unsuitable fill and alluvial/colluvial soils in the vicinity of the detention pond and under proposed Building D will be improved using ground improvement consisting of stone columns. Structural fill placed in the detention pond depression should be compacted to 95 percent of the maximum dry density (MDD).
- The buildings can be supported on conventional spread and mat footings bearing on undisturbed native soils or on structural fill extending to undisturbed native soils. We recommend preliminary allowable bearing pressures of 6,000 pounds per square foot (psf) for shallow foundations bearing on the undisturbed dense to very dense glacial till and 4,000 psf for foundations bearing on undisturbed stiff to hard glaciolacustrine deposits. Foundations supported on structural fill consisting of imported gravel borrow and overlying medium dense to very dense glacial soils may be designed using an allowable bearing pressure of 3,000 psf.
- Depending on building loads, deep foundations or ground improvement should be considered if buildings are planned over the existing detention pond area, especially near the east embankment where the depth to remove the unsuitable fill and alluvial deposits may not be economical. Rammed aggregate piers may be used as ground improvement to support shallow foundations in this area. Augercast piles may be used for deep foundations; however, GeoEngineers should review the building locations and foundation loads when available to determine the appropriate deep foundation system, if needed for the project.
- Conventional slabs-on-grade are considered appropriate for buildings with shallow foundations. The floor slabs should be underlain with at least 4 inches of clean crushed gravel for uniform slab support and to act as a capillary break. For buildings that may be pile supported, structural slabs will likely be considered if settlement below conventional floor slabs are not tolerable.
- Permanent drainage measures should be incorporated into the design of below-grade walls and below slabs-on-grade.

4.1. Earthquake Engineering

We evaluated the site for seismic hazards including liquefaction, lateral spreading, fault rupture and earthquake induced landsliding. Our evaluation indicates that the site does not have liquefiable soils present and therefore also has no risk of liquefaction induced lateral spreading. In addition the site has a low risk of fault rupture and earthquake induced landsliding.

4.1.1. 2018 IBC Seismic Design Information

The 2018 IBC references the 2016 version of Minimum Design Loads for Buildings and Other Structures (ASCE 7-16). Per ASCE 7-16 Section 11.4.8, a ground motion hazard analysis or site-specific response analysis is required to determine design ground motions for structures on Site Class D sites with S_1 greater than or equal to 0.2g (where g represents gravitational acceleration). For this project, the site is best classified as Site Class D based on available subsurface information with an S_1 value of 0.492g; therefore, this provision applies. Alternatively, the parameters listed in Table 2 may be used to determine the design ground motions provided Exception 2 of Section 11.4.8 of ASCE 7-16 is used. Using this exception, the seismic response coefficient (C_S) is determined by Equation (Eq.) (12.8-2) for values of $T \leq 1.15T_S$, and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T > 1.5T_s$ or Eq. (12.8-4) for $T > T_L$, where T represents the fundamental period of the structure and T_S=0.70 seconds (sec).

If requested, we can complete a site-specific seismic response analysis, which could provide reduced seismic demands from the parameters in Table 2 and the requirements of ASCE 7-16 Section 11.4.8 Exception 2 depending on the building configuration and site-specific subsurface conditions. Site-specific borings or geophysical shear wave velocity testing are recommended to be completed to develop the site-specific seismic parameters Site Class for final design.

TABLE 2. 2018 IBC SEISMIC PARAMETERS

2018 IBC Parameter[1]	Value
Site Class	D
Mapped MCE$_R$ Spectral Response Acceleration at Short Period, S_s (g)	1.280
Mapped MCE$_R$ Spectral Response Acceleration at 1-second period, S_1 (g)	0.450
Short Period Site Coefficient, F_a	1.00
Long Period Site Coefficient, F_v	1.85[2]
Design Spectral Acceleration at 0.2-second period, S_{DS} (g)	0.85
Design Spectral Acceleration at 1.0-second period, S_{D1} (g)	0.56[2]
T_S (seconds)	0.65

Notes:

1. Parameters developed based on latitude 47.7628 and longitude -122.1944 using the Applied Technology Council (ATC) Hazards online tool (https://hazards.atcouncil.org/).
2. These values are only valid if the structural engineer utilizes Exception 2 of Section 11.4.8 (ASCE 7-16).

4.1.2. Liquefaction Potential

Liquefaction is a phenomenon where soils experience a rapid loss of internal strength as a consequence of strong ground motions. Ground settlement, lateral spreading and/or sand boils may result from soil liquefaction. Structures supported on liquefied soils could suffer foundation settlement or lateral movement that could be severely damaging to the structures.

Soil conditions that lend themselves to liquefaction generally consist of loose to medium dense, clean to moderately silty sand that is below the groundwater level. We evaluated the liquefaction triggering potential (Youd and Idriss 2001; Idriss and Boulanger 2014) and estimated liquefaction-induced settlement (Tokimatsu and Seed 1987; Ishihara and Yoshimine 1992; Idriss and Boulanger 2014) for the soils at the site using the simplified method.

Based on our analysis, liquefaction is generally not anticipated to occur at the site under the design earthquake due to the gradation and density of the soil, and observed groundwater levels the site. However, our analysis suggests that there is a low potential for liquefaction to occur within a roughly 3-foot-thick zone at a depth of 15 to 18 feet in the vicinity of the detention pond (borings B-3, B-11 and B-15). Liquefaction induced settlement from this zone is estimated to be between ¼ to 1¼ inch.

The potentially liquefiable zone will be mitigated by ground improvement techniques. The recommended method of ground improvement for this site is rammed aggregate piers (stone columns).

4.1.3. Ground Rupture

The site is approximately 2 miles southwest of the United States Geologic Survey (USGS) mapped location of the Southern Whidbey Island Fault (USGS 2013). Bedrock is mapped to be on the order of 1,000 feet below the site (Minard 1985). Given the distance of the closes inferred location of the Southern Whidbey Island Fault, the thickness of glacially consolidated soils above the fault, and the infrequent recurrence interval (thought to be on the order of 1,000 years), it is our opinion the probability of damaging fault rupture on the site is low and does not warrant specific design considerations.

4.1.4. Lateral Spreading

Ground rupture from lateral spreading is associated with liquefaction. Lateral spreading involves lateral displacements of large volumes of liquefied soil and can occur on near-level ground as blocks of surface soils displace relative to adjacent blocks. In our opinion, ground rupture resulting from lateral spreading at the site is unlikely because potentially liquefiable soils are not prevalent across the site, the low risk of soil liquefaction in soils that exhibit potential liquefaction, and ground improvement will mitigate potential liquefaction below Building D.

4.1.5. Landslides

Depending on the final building layout, the east fill slope should be evaluated for seismic stability under the design earthquake. Slope reconstruction may be required to provide sufficient stability for permanent slopes during the design seismic conditions.

4.2. Detention Pond Filling and Embankment Reconstruction

4.2.1. Pond Subgrade Preparation

We recommend removing all ponded water, topsoil, geomembrane liner and preventing discharge of storm water into the pond. Once the geomembrane is removed, the exposed subgrade should be evaluated. Unsuitable fill soils should be removed and replaced with structural fill below planned buildings, unless support by pile foundations or on drilled aggregate piers. The embankment fill on the east side of the pond should be removed and reconstructed using structural fill for permanent slope stability purposes prior to filling the pond.

4.2.2. Filling the Detention Pond

After the pond bottom and side slopes are properly prepared, the depression should be backfilled with structural fill, as follows:

1. Structural fill should consist of the imported gravel borrow as described in Section 9-03.14(1) of the 2018 Washington State Department of Transportation (WSDOT) Standard Specifications, with the additional restriction that the fines content be limited to no more than 5 percent.
2. Fill should be placed from the bottom of the depression upward and in horizontal lifts. Fill should not be allowed to be pushed from the top down.
3. Fill should be placed in loose lifts not exceeding 12 inches in thickness.
4. Each lift should be compacted with a large vibratory drum roller to at least 95 percent of the MDD in accordance with ASTM D-1557.

4.2.3. Embankment Reconstruction

The existing east embankment along the pond exhibits low density and strength properties that does not provide sufficient strength for permanent slopes. Therefore, the east embankment should be reconstructed for permanent conditions using imported structural fill.

All fill placed on existing slopes, including structural fill used to reconstruct the east slope and placed under planned buildings, should be benched or keyed into the existing slope in accordance with Section 2-03.3(14) of the 2018 WSDOT Standard Specifications.

New fill should be benched at least 3 feet into the temporary cut slope and keyed at least 3 feet below adjacent grades along the toe. New slopes should be overbuilt by at least 2 feet, and subsequently cut back to achieve proper compaction throughout the fill along the slope face.

To minimize erosion, newly constructed slopes should be planted or hydroseeded shortly after completion of grading. We recommend that an erosion control blanket such as Curlex I (manufactured by American Excelsior Co.) or SC150 (manufactured by Tensar North American Green) be placed on permanent slopes to help establish vegetation and minimize erosion on slopes made of till soils. Until the vegetation is established, some sloughing and raveling of the slopes should be expected. Localized repairs and revegetation may be necessary in areas where sloughing and raveling occurs. Heavy straw mulch could be used to protect the slopes during periods of rainfall and during the wet season. The hydroseed application should be evaluated to make sure that full coverage is achieved, and we recommend that slopes have the hydroseed applied from above and below the slopes where possible.

4.3. Earthwork

Based on the subsurface soil conditions encountered in the borings, we expect that the soils at the site may be excavated using conventional heavy-duty construction equipment. Undisturbed native glaciolacustrine deposits and glacial till were encountered near the ground surface at the site. Fill soils are present overlying the glacial deposits in the approximate eastern two-thirds of the site. Gravel and cobbles were encountered in the fill. Materials within the deeper portions of excavations will require a large excavator to accomplish the excavations. Glacial deposits in the area commonly contain boulders that may be encountered during excavation. Accordingly, the contractor should be prepared to deal with boulders, if encountered.

The onsite soils within the anticipated excavation zone contain a high percentage of fines (material passing the U.S. standard No. 200 sieve) that are moisture-sensitive and susceptible to disturbance, especially when wet. Ideally, earthwork should be undertaken during extended periods of dry weather when the surficial soils will be less susceptible to disturbance and provide better support for construction equipment. Dry weather construction (typically June through September) will help reduce earthwork costs. If earthwork will occur between October and May, we suggest that a contingency be included in the project schedule and budget to account for increased earthwork difficulties.

Trafficability on the site is not expected to be difficult during dry weather conditions. However, the fill and native soils will be susceptible to disturbance from construction equipment during wet weather conditions. Even in the summer months pumping and rutting of the exposed fill, native lacustrine and glacial till soils under equipment loads will occur.

4.3.1. Clearing and Site Preparation

All areas to receive fill, structures or pavements should be cleared of vegetation and stripped of topsoil. Clearing should consist of removal of all trees, brush and other vegetation within the designated clearing limits. The topsoil materials could be separated and stockpiled for use in areas to be landscaped. Debris should be removed from the site, but organic materials could be chipped/composted and also reused in landscape areas, if desired.

We anticipate that the depth of stripping will generally range from 3 to 6 inches. Stripping depths may be greater in some areas, particularly where trees and large vegetation have been removed. Actual stripping depths should be determined based on field observations at the time of construction. The organic soils can be stockpiled and used later for landscaping purposes or may be spread over disturbed areas following completion of grading. If spread out, the organic strippings should be in a layer less than 1-foot thick, should not be placed on slopes greater than 3H:1V (horizontal to vertical) and should be track-rolled to a uniformly compacted condition. Materials that cannot be used for landscaping or protection of disturbed areas should be removed from the project site.

Grubbing of the project should consist of removing and disposal of stumps, roots larger than 1-inch diameter, and matted roots from the designated grubbing areas. Grubbed materials should be completely removed from the project site. All depressions made during the grubbing activities to remove stumps and other materials, should be completely backfilled with properly placed and compacted structural fill.

Care must be taken to minimize softening of the subgrade soils during stripping operations. Areas of exposed subgrade which become disturbed should be compacted to a firm, non-yielding condition, if practical, prior to placing any structural fill necessary to achieve design grades. If this is not practical because the material is too wet, the disturbed material must be aerated and recompacted or excavated and replaced with structural fill.

Ponded water, topsoil and the geomembrane should be removed from the existing detention pond. All stormwater control structures should also be removed from the pond area. After removal of the geomembrane, exposed subgrade soils should be evaluated by GeoEngineers prior to placement of structural fill. The east embankment should be removed and reconstructed with structural fill.

Construction of the proposed student housing buildings may require removal of the existing rockery located in the northeast area of the site.

All existing utilities should be removed from the building footprint(s) and rerouted if needed. Existing trench backfill should also be removed and replaced with structural fill under the buildings.

4.3.2. Subgrade Preparation

Prior to placing new fills, pavement base course materials or structural fill below on-grade floor slabs to fill the detention pond depression, subgrade areas should be proof rolled to locate any soft or pumping soils. Prior to proof rolling, all unsuitable soils should be removed from below building and pavement areas. Proof rolling can be completed using a piece of heavy tire-mounted equipment such as a loaded dump truck. During wet weather, the exposed subgrade areas should be probed to determine the extent of soft soils. If soft or pumping soils are observed, they should be removed and replaced with structural fill.

We recommend that building concrete slabs-on-grade be supported on at least 6 inches of capillary break gravel overlying properly compacted imported structural fill or approved native soil subgrade. Recommendations for subgrade preparation under building foundations is provided in Section 4.5.5.

If deep pockets of soft or pumping soils are encountered below floor slabs or outside the building footprint, it may be possible to limit the depth of overexcavation by placing a woven geotextile fabric such as Mirafi 500X (or similar material) on the overexcavated subgrade prior to placing structural fill. The geotextile will provide additional support by bridging over the soft material and will help reduce fines contamination into the structural fill. This may be performed under pavement and building floor slab areas depending on actual conditions observed during construction, but it should not occur under future building foundations.

After completing the proof rolling, the subgrade areas should be recompacted to a firm and unyielding condition, if possible. The achievable degree of compaction will depend on when construction is performed. If the work is performed during dry weather conditions, we recommend that all subgrade areas be recompacted to at least 95 percent of the MDD in accordance with the American Society for Testing and Materials (ASTM) D 1557 test procedure (modified Proctor). If the work is performed during wet weather conditions, it may not be possible to recompact the subgrade to 95 percent of the MDD. In this case, we recommend that the subgrade be compacted to the extent possible without causing undue weaving or pumping of the subgrade soils.

Subgrade disturbance or deterioration could occur if the subgrade is wet and cannot be dried. If the subgrade deteriorates during proof rolling or compaction, it may become necessary to modify the proof rolling or compaction criteria or methods.

4.3.3. Subgrade Protection

Site soils contain significant fines content (silt/clay) and will be highly sensitive and susceptible to moisture and equipment loads. The contractor should take necessary measures to prevent site subgrade soils from becoming disturbed or unstable. Construction traffic during the wet season should be restricted to specific areas of the site, preferably areas that are surfaced with crushed rock materials not susceptible to wet weather disturbance.

4.3.4. Structural Fill

All fill, whether on-site or imported soil, supporting floor slabs, pavement areas, foundations, or placed against retaining walls or in utility trenches should meet the criteria for structural fill presented below. The suitability of soil for use as structural fill depends on its gradation and moisture content.

4.3.4.1. Materials

Materials to be placed below the building footprints, to backfill below-grade structures, below-grade walls, utility trenches, detention pond area, to constructed slopes, and placed below paved areas are classified as structural fill for the purpose of this report. Structural fill material quality varies depending upon its use as described below:

1. Structural fill placed below the building foundations (designed for an allowable bearing pressure of 5,000 psf or less) may consist of the following materials (four options) provided that the structural fill materials extend the minimum distance beyond the edge of footings as specified and extend down to approved native glacial till or glaciolacustrine deposits:

    a. Crushed rock meeting the gradation specifications of Section 9-03.1(4)C, Grading No. 57 of the 2018 WSDOT Standard Specifications, or approved equivalent. Crushed rock should extend a minimum distance of 1H:1V beyond the edge of footings;

    b. Controlled density fill (CDF) with a minimum compressive strength of 200 pounds per square inch (psi). CDF should extend a minimum distance of ½H:1V beyond the edge of footings;

    c. Lean mix concrete with a minimum compressive strength of 1,000 psi can be placed in a neat cut excavation below the footing; or

    d. Cement treated soils with 5 to 7 percent dry Portland cement by weight. Cement treated soils should extend a minimum of 1H:1V beyond the edge of footings.

2. Structural fill placed below the building foundations (designed for an allowable bearing pressure of 3,000 psf or less) may consist of the following materials (three options) provided that the structural fill materials extend the minimum distance beyond the edge of footings as specified and extend at least two feet below the footing:

    a. Imported gravel borrow as described in Section 9-03.14(1) of the 2018 WSDOT Standard Specifications, with the additional restriction that the fines content be limited to no more than 5 percent. Gravel borrow should extend a minimum distance of 1H:1V beyond the edge of footings;

    b. Cement treated soils with 5 to 7 percent dry Portland cement by weight. Cement treated soils should extend a minimum distance of 1H:1V beyond the edge of footings; or

    c. Approved on-site sand and gravel fill that meets compaction requirements. Approved on-site soils should extend a minimum distance of 1H:1V beyond the edge of footings.

3. Structural fill placed below floor slabs, behind below-grade walls, and within the 1H:1V zone of influence of buildings should consist of imported gravel borrow as described in Section 9-03.14(1) of the 2018 WSDOT Standard Specifications, with the additional restriction that the fines content be limited to no more than 5 percent.

4. Structural fill placed to construct embankment, roadway, and parking areas, to backfill utility trenches and the existing detention pond, and for general site grading may consist of on-site weathered till and glacial till soils or suitable fill soils provided that the soils are moisture conditioned to within about 2 percent of the optimum moisture content and can be properly compacted. If needed during dry weather, imported soil should meet the criteria for select borrow as described in Section 9-03.14(2) of the 2018 WSDOT Standard Specifications. On-site soils and imported select borrow will be suitable for use as structural fill during dry weather conditions only and only if properly moisture conditions and compacted. If structural fill is placed during wet weather and/or the wet season (October through May) the structural fill should consist of imported gravel borrow as described in Section 9-03.14(1) of the 2018 WSDOT Standard Specifications, with the additional restriction that the fines content be limited to no more than 5 percent. For planning purposes we recommend that gravel borrow be used throughout the project during wet weather conditions and from October through May.

5. Structural fill placed immediately outside below-grade walls (drainage zone) or around footing drains should consist of washed ⅜-inch to No. 8 pea gravel per Section 9-03.1(4)C Grading No. 8, or conform to Section 9-03.12(4) of the 2018 WSDOT Standard Specifications, as shown on Figure 9, Wall Drainage and Backfill.

6. Structural fill placed as crushed surfacing base course (CSBC) below pavements should conform to Section 9-03.9(3) of the 2018 WSDOT Standard Specifications.
7. Structural fill placed as capillary break below slabs should consist of 1-inch minus clean crushed gravel with negligible sand or silt in conformance with Section 9-03.1(4)C, Grading No. 67 of the 2018 WSDOT Standard Specifications, as shown on Figure 9.

4.3.4.2. Reuse of On-site Native Soils

Imported gravel borrow should be used for backfill required within the student housing building footprints and within the building influence zone. The on-site weathered till and glacial till soils are expected to be suitable for use as structural fill in areas outside of the building footprint in areas requiring compaction to at least 95 percent of MDD (per ASTM D 1557) provided the work is accomplished during the normally dry season (July through September) and that the soil can be properly moisture conditioned to achieve the specified compaction criteria. Laboratory tests indicate that the moisture content of on-site soils within anticipated areas of cut ranges between about 8 to 25 percent. The optimum moisture content to achieve adequate compaction for the glacial till soils likely ranges from 7 to 9 percent; therefore, the contactor should be prepared to dry the on-site soils as necessary during the dry season.

An alternative to importing structural fill during the wet season is to cement treat on-site soils. See Section 4.3.4.1 for cement treatment recommendations.

The glaciolacustrine silt and clay deposits should not be reused as structural fill on the site.

It will be necessary to import gravel borrow to achieve adequate compaction for support of pavement and other areas outside of the building footprint during wet weather construction. For planning purposes the project should include importing all structural fill for wet weather construction where compaction to at least 90 percent of MDD is required. The use of existing on-site glacial till soils as structural fill during wet weather should be planned only for areas requiring compaction to 90 percent of MDD, as long as the soils are properly protected and not placed during periods of precipitation. The contractor should plan to cover all stockpiles with plastic sheeting if to be used as structural fill. The reuse of on-site soils is highly dependent on the skill of the contractor, schedule, and the weather, and we will work with the design team to maximize the reuse of on-site soils during the wet and dry seasons.

4.3.4.3. Reuse of Existing Concrete and Asphalt Rubble

Existing base course and portland cement concrete (PCC) rubble may be reused as structural fill if properly crushed during demolition. PCC rubble and base course materials may be reused as structural fill throughout the project, except in landscape areas. Recycled asphalt may be used as structural fill in utility trenches, and under pavement areas, and should not be used under building footprints or within building influence zones, or in landscape areas. For use as structural fill, the concrete rubble and asphalt rubble should be crushed or otherwise ground up separately (should not be mixed) and should meet the gradation requirements for gravel borrow as described in Section 9-03.14(1) of the 2018 WSDOT Standard Specifications. If recycled concrete will be used under pavement areas, we recommend that it meet the gradation requirements for CSBC as described in Section 9-03.9(3) of the 2018 WSDOT Standard Specifications.

4.3.4.4. Fill Placement and Compaction Criteria

Structural fill should be mechanically compacted to a firm, non-yielding condition. Structural fill should be placed in loose lifts not exceeding 12 inches in thickness when using heavy compactors and 6 inches when using hand operated compactors. The actual thickness will be dependent on the structural fill material used and the type and size of compaction equipment. Each lift should be moisture conditioned to within about 2 percent of the optimum moisture content and compacted to the specified density before placing subsequent lifts. Compaction of all structural fill at the site should be in accordance with the ASTM D 1557 test method. Structural fill should be compacted to the following criteria:

1. Structural fill placed below building footprints and within the building influence zones, and below foundations should be compacted to at least 95 percent of the MDD, including all backfill for utility trenches under the building footprints.
2. Structural fill placed behind below-grade walls should be compacted to between 90 to 92 percent of the MDD estimated in accordance with ASTM D 1557. Care should be taken when compacting fill near the face of below-grade walls to avoid over-compaction and overstressing the walls. Hand operated compactors should be used within 5 feet behind the wall. Wall backfill placed within the building footprint and under floor slabs should be compacted to between 90 to 92 percent of the MDD within 5 feet of the walls and to at least 95 percent of the MDD beyond 5 feet of the walls. The upper 3 feet of fill below floor slab subgrade should also be compacted to at least 95 percent of the MDD. The contractor should keep all heavy construction equipment away from the top of retaining walls a distance equal to half the height of the wall, or at least 5 feet, whichever is greater.
3. Structural fill in new pavement and hardscape areas, including utility trench backfill, should be compacted to at least 90 percent of the MDD, except that the upper 2 feet of fill below final subgrade should be compacted to at least 95 percent of the MDD, as shown on Figure 11.
4. Structural fill placed to reconstruct the east embankment should be compacted to at least 95 percent of the MDD. Structural fill placed as crushed rock base course below pavements should be compacted to at least 95 percent of the MDD.
5. Non-structural fill, such as fill placed in landscape areas, should be compacted to at least 90 percent of the MDD.

4.3.4.5. Weather Considerations

Disturbance of near surface soils should be expected if earthwork is completed during periods of wet weather. During dry weather, the soils will: (1) be less susceptible to disturbance, (2) provide better support for construction equipment, and (3) be more likely to meet the required compaction and subgrade preparation criteria.

The wet weather season generally begins in October and continues through May in western Washington; however, periods of wet weather may occur during any month of the year. For earthwork activities during wet weather, we recommend that the following steps be taken:

- The ground surface in and around the work area should be sloped so that surface water is directed away from the work area. The ground surface should be graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work area.
- Earthwork activities should not take place during periods of moderate to heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.

- The contractor should take necessary measures to prevent on-site soils and soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting, sumps with pumps, and grading. The site soils should not be left uncompacted and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent that these soils become wet or unstable.
- The contractor should cover all soil stockpiles that will be used as structural fill with plastic sheeting.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with working pad materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.

Routing of equipment on the native soils during the wet weather months will be difficult and the subgrade will likely become highly disturbed and rutted. In addition, a significant amount of mud can be produced by routing equipment directly on the glacial soils in wet weather. Therefore, to protect the subgrade soils and to provide an adequate wet weather working surface for the contractor's equipment and labor, we recommend that the contractor protect exposed subgrade soils with crushed gravel or asphalt-treated base (ATB).

4.3.5. Permanent Cut and Fill Slopes

We recommend that permanent slopes be constructed at inclinations of 2H:1V or flatter. Fill slopes should be blended into existing slopes with smooth transitions. To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill.

All fill placed on existing slopes, including structural fill placed under the buildings, should be benched or keyed into the slope in accordance with Section 2-03.3(14) of the 2018 WSDOT Standard Specifications.

To reduce erosion, newly constructed slopes should be planted or hydroseeded shortly after completion of grading. Until the vegetation is established, some sloughing and raveling of the slopes should be expected. This may necessitate localized repairs and reseeding. Temporary covering, such as clear heavy plastic sheeting, jute fabric, or erosion control blankets (such as American Excelsior Curlex 1 or North American Green SC150) could be used to protect the slopes during periods of rainfall.

4.3.6. Utility Trenches

Trench excavation, pipe bedding, and trench backfilling should be completed using the general procedures described in the 2018 WSDOT Standard Specifications or other suitable procedures specified by the project civil engineer. The native glacial deposits and fill soils encountered at the site are generally of low corrosivity based on our experience in the Puget Sound area and on the campus.

Utility trench backfill should consist of structural fill and should be placed in loose lifts of 12 inches or less when using heavy compaction equipment such that adequate compaction can be achieved throughout the lift. The loose lift thickness should not exceed 6 inches when using hand operated equipment. Each lift must be compacted prior to placing the subsequent lift. Prior to compaction, the backfill should be moisture conditioned to within about 2 percent of the optimum moisture content. The backfill should be compacted in accordance with the criteria discussed above. Figure 11 illustrates recommended trench compaction criteria under pavement and non-structural areas.

4.3.7. Erosion and Sediment Control

In our opinion, the erosion potential of the on-site soils is low to moderate. Construction activities including stripping and grading will expose soils to the erosional effects of wind and water. The amount and potential impacts of erosion are partly related to the time of year that construction actually occurs. Wet weather construction will increase the amount and extent of erosion and potential sedimentation.

Erosion and sedimentation control measures may be implemented by using a combination of interceptor swales, straw bale barriers, silt fences and straw mulch for temporary erosion protection of exposed soils. All disturbed areas should be finish graded and seeded as soon as practicable to reduce the risk of erosion. Erosion and sedimentation control measures should be installed and maintained in accordance with the requirements of the City of Bothell.

4.4. Excavation Considerations

Temporary cut slopes will be needed for excavations on the project, including around the perimeter of the buildings and at the steps between various floor levels within each building. We also understand that the contractor is considering using temporary cantilever soldier piles for excavation support along the steps of the buildings. Cantilever soldier pile recommendations are provided in Section 4.4.2.

The contractor performing the work has the primary responsibility for protection of workmen and adjacent improvements. In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to variable soil and groundwater conditions. Therefore, the contractor should have the primary responsibility for deciding whether or not to use open cut slopes for much of the excavations rather than some form of temporary excavation support, and for establishing the safe inclination of the cut slope. Acceptable slope inclinations for utilities and ancillary excavations should be determined during construction. Because of the diversity of construction techniques and available shoring systems, the design of temporary shoring is most appropriately left up to the contractor proposing to complete the installation. Temporary cut slopes and shoring must comply with the provisions of Title 296 Washington Administrative Code (WAC), Part N, “Excavation, Trenching and Shoring.”

We anticipate that excavations will be completed primarily in fill, dense to very dense glacial till, and very stiff to hard glaciolacustrine deposits. The following sub-sections summarize our general excavation recommendations.

4.4.1. Temporary Cut Slopes

For planning purposes, temporary unsupported cut slopes more than 4 feet high may be inclined at 1H:1V maximum steepness within the dense to very dense glacial till and 1.5H:1V maximum steepness in the fill, medium dense weathered till, and glaciolacustrine deposits. If conditions allow, temporary cuts made in the dense to very dense till may be included to ¾H:1V, based on observations made during construction by the geotechnical engineer and if groundwater seepage is not encountered. If significant seepage is present on the cut face then the cut slopes may have to be flattened. However, temporary cuts should be discussed with the geotechnical engineer during final design development to evaluate suitable cut slope inclinations for the various portions of the excavation. The contractor should scale slopes cut at 1H:1V or steeper to remove loose materials and cobbles.

The above guidelines assume that surface loads such as traffic, construction equipment, stockpiles or building supplies will be kept away from the top of the cut slopes a sufficient distance so that the stability of the excavation is not affected. We recommend that this distance be at least 5 feet from the top of the cut for temporary cuts made at 1H:1V or flatter, and no closer than a distance equal to one half the height of the slope for cuts made steeper than 1H:1V.

Temporary cut slopes should be planned such that they do not encroach on a 1H:1V influence line projected down from the edges of nearby or planned foundation elements. New footings planned at or near existing grades and in temporary cut slope areas for the lower level should extend through wall backfill and be embedded in native soils.

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

If temporary cut slopes experience excessive sloughing or raveling during construction, it may become necessary to modify the cut slopes to maintain safe working conditions. Slopes experiencing problems can be flattened, regraded to add intermediate slope benches, or additional dewatering can be provided if the poor slope performance is related to groundwater seepage.

4.4.2. Cantilever Soldier Pile Walls

Soldier pile walls consist of steel beams that are concreted into drilled vertical holes located along the wall alignment, typically about 8 feet on center. Timber lagging is typically installed behind the flanges of the steel beams to retain the soil located between the soldier piles.

The shoring system should be designed to limit lateral deflection to less than 1 inch in order to reduce the risk of damage to existing improvements.

Geotechnical design recommendations for each of these components of the soldier pile wall system are presented in the following sections.

4.4.2.1. Soldier Piles

We recommend that soldier pile walls constructed at grade transitions for Buildings A, B, or C be designed using the earth pressure diagram presented in Figure 8. The earth pressures presented in Figure 8 are for full-height cantilever soldier pile walls and the pressures represent the estimated loads that will be applied to the wall system for various wall heights. No seismic pressures have been included because it is assumed that the shoring will be temporary. These earth pressures are not appropriate for supporting excavations in the Building D area.

Surcharge loads, such as cranes, construction equipment or construction staging areas, should be applied to the shoring system as recommended in Figure 9.

We recommend that the embedded portion of the soldier piles be at least 2 feet in diameter and extend a minimum distance of 10 feet below the base of the excavation to resist “kick-out.” The axial capacity of the soldier piles must resist the downward component of the anchor loads and other vertical loads, as appropriate. We recommend using an allowable end bearing value of 40 kips per square foot (ksf) for piles supported on the glacially consolidated soils. The allowable end bearing value should be applied to the base area of the drilled hole into which the soldier pile is concreted. This value includes a factor of safety of about 2.5. The allowable end bearing value assumes that the shaft bottom is cleaned out immediately prior to concrete placement. If necessary, an allowable pile skin friction of 1.5 ksf may be used on the embedded portion of the soldier piles to resist the vertical loads.

4.4.2.2. Lagging

Table 3 presents recommend lagging thicknesses (roughcut) as a function of soldier pile clear span and depth .

TABLE 3. RECOMMENDED TIMBER LAGGING THICKNESS

	Recommended Lagging Thickness (roughcut) for clear spans of:					
Depth (feet)	**5 feet**	**6 feet**	**7 feet**	**8 feet**	**9 feet**	**10 feet**
0 to 15	2 inches	3 inches	3 inches	3 inches	4 inches	4 inches

Lagging should be installed promptly after excavation, especially in areas where perched groundwater is present or where clean sand and gravel soils are present and caving soils conditions are likely. The workmanship associated with lagging installation is important for maintaining the integrity of the excavation.

The space behind the lagging should be backfilled within a single shift. Backfill behind timber lagging will help reduce the risk of voids developing behind the wall and damage to existing improvements located behind the wall.

Material used as backfill for voids located behind the lagging should not cause buildup of hydrostatic pressure behind the wall. Lean concrete is a suitable option for the use of backfill behind the walls. Lean concrete will reduce the volume of voids present behind the wall. Based on our experience, the voids between each lean concrete lift are sufficient for preventing the buildup of hydrostatic pressure behind the wall.

4.4.2.3. Drainage

Drainage for soldier pile and lagging walls is achieved through seepage through the timber lagging. Seepage flows at the bottom of the excavation should be contained and controlled in order to prevent loss of soil from behind the lagging. Drainage should be provided for permanent below-grade walls as described in Section 4.8.

4.4.2.4. Construction Considerations

Shoring construction shall be completed by a qualified shoring contractor. Temporary casing or drilling fluid may be required to install the soldier piles where:

- Loose fill is present;
- The native soils do not have adequate cementation or cohesion to prevent caving or raveling; and/or
- Groundwater is present.

GeoEngineers should be allowed to observe and document shoring installation to evaluate conformance with the design assumptions and recommendations.

4.4.3. Shoring Wall Performance

Temporary shoring walls typically move on the order of 0.1 to 0.2 percent of H, where H is the vertical distance between the existing ground surface and the base of excavation. The deflections and settlements are usually highest at the excavation face and decrease to negligible amounts beyond a distance behind the wall equal to the height of the excavation. Localized deflections may exceed the above estimates and may reflect local variations in soil conditions (such as around side sewers) or may be the result of the workmanship used to construct the shoring wall. If temporary shoring is installed adjacent to existing improvements, some cosmetic damage should be expected (for instance, cracks in drywall finishes; widening of existing cracks; minor cracking of slabs-on-grade/hardscapes; cracking of sidewalks, curbs/gutter, and pavements/pavement panels; etc.). For this reason, it is important to complete a pre-construction survey and photo documentation of existing buildings and improvements prior to shoring construction.

4.5. Shallow Foundations

We recommend that the proposed student housing buildings be supported on shallow spread footings founded on the dense to very dense glacial till or stiff to hard glaciolacustrine deposits, on properly compacted structural fill extending down to these soils, or on improved ground.

The depth to competent bearing soils varies across the site and increases to the east (up to 23 feet at boring B-3 located east of the detention pond). Estimated bearing soil elevation contours are presented in Figure 7.

Ground improvement is required for foundations that are not supported directly on competent bearing soils. Where ground improvement is required, foundation support may consist of:

- Removal and replacement by removing unsuitable soils and replacing with structural fill, or
- Rammed aggregate piers (stone columns).

Where overexcavation is not economical due to the depth of fill and alluvial deposits, ground improvement may be utilized. Ground improvement will allow for design of conventional shallow foundations. Ground improvement may consist of rammed aggregate piers (stone columns). The design concept of the rammed aggregate piers is to densify and reinforce loose and compressible soils beneath footings and slabs. This report provides recommendations for shallow foundations and ground improvement.

The following recommendations for building foundations are based on subsurface conditions observed in the borings.

4.5.1. Foundation Design

The buildings can be supported on conventional spread and mat footings bearing on undisturbed native soils or on structural fill. Given the mixed bearing soil conditions at the site, the following recommendations are available for foundation design:

1. **Foundations bearing on undisturbed native soils.** A maximum allowable bearing pressure of 6,000 psf may be used for shallow foundations bearing on the undisturbed dense to very dense glacial till and 5,000 psf for foundations bearing on stiff to hard glaciolacustrine deposits.
2. **Foundations bearing on structural fill.** The depth to native bearing soil ranges up to 4 feet below Building A foundations, up to 7 feet below Building B (East Wing foundations), and up to about 10 feet below Building C foundations. The depth to bearing soils generally increases from west to east across the site.
    a. **Structural fill extending to bearing soils.** A maximum allowable bearing pressure of 5,000 psf may be used for shallow foundations bearing on approved structural fill that extends to dense undisturbed native bearing soils. See Section 4.3.4 for structural fill options, criteria and compaction requirements.
    b. **Structural fill not extending to bearing soils.** A maximum allowable bearing pressure of 3,000 psf may be used for shallow foundations bearing on a minimum of 2 feet of structural fill that does not extend to dense undisturbed native bearing soils. See Section 4.3.4 for structural fill options, criteria and compaction requirements. In order to employ this option, the existing fill surface must be re-compacted and proof rolled before placing structural fill within the zone of influence of a footing.

These allowable soil bearing pressures apply to the total of dead and long-term live loads and may be increased by up to one-third for wind or seismic loads. These allowable soil bearing pressures are net values.

The design frost depth for the Puget Sound area is 12 inches; therefore, we recommend that exterior footings for the building be founded at least 18 inches below lowest adjacent finished grade. Interior footings should be founded at least 12 inches below bottom of slab or adjacent finished grade. Continuous wall footings and individual column footings should have minimum widths of 24 inches.

All footings near below-grade walls should be embedded to a depth that is at least below a 1H:1V line projected up from the bottom of the closest section of wall, otherwise the below-grade walls need to be designed for lateral loads from the footings.

Existing fill material should be removed from below building foundations and be replaced with structural fill. Loose/soft or disturbed soils not removed from below footings may result in settlement and potential damage to the foundations.

4.5.2. Foundation Settlement

We estimate that the post-construction settlement of footings founded as recommended above will be less than 1 inch. Differential settlement between comparably loaded column footings or along a 25-foot section of continuous wall footing should be less than ½ inch. We expect most of the footing settlements will occur as loads are applied. Loose or disturbed soils not removed from footing excavations prior to placing concrete will result in additional settlement.

4.5.3. Lateral Resistance

Lateral loads can be resisted by passive resistance on the sides of the footings and by friction on the base of the footings. Passive resistance should be evaluated using an equivalent fluid density of 350 pounds per cubic foot (pcf) where footings are poured neat against native soil or are surrounded by structural fill compacted to at least 95 percent of MDD, as recommended. Resistance to passive pressure should be calculated from the bottom of adjacent floor slabs and paving or below a depth of 1 foot where the adjacent area is unpaved, as appropriate. Frictional resistance can be evaluated using 0.35 for the coefficient of base friction against footings. The above values incorporate a factor of safety of about 1.5.

If soils adjacent to footings are disturbed during construction, the disturbed soils must be recompacted, otherwise the lateral passive resistance value must be reduced.

4.5.4. Footing Drains

We recommend that perimeter footing drains be installed around the buildings. The perimeter drains should be installed at the base of the exterior footings. The perimeter drains should be provided with cleanouts and should consist of at least 4-inch-diameter perforated pipe placed on a 3-inch bed of, and surrounded by, 6 inches of drainage material enclosed in a nonwoven geotextile such as Mirafi 140N (or approved equivalent) to prevent fine soil from migrating into the drain material. We recommend that the drainpipe consist of either heavy-wall solid pipe (SDR-35 PVC, or equal) or rigid corrugated smooth interior polyethylene pipe (ADS N-12, or equal).

We recommend against using flexible tubing for footing drainpipes. The drainage material should consist of pea gravel or “Gravel Backfill for Drains” per WSDOT standard specifications Section 9-03.12(4), as shown on Figure 10. The perimeter drains should be sloped to drain by gravity, if practicable, to a suitable discharge point, preferably a storm drain. We recommend that the cleanouts be covered and be placed in flush mounted utility boxes. Water collected in roof downspout lines must not be routed to the footing drain lines.

4.5.5. Construction Considerations

During demolition, we recommend completing test pits for each building area, particularly along the south half of Building C, to further assess the actual depth of existing fill that will require overexcavation/ replacement or ground improvement.

Immediately prior to placing concrete, all debris and loose soils that accumulated in the footing excavations during forming and steel placement must be removed. Debris or loose soils not removed from the footing excavations will result in increased settlement.

If wet weather construction is planned, we recommend that all footing subgrades be protected using a lean concrete mud mat. The mud mat should be placed the same day that the footing subgrade is excavated and approved for foundation support.

We recommend that all completed footing excavations be observed by a representative of our firm prior to placing mud mat, reinforcing steel, and structural concrete. Our representative will confirm that the bearing surface has been prepared in a manner consistent with our recommendations and that the subsurface conditions are as expected.

4.6. Ground Improvement

Ground improvement is planned below Building D and potentially below Building C. We understand that ground improvement is also being considered where 5,000 psf allowable bearing capacity is required in the eastern portions of Buildings A and B, if overexcavation and replacement with structural fill is not economical. The preferred ground improvement option is stone columns installed at the base of the planned foundations. This ground improvement option would be completed on a grid pattern, where necessary, to transfer the foundation loading to the bearing soils and will mitigate potential settlement of the fill and alluvial soils.

The purpose of ground improvement is to mitigate potential static and/or seismic induced settlement resulting from consolidation of fill and alluvial deposits. Ground improvement will allow for design and construction of conventional shallow foundations and slabs-on-grade both of which are anticipated to result in more efficient and more cost-effective construction.

GeoEngineers can design the ground improvement system in collaboration with the structural engineer, if needed, otherwise a proprietary system such as Geopiers may be designed by the specialty contractor.

4.6.1. Stone Columns

Ground improvement using stone columns is the preferred option to mitigate settlement hazards where overexcavation and replacement is not cost effective. Where used, stone columns would be needed below foundations only and are not required below floor slabs. We recommend that stone columns be constructed using bottom-feed vibro-replacement construction techniques. Rammed aggregate piers such as Geopiers may also be used.

Vibro-replacement method typically consists of vibrating a probe to the desired design depth. While the probe is being withdrawn from the hole, aggregate is placed through the feeder at the tip of the probe. The probe can be dropped at various lift heights and the aggregate will be compacted and pushed into the formation. A maximum allowable soil bearing pressure of 5,000 psf may be used for foundations supported on ground improved with stone columns.

Based on our experience, we anticipate that the system may include the following elements for support of the design loads:

- An area of replacement ratio of 13 to 15 percent;
- For 20-inch-diameter columns, 4-foot-square grid spacing is required to meet the minimum area replacement ratio;
- For 30-inch-diameter columns, 6-foot-square grid spacing is required to meet the minimum area replacement ratio;
- The stone column layout below footings should extend beyond the footing edges such that one row of stone columns is outside of the foundation footprint; and

- Stone columns should be embedded 3 feet into the glacial till or glaciolacustrine or to a depth of practical refusal.

We estimate that the post-construction settlement of footings founded as recommended above will be less than about 1 inch. Differential settlement between comparably loaded column footings or along a 25-foot section of continuous wall footing is estimated to be less than ½-inch. We expect most of the footing settlements will occur as loads are applied. Loose or disturbed soils not removed from footing excavations prior to placing concrete will result in additional settlement.

4.7. Slab-On-Grade Floors

Slab-on-grade floors can be supported on medium dense to dense native soils and on structural fill overlying suitable native soils or approved existing fill. A subgrade modulus of 100 feet per cubic inch (pci) may be used for design of the slabs-on-grade at the site. We recommend that an appropriate capillary break and vapor retarder be installed below the floor slab to reduce the risk of moisture migration through the floor slab. This is especially important since zones of groundwater seepage may be present at the planned floor slab level in more permeable layers within the native soil or in looser soils on top of the native soil.

We recommend that concrete slabs-on-grade be constructed on a gravel layer to provide uniform support and drainage, and to act as a capillary break. The gravel layer below slabs-on-grade should consist of 6 inches of clean crushed gravel, with a maximum particle size of 1 inch and negligible sand or silt, such as WSDOT Standard Specification Section 9-03.1(4)C, AASHTO Grading No. 67, as shown on Figure 10. If prevention of moisture migration through the slab is essential, such as where carpet or floor coverings are used, a vapor retarder such as heavy plastic sheeting or Moist-Stop should be installed between the slab and the gravel layer. We recommend that the plastic sheet be placed over the capillary break layer. The contractor should be made responsible for maintaining the integrity of the vapor barrier during construction. It may also be prudent to apply a sealer to the slab to further retard the migration of moisture through the floor.

4.8. Below-Grade Walls and Retaining Walls

4.8.1. Cast-In-Place Walls

Lateral earth pressures for design of below-grade walls and retaining structures should be evaluated using an equivalent fluid density of 35 pcf provided that the walls will not be restrained against rotation when backfill is placed. If the walls will be restrained from rotation, we recommend using an equivalent fluid density of 55 pcf. Walls are assumed to be restrained if top movement during backfilling is less than H/1000, where H is the wall height. These lateral soil pressures assume that the ground surface behind the wall is horizontal. If the ground surface within five feet of the wall rises at an inclination of 2H:1V or steeper, the walls should be designed for lateral pressures based on equivalent fluid densities of 50 and 80 pcf, respectively, for unrestrained and restrained conditions. These lateral soil pressures do not include the effects of surcharges such as floor loads, traffic loads or other surface loading. Surcharge effects should be included as appropriate. Below-grade walls for the building should also include seismic earth pressures. Seismic earth pressures should be determined using a rectangular distribution of 8H in psf, where H is the wall height.

If vehicles can approach the tops of exterior walls to within ½ the height of the wall, a traffic surcharge should be added to the wall pressure. For car parking areas, the traffic surcharge can be approximated by the equivalent weight of an additional 1 foot of soil backfill (125 psf) behind the wall. For delivery truck parking areas and access driveway areas, the traffic surcharge can be approximated by the equivalent weight of an additional 2 feet (250 psf) of soil backfill behind the wall. Other surcharge loads, such as from foundations, construction equipment, or construction staging areas, should be considered on a case-by-case basis. Positive drainage should be provided behind below-grade walls and retaining structures as discussed in Section 4.8.2.

These recommendations assume that all retaining walls will be provided with adequate drainage. The values for soil bearing, frictional resistance and passive resistance presented above for foundation design are applicable to retaining wall design. Walls located in level ground areas should be founded at least 18 inches below the adjacent grade.

4.8.2. Wall Drainage

Positive drainage should be provided behind cast-in-place retaining walls by using free draining wall drainage material with perforated pipes to discharge the collected water, as shown in Figure 10. Wall drainage material may consist of washed ⅜-inch to No. 8 pea gravel per WSDOT 9.03.1(4)C, AASHTO Grading No. 8, or clean gravel (gravel backfill for drains per WSDOT Standard Specification Section 9-03.12(4)) surrounded with a non-woven geotextile fabric such as Mirafi 140N (or approved equivalent). The zone of wall drainage material should be 2 feet wide and should extend from the base of the wall to within 2 feet of the ground surface. The wall drainage material should be covered with a nonwoven geotextile separator and at 2 feet of less permeable material, such as the on-site silty sand that is properly moisture conditioned and compacted.

A 4-inch-diameter perforated drain pipe should be installed within the free-draining material at the base of each wall. We recommend using either heavy-wall solid pipe (SDR-35 polyvinyl chloride [PVC]) or rigid corrugated polyethylene pipe (ADS N-12, or equal). We recommend against using flexible tubing for the wall drain pipe. The footing drain recommended in Section 4.5.4 can be incorporated into the bottom of the drainage zone and used for this purpose.

The pipes should be laid with minimum slopes of one-quarter percent and discharge into the storm water collection system to convey the water off site. The pipe installations should include a cleanout riser with cover located at the upper end of each pipe run. The cleanouts could be placed in flush-mounted access boxes. Collected downspout water should be routed to appropriate discharge points in separate pipe systems.

4.8.3. Waterproofing

The recommendations in this section are provided to reduce the potential for buildup of hydrostatic pressures behind below-grade walls and hydrostatic uplift forces below the building slab. If no special waterproofing measures are taken, leaks or seepage may occur in localized areas of the below-grade portion of the building, even if the recommended wall drainage and below-slab drainage provisions are constructed. If leaks or seepage is undesirable, below-grade waterproofing should be specified. A waterproofing consultant should be contracted to provide recommendations for below-grade waterproofing for this project.

4.8.4. Other Considerations

Exterior retaining systems used to achieve grade transitions or for landscaping, can be constructed using traditional structural systems such as reinforced concrete and concrete masonry unit (CMU) blocks. Rockeries may also be used for grade changes. Alternatively, retaining walls can consist of reinforced soil and mechanically stabilized earth (MSE) walls. We can provide additional design recommendations for reinforced soil, MSE walls or rockeries, if requested.

4.9. Surface Water Drainage Considerations

All paved and landscaped areas should be graded so that surface drainage is directed away from the buildings to appropriate catch basins.

Water collected in roof downspout lines must not be routed to the footing drain lines or subsurface drain lines. Collected downspout water should be routed to appropriate discharge points in separate pipe systems.

4.10. Infiltration Considerations

Sieve analyses were performed on selected soil samples within 15 feet of existing site grades from the borings that were completed as part of this study. The soil samples typically consisted of fill, native glacial till, and glaciolacustrine deposits. The preliminary design infiltration value described below are based on the results of the grain size analyses, the United States Department of Agriculture (USDA) Textural Triangle, and the Washington State Department of Ecology Storm Water Management Manual (2019). The grain size analyses are presented in Appendix B.

Based on our analysis, it is our opinion that the on-site soils have a very low infiltration capacity. The majority of the soils across the site have been glacially compacted and also contain significant fines, which limits the infiltration capacity. The results of the sieve analyses indicated that the fines content (material passing the U.S. No. 200 sieve) typically ranges from 30 to 60 percent for the fill and glacial till soils within the upper 10 feet. Due to the density and relative impermeability of the glacial till and the high fines content of the glaciolacustrine deposits, infiltration should be assumed to be negligible when designing the infiltration systems. We recommend an infiltration rate of not more than 0.1 inches per hour be used for design of the infiltration facilities. Infiltration facilities should not be planned near the east fill slope or rockery. We recommended that in-situ pilot infiltration tests be performed if infiltration is being considered at the site.

4.11. Pavement Recommendations

4.11.1. Subgrade Preparation

We recommend the subgrade soils in new pavement areas be prepared and evaluated as described in Section 4.3.2. All new pavement and hardscape areas should be supported on subgrade soils that have been proof rolled or probed as described in Section 4.3.1. If the exposed subgrade soils are loose or soft, it may be necessary to excavate localized areas and replace them with structural fill or gravel base course. Pavement subgrade conditions should be observed during construction and prior to placing the subbase materials in order to evaluate the presence of zones of unsuitable subgrade soils and the need for overexcavation and replacement of these zones.

4.11.2. New Hot-Mix Asphalt Pavement

In light-duty pavement areas (e.g., automobile parking for surface parking lot), we recommend a pavement section consisting of at least a 3-inch thickness of ½-inch hot-mix asphalt (HMA) per WSDOT Sections 5-04 and 9-03, over a 4-inch thickness of densely compacted CSBC per WSDOT Section 9-03.9(3). In heavy-duty pavement areas (such as driveways, truck traffic lanes, materials delivery), we recommend a pavement section consisting of at least a 4-inch thickness of ½-inch HMA over a 6-inch thickness of densely compacted CSBC.

The base course should be compacted to at least 95 percent of the MDD obtained using ASTM D 1557. We recommend that proof rolling of the subgrade and compacted base course be observed by a representative from our firm prior to paving. Soft or yielding zones observed during proof rolling may require overexcavation and replacement with compacted structural fill.

The pavement sections recommended above are based on our experience. Thicker asphalt sections may be needed based on the actual traffic data, truck and bus loads, and intended use. All paved and landscaped areas should be graded so that surface drainage is directed to appropriate catch basins.

4.11.3. Portland Cement Concrete Pavement

PCC sections may be considered for areas where concentrated heavy loads may occur. We recommend that these pavements consist of at least 6 inches of PCC over 6 inches of CSBC. A thicker concrete section may be needed based on the actual load data for use of the area. If the concrete pavement will have doweled joints, we recommend that the concrete thickness be increased by an amount equal to the diameter of the dowels. The base course should be compacted to at least 95 percent of the MDD.

We recommend PCC pavements incorporate construction joints and/or crack control joints spaced at maximum distances of 12 feet apart, center-to-center, in both the longitudinal and transverse directions. Crack control joints may be created by placing an insert or groove into the fresh concrete surface during finishing, or by saw cutting the concrete after it has initially set up. We recommend the depth of the crack control joints be approximately one fourth the thickness of the concrete; or about 1½ inches deep for the recommended concrete thickness of 6 inches. We also recommend the crack control joints be sealed with an appropriate sealant to help restrict water infiltration into the joints.

4.11.4. Asphalt-Treated Base

If pavements are constructed during the wet seasons, consideration may be given to covering the areas to be paved with ATB for protection. Light-duty pavement areas should be surfaced with 3 inches of ATB, and heavy-duty pavement areas should be surfaced with 6 inches of ATB. Thicker ATB sections may be needed based on actual construction equipment loads. Prior to placement of the final pavement sections, we recommend the ATB surface be evaluated and areas of ATB pavement failure be removed and the subgrade repaired. If ATB is used and is serviceable when final pavements are constructed, the CSBC can be eliminated, and the design PCC or asphalt concrete pavement thickness can be placed directly over the ATB.

4.12. Recommended Additional Geotechnical Services

Throughout this report, recommendations are provided where we consider additional geotechnical services to be appropriate. These additional services are summarized below:

- Pilot infiltration tests should be performed if infiltration facilities are being considered at the site.
- GeoEngineers should be retained to review the project plans and specifications when complete to confirm that our design recommendations have been implemented as intended, as required by the City of Bothell.
- During demolition, we recommend completing test pits for each building area, particularly along the south half of the east wing of Building C, to further assess the actual depth of unsuitable existing fill that will require overexcavation/replacement or ground improvement.
- During construction, GeoEngineers should observe and evaluate the suitability of the foundation subgrades, observe installation of temporary shoring systems, observe removal of unsuitable soils, evaluate the suitability of floor slab and pavement subgrades, observe installation of subsurface drainage measures, observe and test structural backfill including reconstruction of the east slope, and provide a summary letter of our construction observation services. The purposes of GeoEngineers construction phase services are to confirm that the subsurface conditions are consistent with those observed in the explorations and other reasons described in Appendix D, Report Limitations and Guidelines for Use.

5.0 LIMITATIONS

We have prepared this report for use by the UW and members of the project team for use in design of this project.

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

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix D for additional information pertaining to use of this report.

6.0 REFERENCES

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FIGURES

Vicinity Map

Husky Village
Bothell, Washington

GeoEngineers

Figure 1

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

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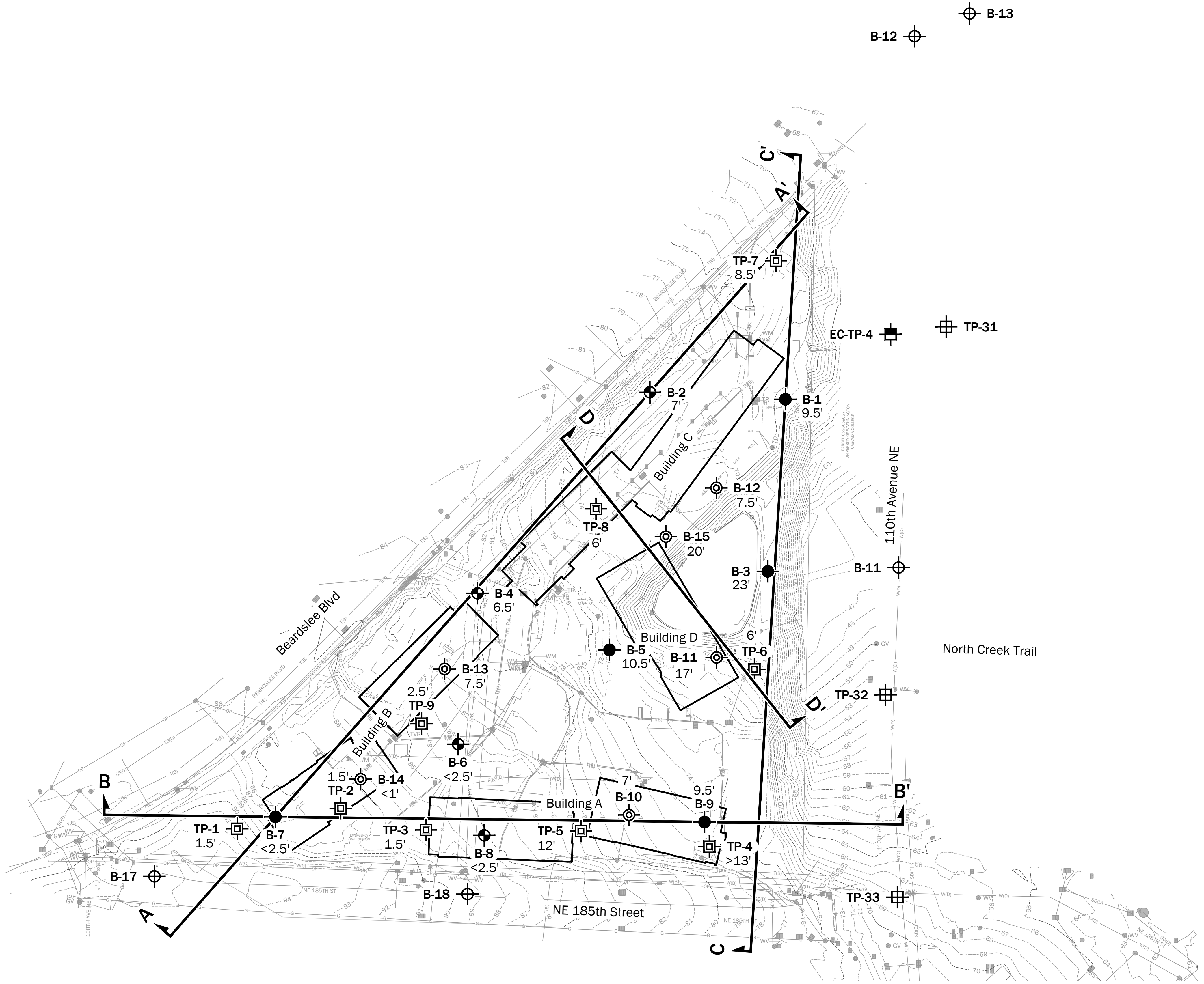


Legend

B-12 ◎ Boring by GeoEngineers, Inc., 2020

B-1 ● Boring with Monitoring Well by GeoEngineers, Inc., 2019

B-2 ◐ Boring by GeoEngineers, Inc., 2019

B-11 ⊕ Boring by GeoEngineers, Inc., 1998

TP-31 ⊞ Test Pit by GeoEngineers, Inc., 1998

EC-TP-4 ■ Test Pit by Earth Consultants, 1985

TP-1 ▣ Test Pit by Cascade Testing Laboratory, 1984

8.5' Depth to Glacially Consolidated Soils

A A' Cross Section Location

☐ Proposed Building

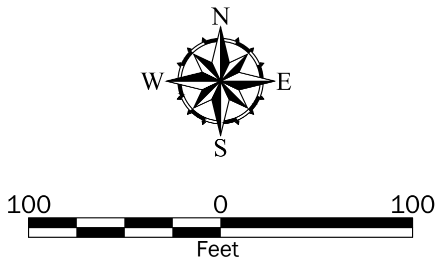
Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from David Evans and Associates, Inc., dated 10/30/19.

Vertical Datum: NAVD 88.

Projection: NAD83 Washington State Planes, North Zone, US Foot.

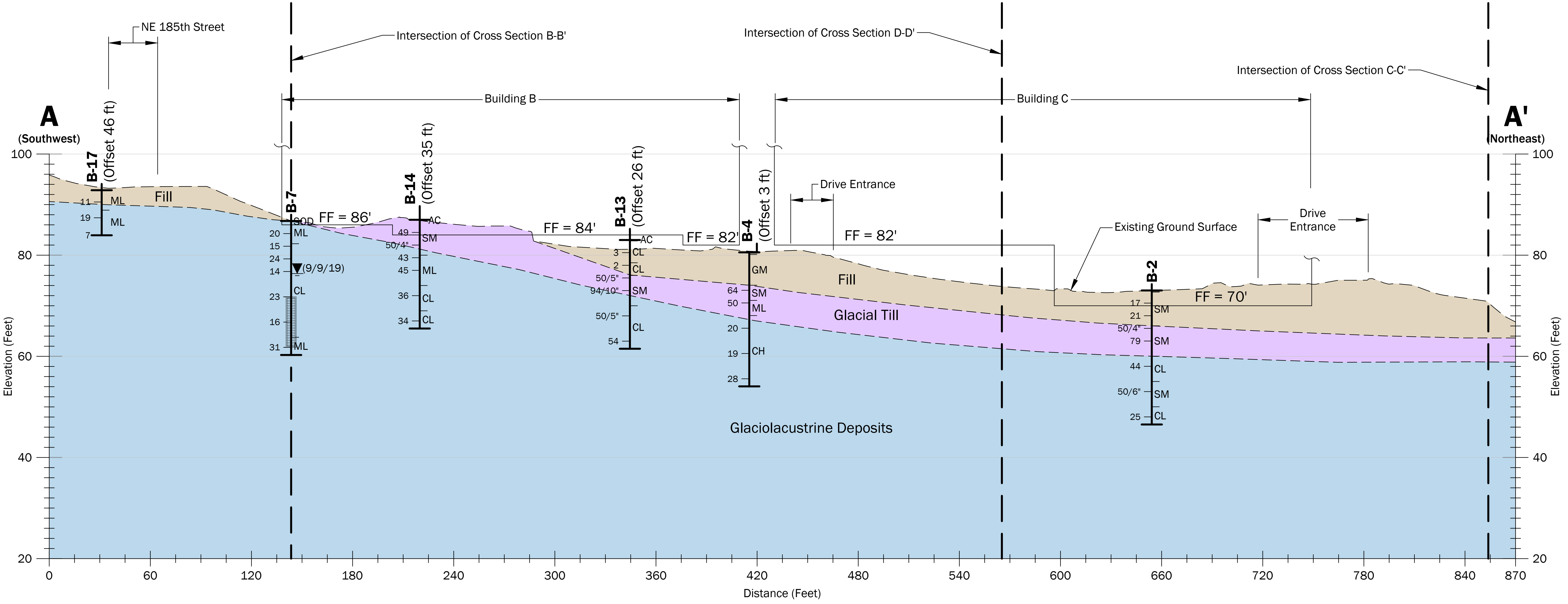


Site Plan

Husky Village
Bothell, Washington

GeoEngineers

Figure 2

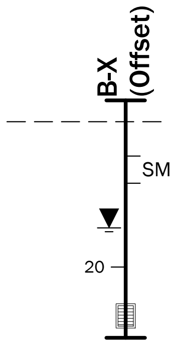


Notes:

1. Existing ground surface from LiDAR King County, 2016.
2. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

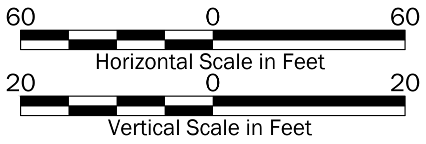
Datum: NAVD 88, unless otherwise noted.

Legend



Boring
Inferred Soil Contact
Soil Classification
Groundwater Measured in Piezometer
Blow Count
Well Screen

▨ Fill
▨ Alluvium
▨ Glacial Till
▨ Glaciolacustrine Deposits



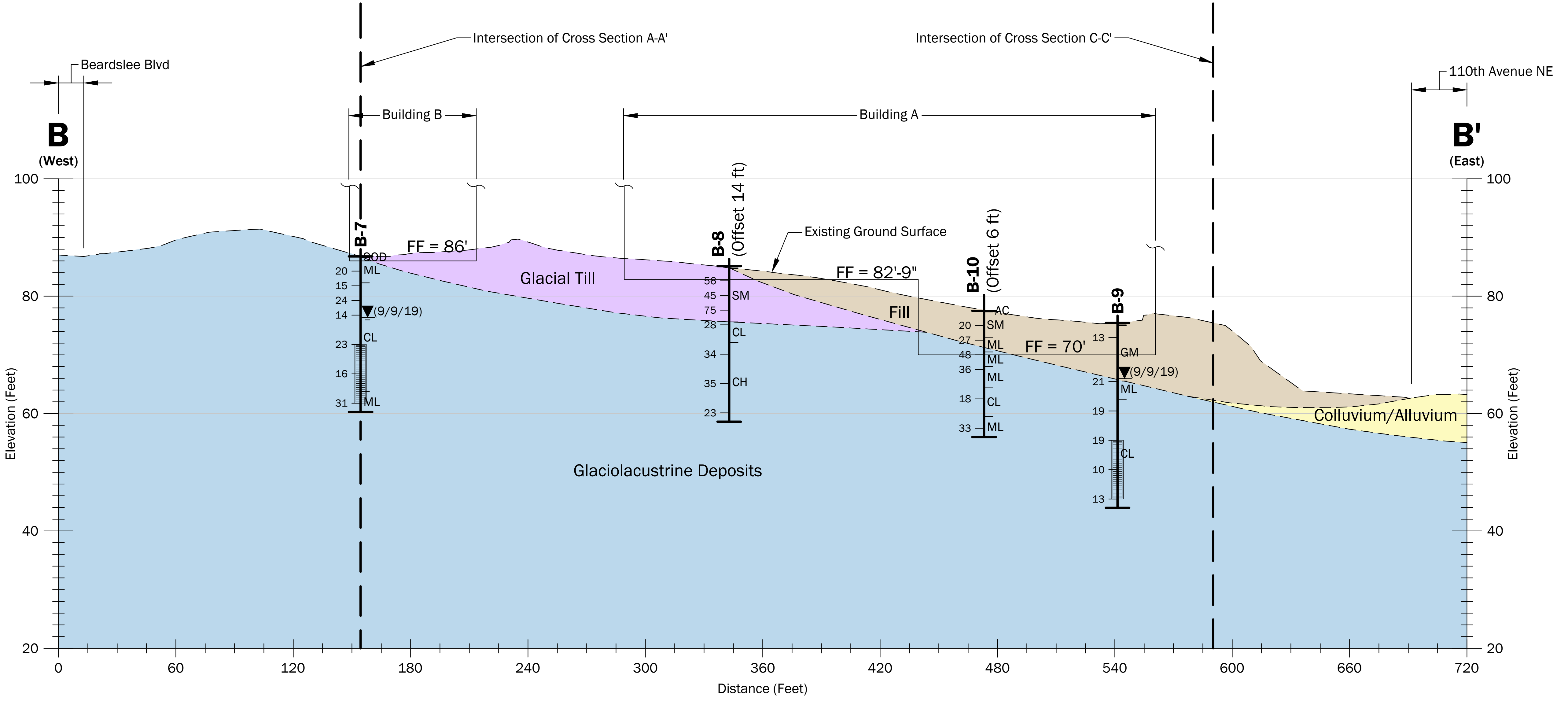
Cross Section A-A'

Husky Village
Bothell, Washington

GEOENGINEERS

Figure 3

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F02-F06 Site Plan and Cross Sections.dwg TAB:F03 Date Exported: 10/14/20 - 11:01 by tbyrd

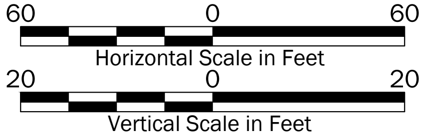


Notes:
1. Existing ground surface from LiDAR King County, 2016.
2. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: NAVD 88, unless otherwise noted.

Legend

B-X (Offset)	Boring
– – – –	Inferred Soil Contact
SM	Soil Classification
▼	Groundwater Measured in Piezometer
20	Blow Count
▥	Well Screen
🟫	Fill
🟨	Colluvium/Alluvium
🟪	Glacial Till
🟦	Glaciolacustrine Deposits



Cross Section B-B'

Husky Village
Bothell, Washington

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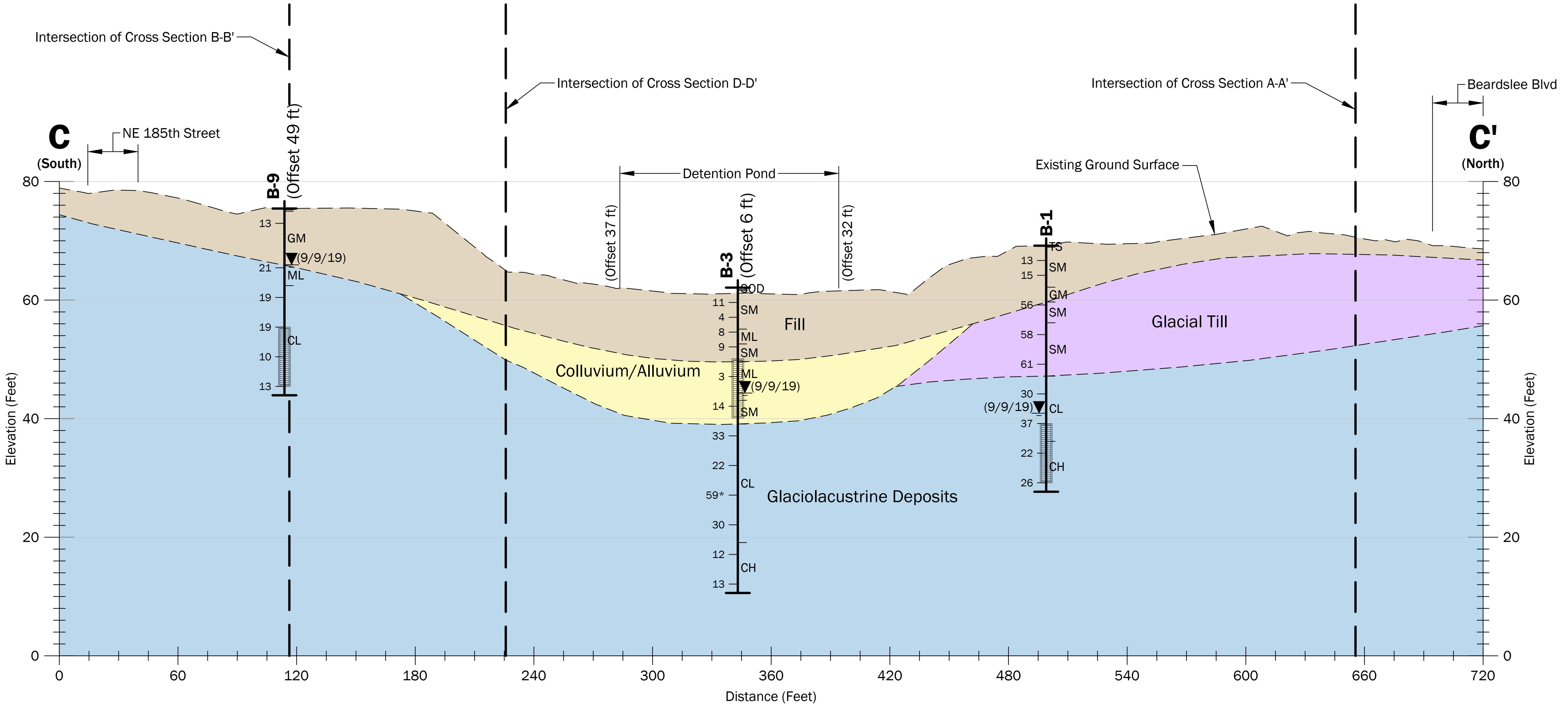
Figure 4

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F02-F06 Site Plan and Cross Sections.dwg TAB:F04 Date Exported: 10/14/20 - 11:04 by tbyrd

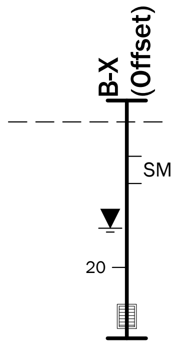


Notes:

1. Existing ground surface from LiDAR King County, 2016.
2. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

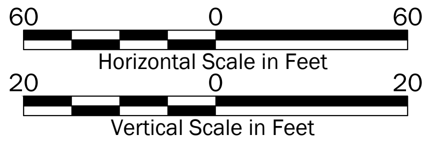
Datum: NAVD 88, unless otherwise noted.

Legend



Boring
Inferred Soil Contact
Soil Classification
Groundwater Measured in Piezometer
Blow Count
Well Screen

🟫 Fill
🟨 Colluvium/Alluvium
🟪 Glacial Till
🟦 Glaciolacustrine Deposits



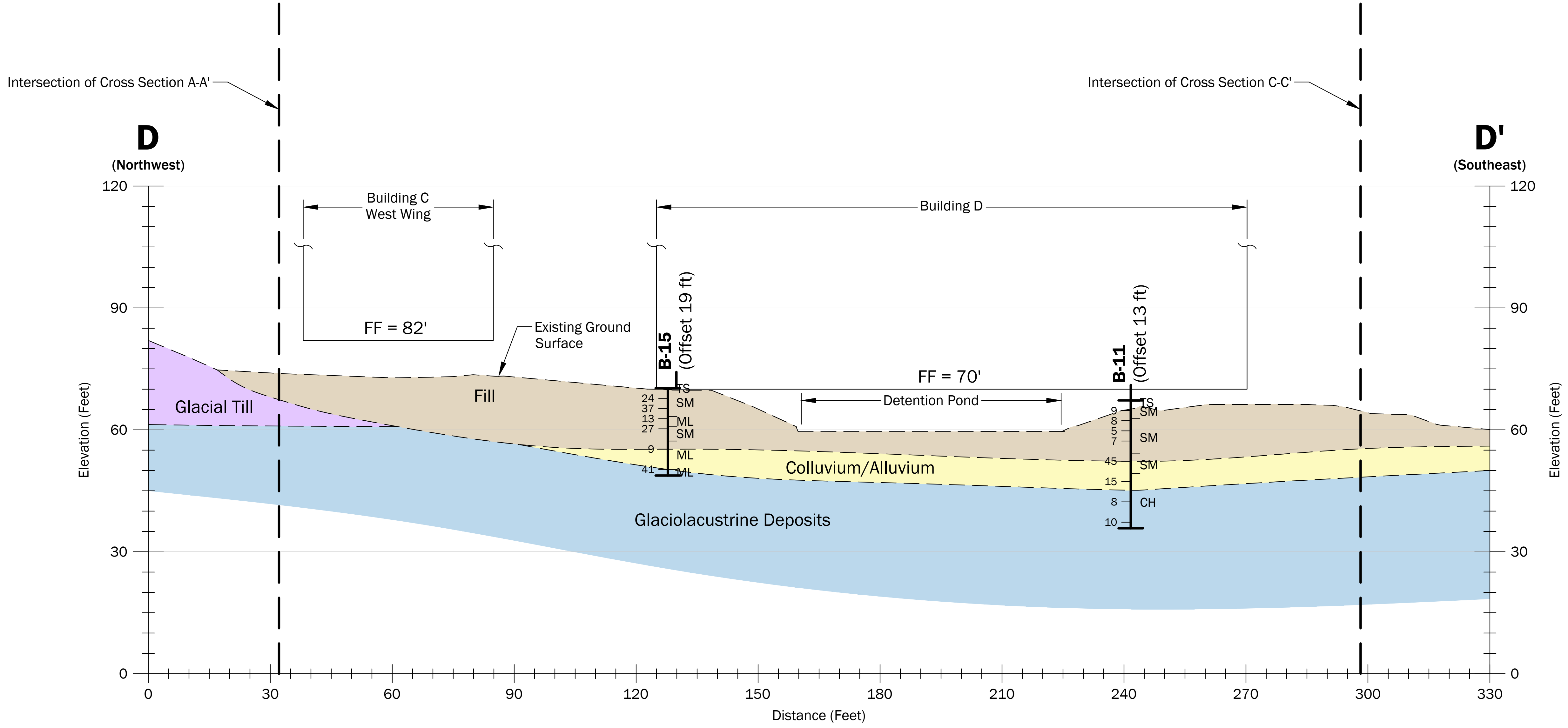
Cross Section C-C'

Husky Village
Bothell, Washington

GeoEngineers

Figure 5

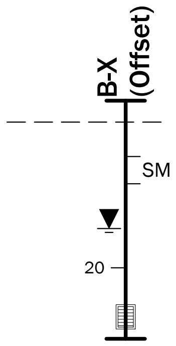
\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F02-F06 Site Plan and Cross Sections.dwg TAB:F05 Date Exported: 10/14/20 - 11:06 by tbyrd



Notes:
1. Existing ground surface from LiDAR King County, 2016.
2. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: NAVD 88, unless otherwise noted.

Legend



Boring
Inferred Soil Contact
Soil Classification
Groundwater Measured in Piezometer
Blow Count
Well Screen

🟫 Fill
🟨 Colluvium/Alluvium
🟪 Glacial Till
🟦 Glaciolacustrine Deposits

30 0 30
Scale in Feet

Cross Section D-D'

Husky Village
Bothell, Washington

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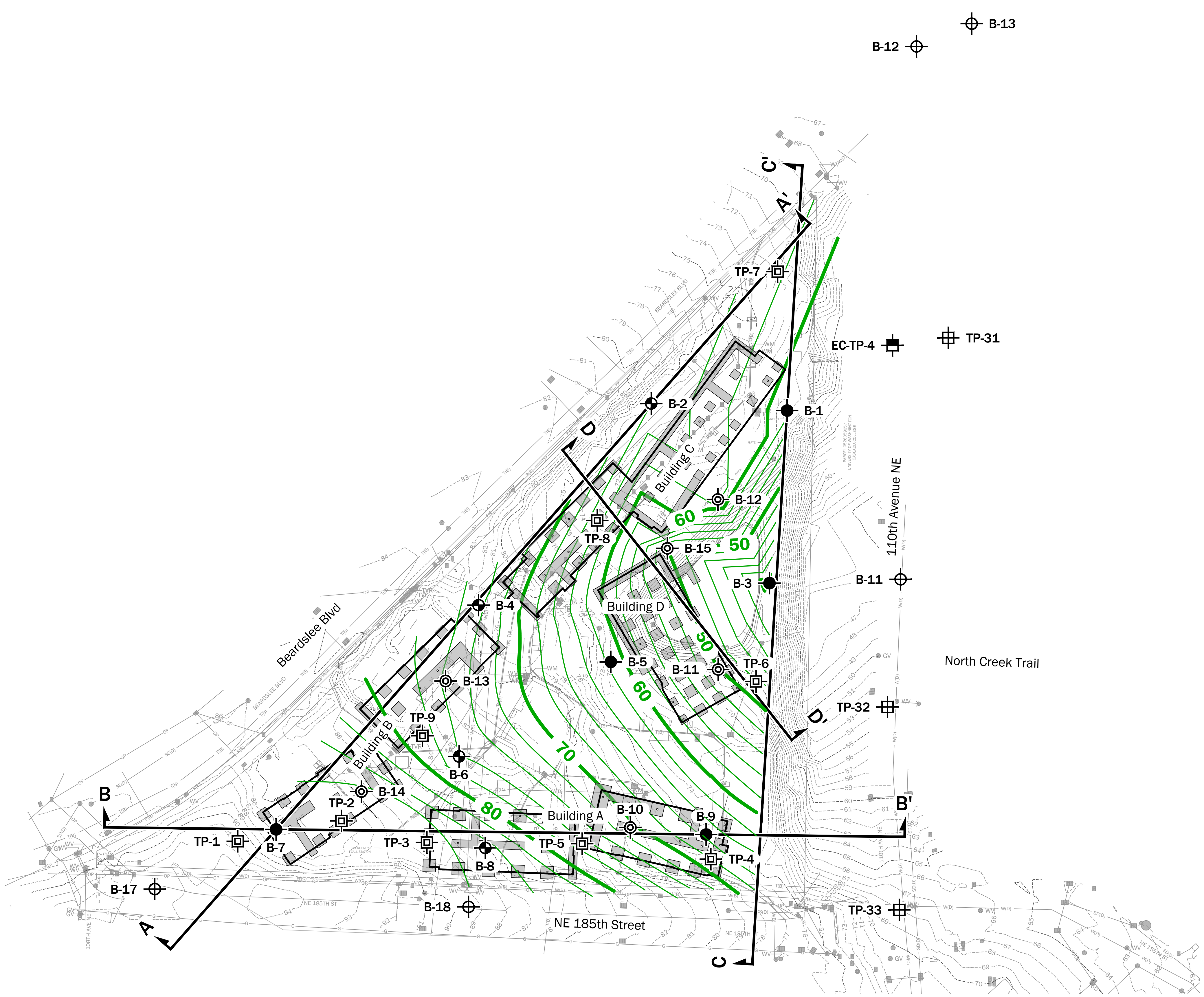
Figure 6



Legend

B-12	Boring by GeoEngineers, Inc., 2020
B-1	Boring with Monitoring Well by GeoEngineers, Inc., 2019
B-2	Boring by GeoEngineers, Inc., 2019
B-11	Boring by GeoEngineers, Inc., 1998
TP-31	Test Pit by GeoEngineers, Inc., 1998
EC-TP-4	Test Pit by Earth Consultants, 1985
TP-1	Test Pit by Cascade Testing Laboratory, 1984
A A'	Cross Section Location
☐	Proposed Building
50	Bearing Soil Elevation Contours

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from David Evans and Associates, Inc., dated 10/30/19.

Vertical Datum: NAVD 88.

Projection: NAD83 Washington State Planes, North Zone, US Foot.

N
W E
S

100 0 100
Feet

Bearing Soil Contours

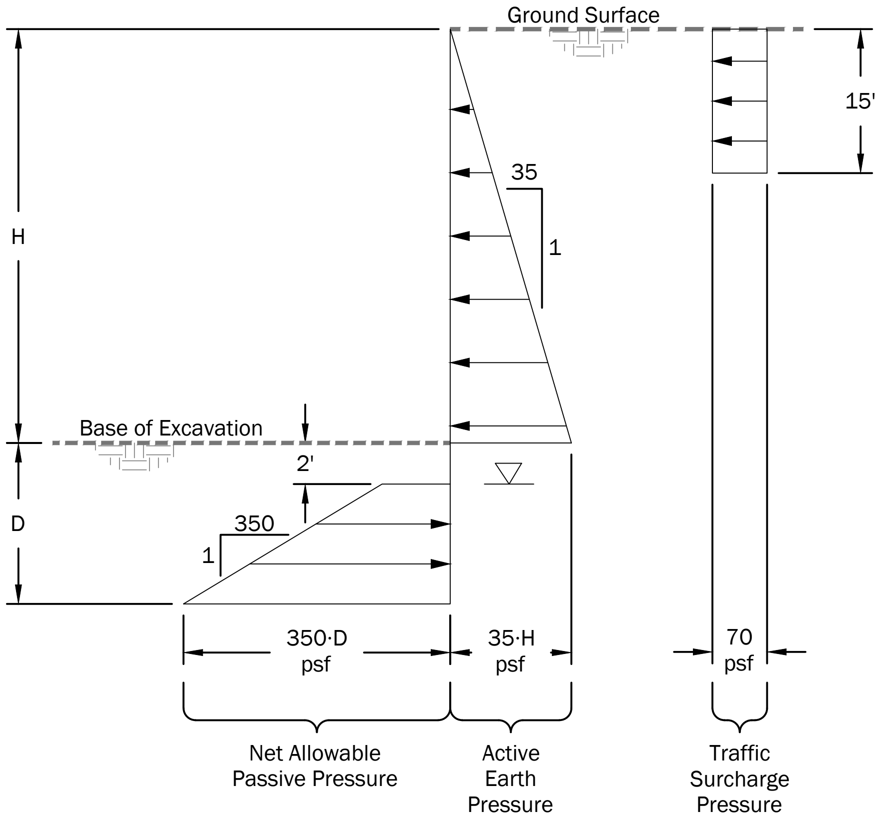
Husky Village
Bothell, Washington

GeoEngineers

Figure 7

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F07 Bearing Soil Contours.dwg TAB:F06 Date Exported: 09/24/20 - 12:51 by tbyrd

Cantilever Soldier Pile



Legend

H = Height of Excavation, Feet

D = Vertical Embedment Depth, Feet

▽ Design Groundwater Elevation for Drained Walls/ Passive Resistance Design

Not To Scale

Notes:
1. Active earth pressure and traffic surcharge pressure act over the pile spacing above the base of the excavation.
2. Passive earth pressure acts over 2.5 times the concreted diameter of the soldier pile, or the soldier pile spacing, whichever is less.
3. Passive pressure includes a factor of safety of 1.5
4. Additional surcharge from footings of adjacent buildings should be included in accordance with recommendations provided on Figure 9.
5. This pressure diagram is appropriate for temporary cantilever soldier pile walls. If additional surcharge loading (such as from soil stockpiles, excavators, dumptrucks, cranes, or concrete trucks) is anticipated, GeoEngineers should be consulted to provide revised surcharge pressures.

Earth Pressure Diagram
Temporary Cantilever Soldier Pile Wall

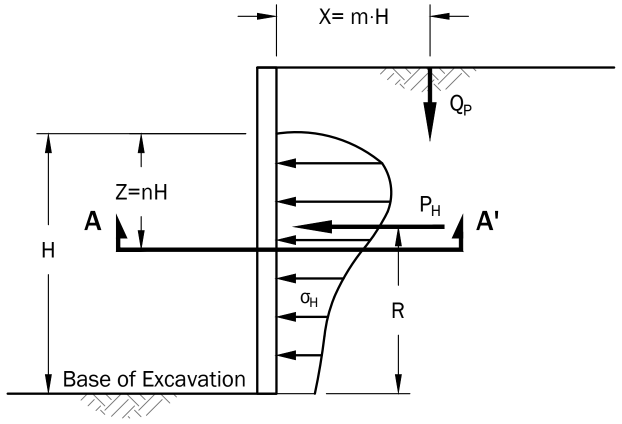
Husky Village
Bothell, Washington

GEOENGINEERS

Figure 8

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F08_EPD.dwg TAB:F08 Date Exported: 12/17/20 - 17:37 by mwoods

Lateral Earth Pressure from Point Load, Q_P (Spread Footing)



For $m \leq 0.4$

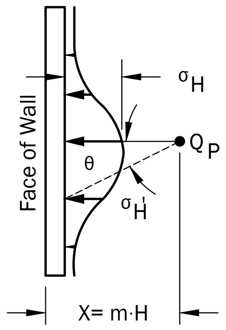
$$\sigma_H = \frac{0.28 Q_P n^2}{H^2(0.16+n^2)^3}$$

For $m > 0.4$

$$\sigma_H = \frac{1.77 Q_P m^2 n^2}{H^2(m^2+n^2)^3}$$

$$\sigma'_H = \sigma \, \text{COS}^2 (1.1\theta)$$

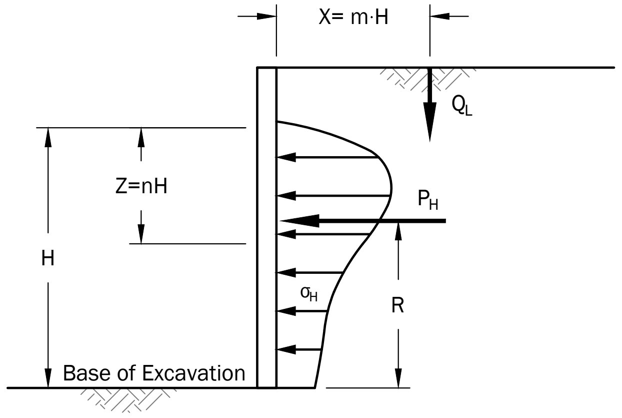
m	$P_H\left(\frac{H}{Q_P}\right)$	R
0.2	0.78	0.59H
0.4	0.78	0.59H
0.6	0.45	0.48H



Section A-A'

Pressures from Point Load Q_P

Lateral Earth Pressure from Line Load, Q_L (Continuous Wall Footing)



For $m \leq 0.4$

$$\sigma_H = \frac{0.2n \cdot Q_L}{H(0.16+n^2)^2}$$

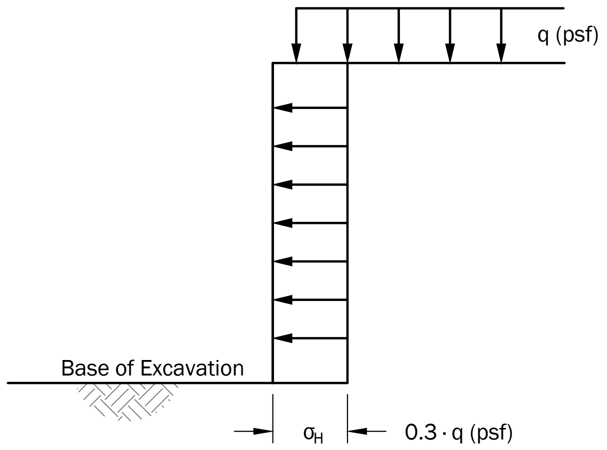
For $m > 0.4$

$$\sigma_H = \frac{1.28 m^2 n Q_L}{H(m^2+n^2)^2}$$

$$\text{Resultant } P_H = \frac{0.64 Q_L}{(m^2+1)}$$

m	R
0.1	0.60H
0.3	0.60H
0.5	0.56H
0.7	0.48H

Uniform Surcharges, q (Floor Loads, Large Foundation Elements or Traffic Loads)



σ_H = Lateral Surcharge Pressure from Uniform Surcharge

Definitions:

Q_P = Point load in pounds
Q_L = Line load in pounds/foot
H = Excavation height below footing, feet
σ_H = Lateral earth pressure from surcharge, psf
q = Surcharge pressure in psf
θ = Radians
σ'_H = Distribution of σ_H in plan view
P_H = Resultant lateral force acting on wall, pounds
R = Distance from base of excavation to resultant lateral force, feet
X = Resultant lateral force acting on wall, pounds
Z = Depth of σ_H to be evaluated below the bottom of Q_P or Q_L
m = Ratio of X to H
n = Ratio of Z to H

Notes:

1. Procedures for estimating surcharge pressures shown above are based on Manual 7.02 Naval Facilities Engineering Command, September 1986 (NAVFAC DM 7.02).
2. Lateral earth pressures from surcharge should be added to earth pressures presented on Figure 8.
3. See report text for where surcharge pressures are appropriate.

Recommended Surcharge Pressure

Husky Village
Bothell, Washington

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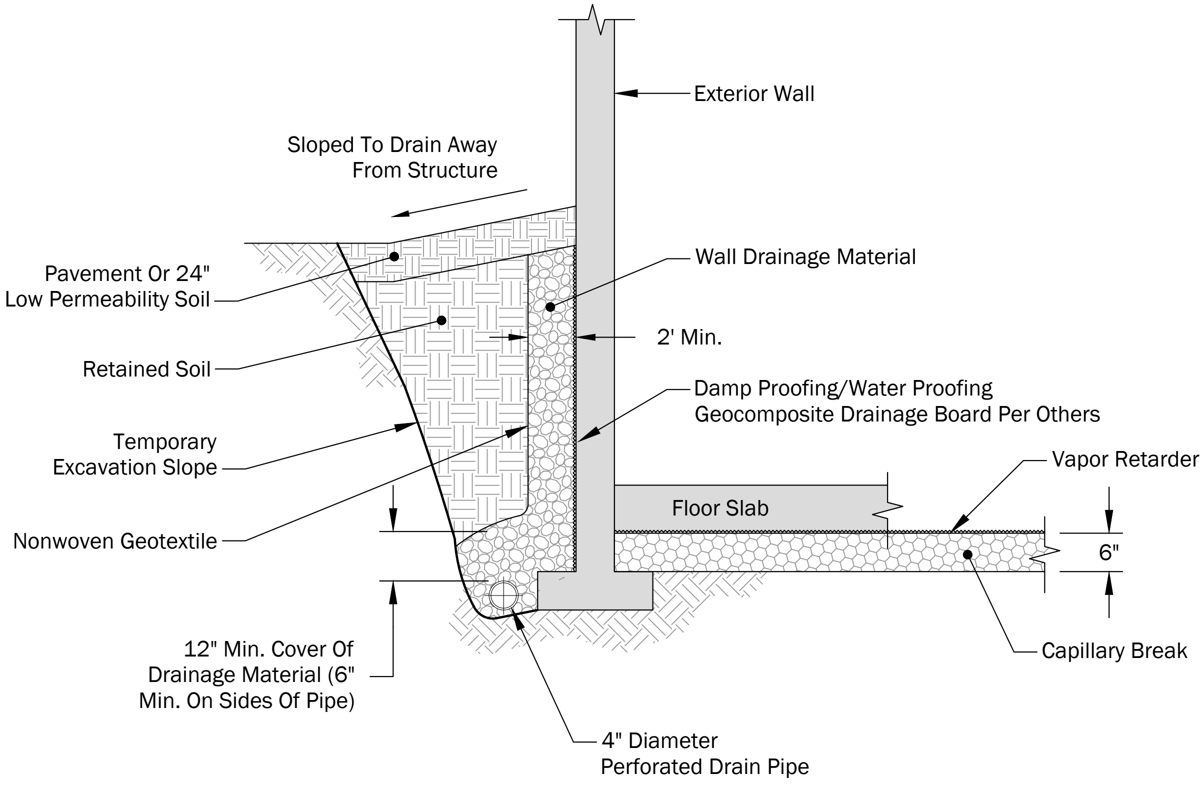
Figure 9

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F09_EPD.dwg TAB:F09 Date Exported: 12/17/20 - 17:39 by mwoods



Not To Scale

Materials:

A. WALL DRAINAGE MATERIAL

May consist of washed 3/8-inch to No.8 pea gravel or conform to Section 9-03.12(4) of the WSDOT Standard Specifications, surrounded with a non-woven geotextile such as Mirafi 140N (or approved equivalent).

B. RETAINED SOIL

Should consist of structural fill, either on-site soil or imported. The backfill should be compacted in loose lifts not exceeding 6 inches within 5' of the wall. Backfill not supporting building floor slabs, sidewalks, or pavement should be compacted to 90 - 92 percent of the maximum dry density, per ASTM D1557. Backfill supporting sidewalks or pavement areas should be compacted to at least 95 percent in the upper two feet. Only hand-operated equipment should be used for compaction within 5 feet of the walls and no heavy equipment should be allowed within 5 feet of the wall.

C. CAPILLARY BREAK

Should consist of 1-inch minus clean crushed rock with neglibile sand or silt per the 2018 WSDOT Specification 9-03.1(4)C, grading No.67.

D. PERFORATED DRAIN PIPE

Should consist of a minimum 4-inch diameter perforated heavy-wall solid pipe (SDR-35 PVC) or rigid corrugated polyethylene pipe (ADS N-12) or equivalent. Drain pipes should be placed with 0.25 percent minimum slopes and discharge to the storm water collection system.

Notes:
1. Thickness/location of permanent wall and slab on grade, and perimeter foundation shown here to depict intent of wall drainage design. Actual thickness/location of these structural elements will vary.

Wall Drainage and Backfill

Husky Village
Bothell, Washington

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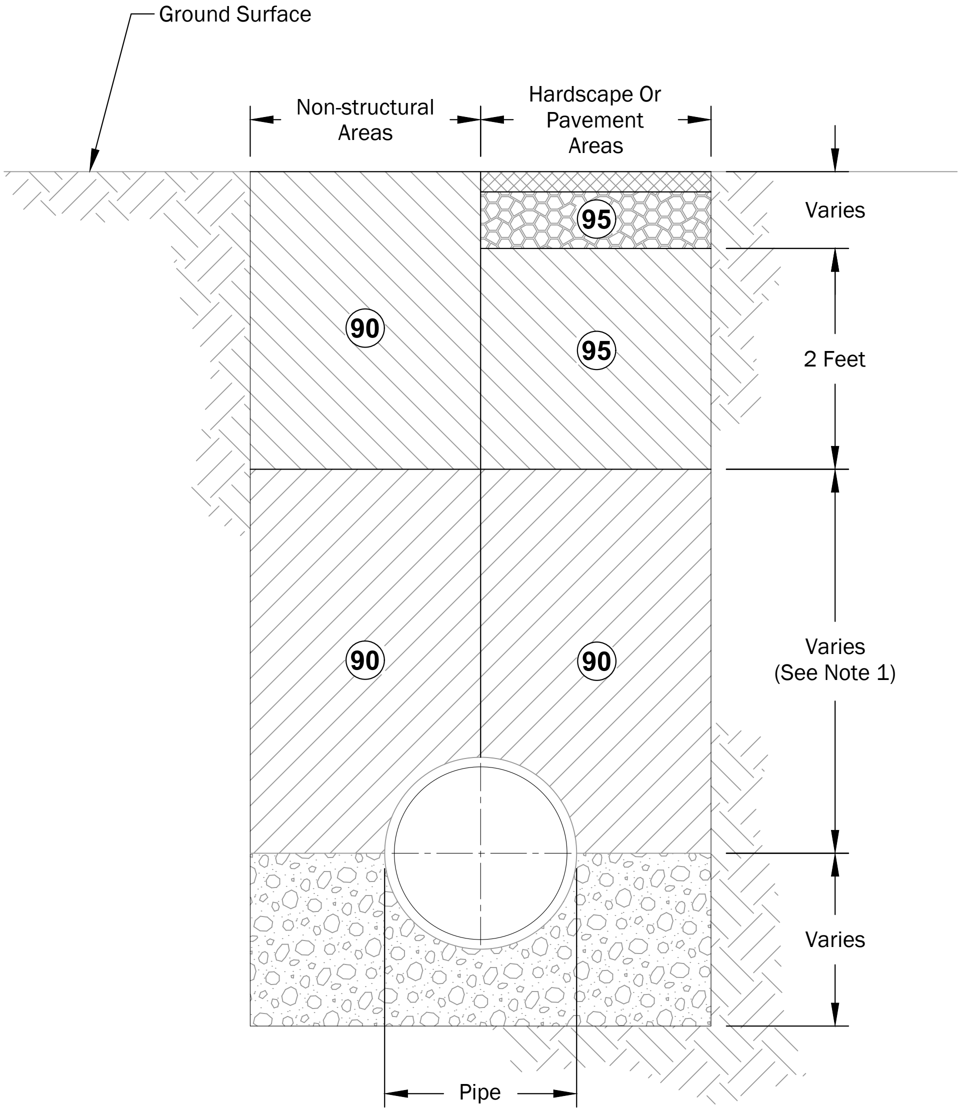
Figure 10



Not To Scale

Legend

(95) Recommended Compaction as a Percentage of Maximum Dry Density, by Test Method ASTM D1557 (Modified Proctor)

▩ Concrete or Asphalt Pavement

▦ Base Course

▨ Trench Backfill

▤ Pipe Bedding

Notes:

1. All backfill under building areas should be compacted to at least 95 percent per ASTM D1557.

Compaction Criteria for Trench Backfill

Husky Village
Bothell, Washington

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Figure 11

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Geotech\018314101_F11_Compaction Criteria.dwg TAB:F11 Date Exported: 12/17/20 - 17:43 by mwoods

APPENDICES

GeoEngineers

APPENDIX A

Field Explorations

APPENDIX A
FIELD EXPLORATIONS

The subsurface soil and groundwater conditions were evaluated by reviewing existing geotechnical information in the project vicinity and drilling fifteen borings (B-1 through B-15). Borings B-1 through B-9 were completed from August 12 through 14, 2019, and were drilled to depths ranging from 26½ to 51½ feet below the existing ground surface. Borings B-10 through B-15 were completed on August 27 and 28, 2020, and were drilled to depths ranging from 21 to 31½ feet below the existing ground surface. The borings were drilled by Advance Drill Technologies, Inc. of Snohomish, Washington, using a track-mounted drill rig equipped with an auto-hammer. Two-inch-diameter monitoring wells were installed in borings B-1, B-3, B-5, B-7, and B-9 to monitor groundwater conditions.

Locations of the explorations were determined in the field by tape measuring distances from the exploration locations to existing site features such as sidewalks, fences, parking lot curbs, and buildings. Ground surface elevations were determined based a site survey completed by David Evans and Associates on October 30, 2019.

Borings

The borings were completed using track-mounted, continuous-flight, hollow-stem auger drilling equipment. The borings were advanced using 3¼- and 4¼-inch inside-diameter hollow-stem augers. The borings were continuously monitored by a geotechnical engineer from our firm who reviewed and classified the soils encountered, obtained representative soil samples, observed groundwater conditions and prepared a detailed log of each exploration.

The soils encountered in the borings were typically sampled at 2½ to 5-foot vertical intervals with a 2-inch outside-diameter split-barrel standard penetration test (SPT) sampler. The samples were obtained by driving the sampler 18 inches into the soil with a 140-pound auto-hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration is recorded. The blow count ("N-value") of the soil is calculated as the number of blows required for the final 12 inches of penetration. This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils. Where very dense soil conditions preclude driving the full 18 inches, the penetration resistance for the partial penetration is entered on the logs. The blow counts are shown on the boring logs at the respective sample depths.

The soils encountered during boring operations were visually classified in the field in general accordance with the Unified Soil Classification System (USCS), ASTM D 2488, and the system described on Figure A-1. Representative soil samples were obtained from the borings, logged, placed in plastic bags, and transported to our laboratory in Redmond, Washington. The field classifications were checked in our laboratory.

In addition, pertinent information including soil sample depth, stratigraphy, and groundwater were recorded. Groundwater levels were estimated by observing soil samples and the drill rods. The drilling operation was also monitored for indication of various drilling conditions, such as hard and soft drilling. At completion of drilling, the borings were backfilled in accordance with the procedures of the Washington State Department of Ecology.

Summary boring logs are presented on Figures A-2 through A-16. A key to the symbols and terms used on the logs are included on Figure A-1. These logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. They also indicate the approximate depths at which the soils or their characteristics change, although the change may be gradual. If a change occurred between samples in the borings, it was interpreted.

Monitoring Wells

Groundwater monitoring wells were installed in borings B-1, B-3, B-5, B-7, and B-9. The monitoring wells were constructed using 2-inch-diameter polyvinyl chloride (PVC) casing. The depth to which the casing was installed was selected based on our understanding of subsurface soil and groundwater conditions observed during drilling. The lower portion of the casing was slotted to allow entry of water into the casing. Medium sand was placed in the borehole annulus surrounding the slotted portion of the casing. A bentonite seal was placed above the slotted portion of the casing. The monitoring well was protected by installing flush-mount steel monuments set in concrete. Completion details for the monitoring wells are shown on Figures A-2, A-4, A-6, A-8, and A-10.

Groundwater Measurements

Groundwater levels in the monitoring wells were measured on August 14, 2019; September 9, 2019; and August 28, 2020.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	○	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
			○	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	░	SW	WELL-GRADED SANDS, GRAVELLY SANDS
			░	SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▥	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▮	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			◡	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
■	AC	Asphalt Concrete
▨	CC	Cement Concrete
▩	CR	Crushed Rock/ Quarry Spalls
⩊	SOD	Sod/Forest Duff
░	TS	Topsoil

Groundwater Contact

▼ **Measured groundwater level in exploration, well, or piezometer**

▼ **Measured free product in well or piezometer**

Graphic Log Contact

—— **Distinct contact between soil strata**

/ **Approximate contact between soil strata**

Material Description Contact

—— **Contact between geologic units**

– – – – **Contact between soil of the same geologic unit**

Sampler Symbol Descriptions

- ◫ **2.4-inch I.D. split barrel**
- ☒ **Standard Penetration Test (SPT)**
- ■ **Shelby tube**
- ☰ **Piston**
- ◧ **Direct-Push**
- ◫ **Bulk or grab**
- ▥ **Continuous Coring**

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

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Figure A-1

Rev 09/2020

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	8/12/2019	8/12/2019	41.5	CWM	AP	Advance Drill Technologies, Inc.	Hollow-stem Auger

Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop

Drilling Equipment: Diedrich D50 Turbo

Surface Elevation (ft): 69.18
Vertical Datum: NAVD88

Top of Casing Elevation (ft): 68.78

Easting (X): 1305869
Northing (Y): 281362

Horizontal Datum: WA State Plane North NAD83

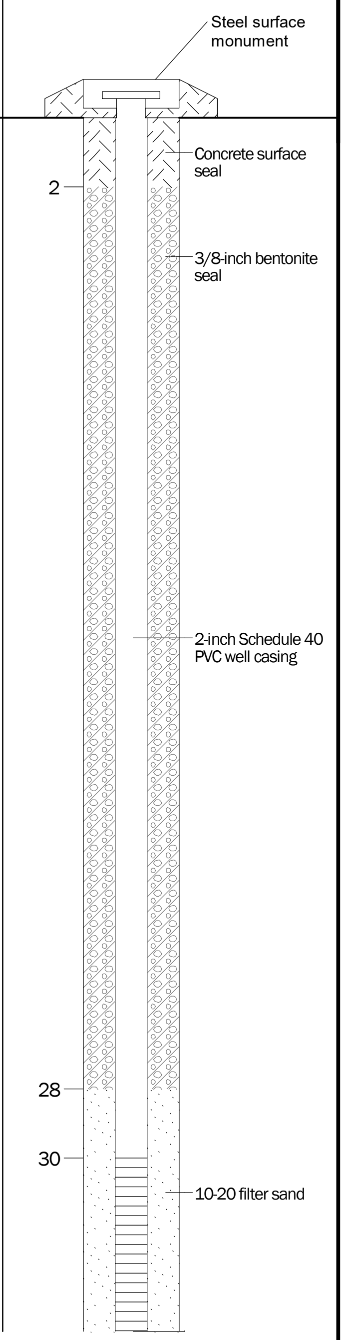
DOE Well I.D.: BKU 953
A 2-in well was installed on 8/12/2019 to a depth of 40 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	27.70	41.08

Notes: *Blow counts high due to gravel and cobbles
Well casing pressurized on 9/9/2019

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0					TS	3 inches topsoil/grass		
						SM	Brown silty fine to medium sand with gravel (medium dense, moist) (fill)		
		18	13	1 SA				12	35
65	5	9	15	2					
						GM	Brown silty coarse gravel with sand and cobbles (dense, moist) (rough drilling)		
		4	76/10"*	3					
60						SM	Brown silty fine to coarse sand with gravel (very dense, moist) (glacial till)		
	10	8	56	4 MC				8	
						SM	Gray silty fine to medium sand with gravel (very dense, moist)		
55	15	9	58	5 %F				10	26
50	20	14	61	6 MC			Decreased gravel content	14	
						CL	Gray lean clay (very stiff, moist) (glaciolacustrine deposits)		
45	25	3	30	7					
					▼				
40							Becomes hard		
	30	15	37	8 AL			AL (LL = 47; PI = 26)	21	
						CH	Gray fat clay; slickensided (very stiff, moist)		
35	35								

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

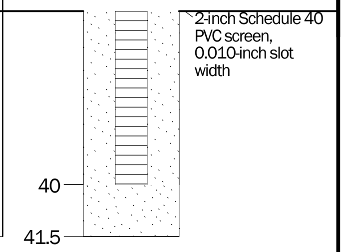
Log of Boring B-1

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	35	☒	18	22		9		▨		1-inch sand seams		
30								▨				
	40	☒	15	26		10 MC		▨			25	

WELL LOG



Log of Boring B-1 (continued)

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Drilled	Start 8/12/2019	End 8/12/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Surface Elevation (ft) Vertical Datum	73 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Easting (X) Northing (Y)	1305747 281368	System Datum	WA State Plane North NAD83	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	2 inches asphalt concrete pavement			
								CR	2 inches base course			
								SM	Brown silty fine to medium sand with gravel; fine roots, debris (medium dense, moist) (fill)			
70		☒	14	17		1 CA						
	5	☒	9	21		2 SA				9	30	
65		☒	3	50/4"		3 %F		SM	Brown silty fine to medium sand with gravel (very dense, moist to wet) (glacial till)	10	33	
	10	☒	18	79		4			Occasional gravel			
60								CL	Gray lean clay; slickensided (hard, moist) (glaciolacustrine deposits)			
	15	☒	18	44		5 AL				23		AL (LL = 49; PI = 27)
55								SM	Gray silty fine to medium sand with gravel (very dense, moist)			
	20	☒	12	50/6"		6 MC				8		
50								CL	Gray lean clay with sand (very stiff, moist)			
	25	☒	15	25		7						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-2

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-3
Sheet 1 of 1

Drilled	Start 8/14/2019	End 8/14/2019	Total Depth (ft) 51.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo		
Surface Elevation (ft) Vertical Datum	62 NAVD88	Top of Casing Elevation (ft)	61.81		
Easting (X) Northing (Y)	1305853 281206	Horizontal Datum	WA State Plane North NAD83		

DOE Well I.D.: BKU 956
A 2-in well was installed on 8/14/2019 to a depth of 22 ft.

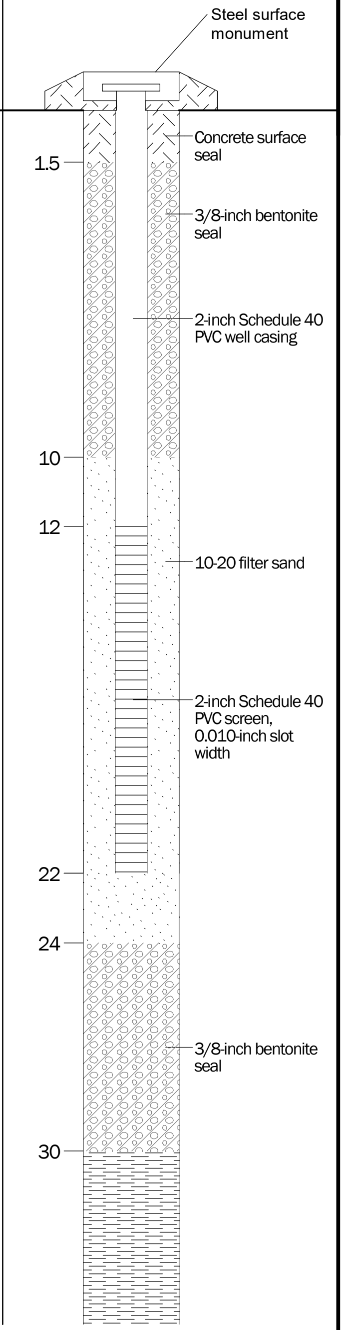
Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	18.30	43.51

Notes: *Blow counts high due to gravel and cobbles

FIELD DATA

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0					SOD	3 to 4 inches sod/topsoil		
							Geomembrane liner		
						SM	Brown silty fine to medium sand with gravel; small roots (loose to medium dense, moist) (fill)		
60									
		18	11	1 SA; CA				9	37
	5	9	4	2 CA					
55									
						ML	Brown sandy silt with gravel; small roots (medium stiff, moist)		
		10	8	3 CA					
						SM	Brown silty fine to medium sand with occasional gravel; small roots (loose, moist)		
	10	5	9	4 %F				14	41
50									
						ML	Gray silt with sand; horizontal bedding (soft, moist to wet) (alluvium)		
	15	10	3	5 %F; CA				24	62
45									
					▼				
						SM	Gray silty fine to medium sand with gravel; interbedded silt layers (medium dense, wet)		
	20	9	14	6 SA				14	35
40									
						CL	Gray lean clay with occasional sand and gravel (very stiff to hard, moist) (glaciolacustrine deposits)		
	25	12	33	7 AL			AL (LL = 38; PI = 19)	19	
35									
	30	13	22	8					
30									
	35								

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-3

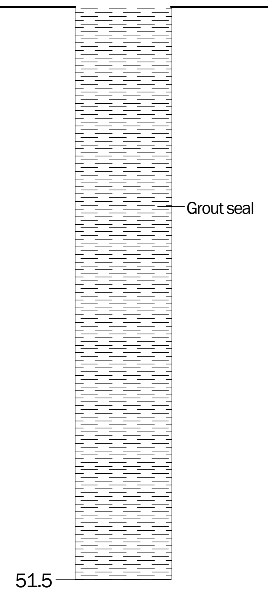
GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-4
Sheet 1 of 2

	FIELD DATA											
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	35	☒	12	59*		9 MC					15	
25												
										(Rough drilling)		
	40	☒	18	30		10						
20												
									CH	Gray fat clay; interbedded sand seams (stiff, moist)		
	45	☒	18	12		11 MC					30	
15												
	50	☒	18	13		12						

WELL LOG



Log of Boring B-3 (continued)

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-4
Sheet 2 of 2

Drilled	Start 8/12/2019	End 8/12/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Surface Elevation (ft)	81	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Vertical Datum	NAVD88				
Easting (X)	1305591	System	WA State Plane North	Groundwater not observed at time of exploration	
Northing (Y)	281186	Datum	NAD83		

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	2 inches asphalt concrete pavement			
80								CR	3 inches base course			
								GM	Brown silty coarse gravel with sand (very dense, moist) (fill)			
		☒	5	79/11"*		1						*Blow counts high due to gravel
	5	☒	11	50/5"		2 SA				8	44	Very rough drilling, through cobble
75								SM	Gray silty fine to coarse sand with gravel and cobbles; moderate oxidation staining (very dense, moist) (glacial till)			
		☒	13	64		3						
								ML	Gray sandy silt with occasional gravel (very stiff, moist)			
	10	☒	15	50		4 SA				11	45	
70								CH	Gray fat clay; interbedded sand seams and slickensided (very stiff, moist) (glaciolacustrine deposits)			
	15	☒	18	20		5						
65												
	20	☒	18	19		6 AL			Occasional sand	26		AL (LL = 50; PI = 28)
60												
	25	☒	15	28		7			Sand and occasional gravel			
55												

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-4

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-5
Sheet 1 of 1

Drilled	Start 8/14/2019	End 8/14/2019	Total Depth (ft) 31.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				

Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop

Drilling Equipment: Diedrich D50 Turbo

DOE Well I.D.: BKU 957
A 2-in well was installed on 8/14/2019 to a depth of 30 ft.

Surface Elevation (ft): 72
Vertical Datum: NAVD88

Top of Casing Elevation (ft): 71.47

Easting (X): 1305710
Northing (Y): 281135

Horizontal Datum: WA State Plane North NAD83

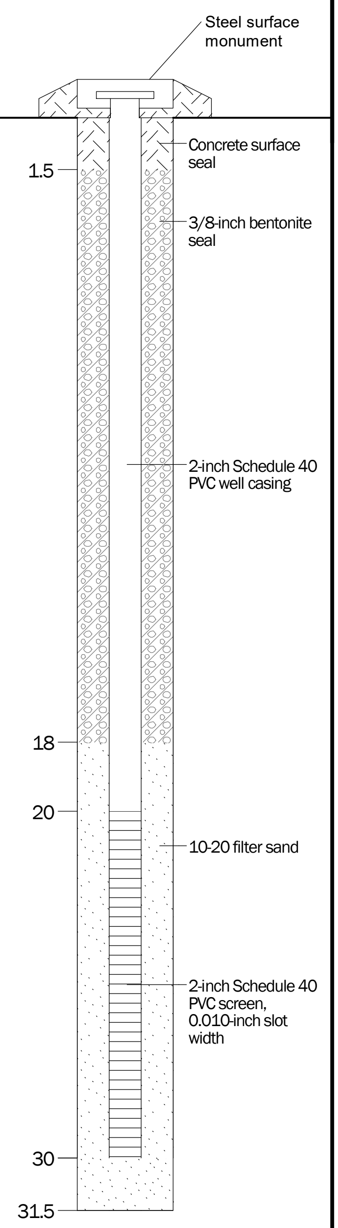
Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	5.30	66.17

Notes:

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0							SM	Brown silty fine to medium sand with gravel; small roots (loose to medium dense, moist) (fill)		
70		☒	15	7		1 SA				18	40
	5	☒	10	11		2	▼		Becomes medium dense		
65								ML	Brown sandy silt with occasional gravel; wood fragments (stiff, moist)		
		☒	12	13		3 MC				22	
								SM	Gray silty fine to medium sand (medium dense, wet)		
	10	☒	14	13		4A 4B %F		ML	Brown sandy silt with occasional gravel; slight oxidation staining (stiff, moist) (glaciolacustrine deposits)	16	52
60								CH	Brown fat clay with occasional sand (stiff, moist)		
	15	☒	12	13		5 AL			AL (LL = 61; PI = 38)	29	
55											
	20	☒	15	14		6			1-inch interbedded sand seams		
50											
	25	☒	18	11		7 MC				36	
45											
	30	☒	18	10		8					

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-5

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-6
Sheet 1 of 1

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Surface Elevation (ft)	83	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Vertical Datum	NAVD88				
Easting (X)	1305574	System	WA State Plane North	Groundwater not observed at time of exploration	
Northing (Y)	281050	Datum	NAD83		
Notes:					

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	2 inches asphalt concrete pavement			
								CR	2 inches base course			
								SM	Brown silty fine to medium sand with gravel (dense, moist) (weathered glacial till)			
80		☒	12	37		1 CA						
	5	☒	8	24		2 SA			Slight oxidation staining	10	49	
								SM	Gray silty fine to medium sand with occasional gravel (very dense, moist) (glacial till)			
75		☒	10	53		3						
	10	☒	14	73		4 %F				9	41	
70												
	15	☒	13	40		5						
								CL	Gray lean clay with 1-inch clean sand seam (very stiff, moist) (glaciolacustrine deposits)			
65												
	20	☒	17	22		6 AL				26		AL (LL = 44; PI = 23)
60												
	25	☒	18	28		7						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-6

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-7
Sheet 1 of 1

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo		
Surface Elevation (ft) Vertical Datum	87 NAVD88	Top of Casing Elevation (ft)	86.47		
Easting (X) Northing (Y)	1305409 280985	Horizontal Datum	WA State Plane North NAD83		

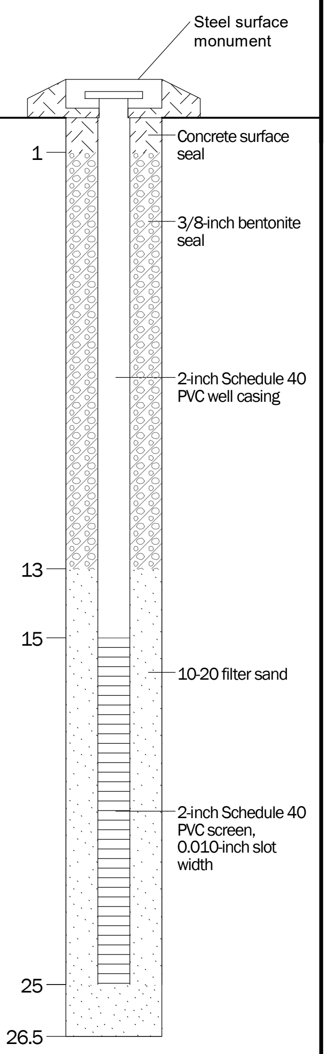
DOE Well I.D.: BKU 954
A 2-in well was installed on 8/13/2019 to a depth of 25 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	7.60	78.87

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0							SOD	2 inches sod/topsoil		
								ML	Gray silt with occasional sand (very stiff, moist) (glaciolacustrine deposits)		
85											
		☒	18	20		1 / MC				25	
	5	☒	15	15		2 / AL		CL	Gray lean clay with occasional sand (stiff to very stiff, moist) AL (LL = 44; PI = 22)	24	
80											
		☒	14	24		3	▼				
	10	☒	15	14		4 / MC			Interbedded sand seams, slickensided	26	
75											
	15	☒	18	23		5 / MC				25	
70											
	20	☒	18	16		6					
65											
								ML	Gray silt with sand (very stiff, moist)		
	25	☒	18	31		7 / MC				18	

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-7

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-8
Sheet 1 of 1

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				

Surface Elevation (ft) Vertical Datum	85 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Easting (X) Northing (Y)	1305598 280968	System Datum	WA State Plane North NAD83	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	2 inches asphalt concrete pavement			
								CR	3 inches base course			
								SM	Brown silty fine to medium sand with gravel; slight oxidation staining (dense to very dense, moist) (glacial till)			
		☒	12	56		1						
80	5	☒	15	45		2						
												Rough drilling
		☒	13	75		3 SA				9	44	
75	10							CL	Gray lean clay with sand; 2-inch interbedded sand seam (very stiff, moist) (glaciolacustrine deposits)			
		☒	15	28		4 MC				16		
								CH	Gray fat clay with sand seams (hard, moist)			
70	15	☒	15	34		5 AL				27		AL (LL = 50; PI = 31)
65	20	☒	18	35		6						
60	25	☒	18	23		7 MC				24		

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-8

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-9
Sheet 1 of 1

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 31.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				

Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop

Drilling Equipment: Diedrich D50 Turbo

Surface Elevation (ft): 75
Vertical Datum: NAVD88

Top of Casing Elevation (ft): 75.15

Easting (X): 1305796
Northing (Y): 280980

Horizontal Datum: WA State Plane North NAD83

DOE Well I.D.: BKU 955
A 2-in well was installed on 8/13/2019 to a depth of 30 ft.

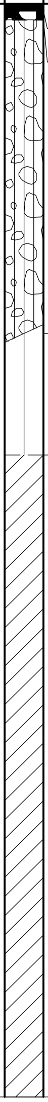
Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	8.75	66.40

Notes: *Blow counts high due to gravel and cobbles
Well casing pressurized on 9/9/19

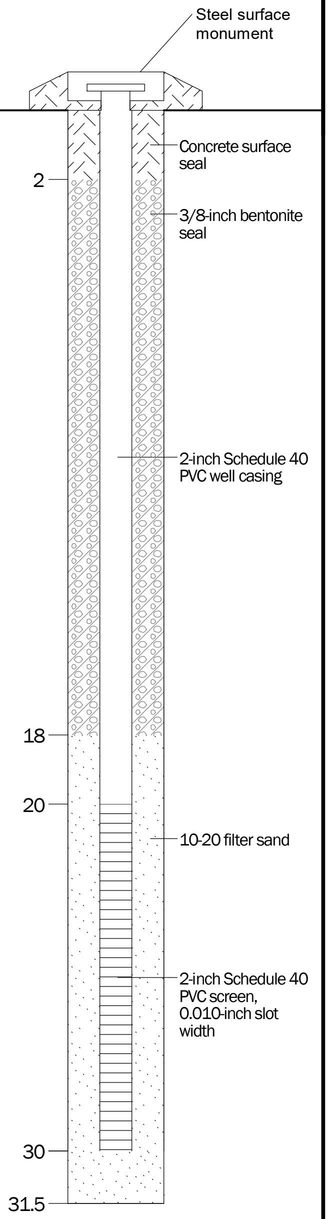
FIELD DATA

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0					AC	2½ inches asphalt concrete pavement		
						CR	3 inches base course		
						GM	Brown silty fine to coarse gravel with sand (medium dense, moist to wet) (fill)		
		18	13	1 SA				10	31
70	5	9	33*	2					
		0	42*	3					
					▼				
65	10	18	21	4 %F		ML	Brown silt with sand and occasional gravel (very stiff, moist) (glaciolacustrine deposits)	15	56
						CL	Gray clay with interbedded sand seams of variable gravel content (very stiff, moist)		
60	15	15	19	5 AL			AL (LL = 43; PI = 22)	21	
55	20	5	19	6 MC				22	
50	25	18	10	7			Becomes stiff		
45	30	18	13	8 MC				30	

Graphic Log



WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

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Log of Boring B-9

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-10
Sheet 1 of 1

Drilled	Start 8/28/2020	End 8/28/2020	
Total Depth (ft)	21.5		
Logged By	CRG	Checked By	KMS
Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft)	77.5	Vertical Datum	NAVD88
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Turbo
Easting (X)	1305728	Northing (Y)	280987
System Datum		Groundwater not observed at time of exploration	
Notes:			

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
								SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
75		☒	5	20		1						
	5	☒	18	27		2 SA		ML	Brown sandy silt with occasional gravel (very stiff, moist)	15	58	
70		☒	18	48		3 %F		ML	Brown sandy silt with gravel (hard, moist) (glacial till)	12	51	
	10	☒	4	36		4 MC		ML	Gray sandy silt with gravel (hard, moist)	13		
65												
								CL	Gray lean clay with occasional fine sand, blocky, varved (very stiff, moist) (glaciolacustrine deposits)			
	15	☒	18	18		5 AL				23		AL (LL = 43; PI = 19)
60												
								ML	Gray silt with sand (hard, moist)			
	20	☒	6	33		6 %F				15	70	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-10

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-11
Sheet 1 of 1

Drilled	Start 8/27/2020	End 8/27/2020	Total Depth (ft) 31.5	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) 67 Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Diedrich D-50 Turbo
Easting (X) 1305807 Northing (Y) 281129	System Datum	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							TS	Approximately 2 to 3 inches of topsoil/sod			
								SM	Gray silty fine to coarse sand with gravel, occasional wood fragments (loose, wet) (fill)			
65		☒	6	9		1 MC				7		No sheen
	5	☒	12	8		2 SA		SM	Gray silty fine to medium sand with gravel (loose, moist to wet)	15	37	No sheen
60		☒	12	5		3 MC			Wood fragments	15		No sheen
	10	☒	3	7		4 MC				20		No sheen
55									Becomes moist			
								SM	Gray silty fine to coarse sand with gravel (loose to medium dense, wet) (alluvium)			
	15	☒	8	45*		5 %F				18	15	*Blow count not representative due to sample driving in coarse gravel Rough drilling 15 to 18 feet Groundwater observed at approximately 15 feet below ground surface during drilling
50								CH	Gray fat clay with occasional fine sand, horizontal bedding (medium stiff to very stiff, moist) (glaciolacustrine deposits)			
	20	☒	18	15		6 %F				28	85	
45												
	25	☒	5	8		7 AL				32		AL (LL = 52; PI = 30)
40												
	30	☒	6	10		8 MC				30		

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-11

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Drilled	Start 8/27/2020	End 8/27/2020	Total Depth (ft) 21	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Surface Elevation (ft) Vertical Datum	70 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Turbo
Easting (X) Northing (Y)	1305807 281282	System Datum		Groundwater not observed at time of exploration	
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							TS	Approximately 2 to 3 inches of topsoil/sod			
								SM	Brown silty fine to medium sand with gravel (dense to very dense, dry) (fill/weathered glacial till?)			
		☒	18	54		1 %F				6	29	No sheen
65	5	☒	18	43		2 SA		SM	Brown silty fine to coarse sand with gravel (medium dense, moist)	3	15	No sheen
		☒	18	20		3 %F		SM	Gray silty fine sand with occasional gravel (medium dense, moist) (glaciolacustrine deposits)	9	39	No sheen
60	10	☒	12	17		4 %F				11	40	No sheen
55	15	☒	4	27		5 %F				10	30	No sheen
								SM	Gray silty fine to medium sand with gravel (very dense, moist)			
50	20	☒	6	50/5"		6 %F				8	37	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-12

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-13
Sheet 1 of 1

Drilled	Start 8/28/2020	End 8/28/2020	Total Depth (ft)	21.5	Logged By CRG Checked By KMS	Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) 83
Vertical Datum NAVD88

Hammer Data Autohammer 140 (lbs) / 30 (in) Drop

Drilling Equipment Diedrich D-50 Turbo

Easting (X) 1305562
Northing (Y) 281118

System Datum

Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
								CL	Gray lean clay with fine sand (medium stiff, moist) (fill)			
80		☒	6	3		1 MC				36		
	5	☒	8	2		2 %F		CL	Brown lean clay with sand (soft, moist)	23	98	
75		☒	11	50/5"		3 SA		SM	Brown silty fine to medium sand with occasional gravel (very dense, moist) (glacial till)	13	30	
	10	☒	15	94/10"		4			With gravel			
70								CL	Gray lean clay with sand and occasional gravel (hard, moist) (glaciolacustrine deposits)			
	15	☒	5	50/5"		5 %F				24	69	
65												
	20	☒	4	54		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-13

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Drilled	Start 8/28/2020	End 8/28/2020	Total Depth (ft)	21.5	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	87 NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment	Diedrich D-50 Turbo
Easting (X) Northing (Y)	1305486 281019		System Datum			Groundwater not observed at time of exploration	
Notes:							

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
								SM	Gray silty fine sand with gravel (dense, moist) (glacial till)			
85												
		☒	18	49		1 SA				9	41	
	5	☒	4	50/4"		2 MC				8		
80												
								ML	Gray sandy silt with occasional gravel (hard, moist)			
		☒	12	43		3 %F				10	50	
	10	☒	16	45		4						
75												
								CL	Gray lean clay with sand and occasional gravel (hard, moist) (glaciolacustrine deposits)			
	15	☒	12	36		5 %F; AL				20	79	AL (LL = 36; PI = 15)
70												
								CL	Gray lean clay with occasional slickensided surfaces (hard, moist)			
	20	☒	10	34		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-14

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-15
Sheet 1 of 1

Date:9/22/20 Path:W:\PROJECTS\0\0183141\GINT\018314101.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled	Start 8/27/2020	End 8/27/2020	Total Depth (ft)	21.5
Logged By	CRG	Checked By	KMS	
Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger	
Surface Elevation (ft) Vertical Datum	70 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	
Drilling Equipment	Diedrich D-50 Turbo			
Easting (X) Northing (Y)	1305761 281238	System Datum		
See "Remarks" section for groundwater observed				

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							TS	Approximately 2 to 3 inches of topsoil/sod			
								SM	Brown silty fine to medium sand with gravel (medium dense to dense, moist) (fill)			
		☒	6	24		1 %F				5	26	
65	5	☒	10	37		2 SA				3	14	
		☒	10	13		3 %F		ML	Gray sandy silt with sand and occasional gravel, roots, piece of ¾-inch-diameter root or branch (stiff, moist)	14	54	
60	10	☒	12	27		4 %F		SM	Gray silty sand with occasional gravel, roots, piece of ¾-inch-diameter root or branch (medium dense, moist)	14	37	
								ML	Brown sandy silt (stiff, wet) (colluvium/alluvium)			
55	15	☒	12	9		5 MC				18		Groundwater observed at approximately 15 feet below ground surface during drilling
50	20	☒	18	41		6 SA		ML	Gray sandy silt with gravel (hard, moist) (glacial till)	11	53	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-15

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-16
Sheet 1 of 1

APPENDIX B
Laboratory Testing

APPENDIX B
LABORATORY TESTING

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

Soil Classifications

Soil samples obtained from the explorations were visually classified in the field and/or in our laboratory using a system based on the Unified Soil Classification System (USCS) and ASTM classification methods. ASTM test method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. These classification procedures are incorporated in the exploration logs shown in Figures A-2 through A-16 in Appendix A.

Moisture Content Determinations

Moisture contents tests were completed in general accordance with ASTM D 2216 for representative samples obtained from the explorations. The test results are presented on the exploration logs in Appendix A at the respective sample depth.

Percent Passing U.S. No. 200 Sieve (%F)

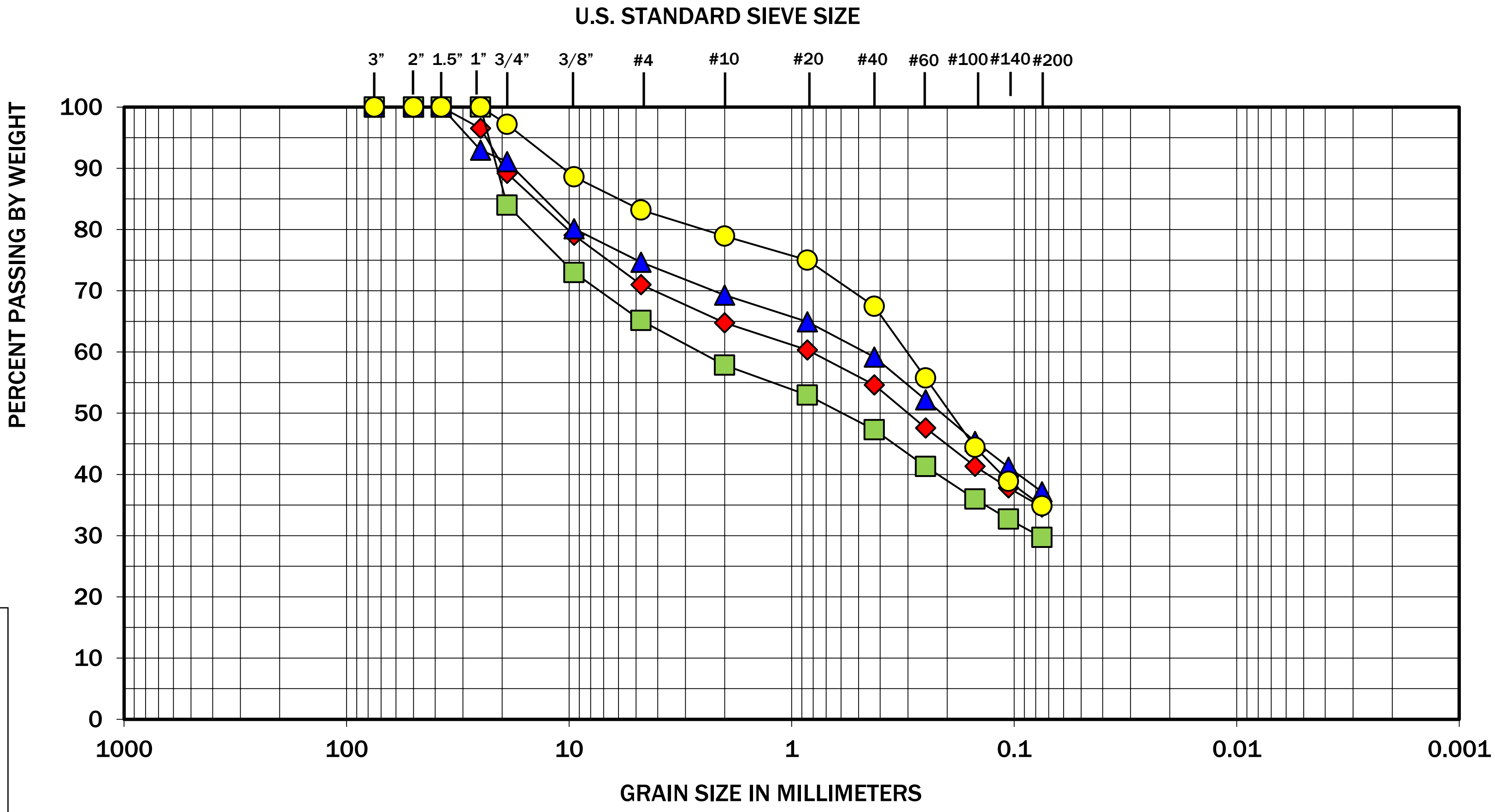
Selected samples were “washed” through the U.S. No. 200 mesh sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to estimate the fines content for analysis purposes. The tests were conducted in accordance with ASTM D 1140, and the results are shown on the exploration logs in Appendix A at the respective sample depths.

Sieve Analysis

Sieve analyses were performed on selected samples in general accordance with ASTM D 422. The wet sieve analysis method was used to estimate the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the USCS, and presented on Figures B-1 through B-5.

Atterberg Limits

Atterberg limits testing was performed on selected fine-grained soil samples. The tests were used to classify the soil and to estimate index properties of the soil. The liquid limit and the plastic limit were performed in general accordance with ASTM D 4318. The results of the Atterberg limits are summarized in Figures B-6 through B-8. The plasticity chart relates the plasticity index (liquid limit minus the plastic limit) to the liquid limit.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-1	2.5	12	Silty fine to medium sand with gravel (SM)
■	B-2	5	9	Silty fine to medium sand with gravel (SM)
▲	B-3	2.5	9	Silty fine to medium sand with gravel (SM)
●	B-3	20	14	Silty fine to medium sand with gravel (SM)

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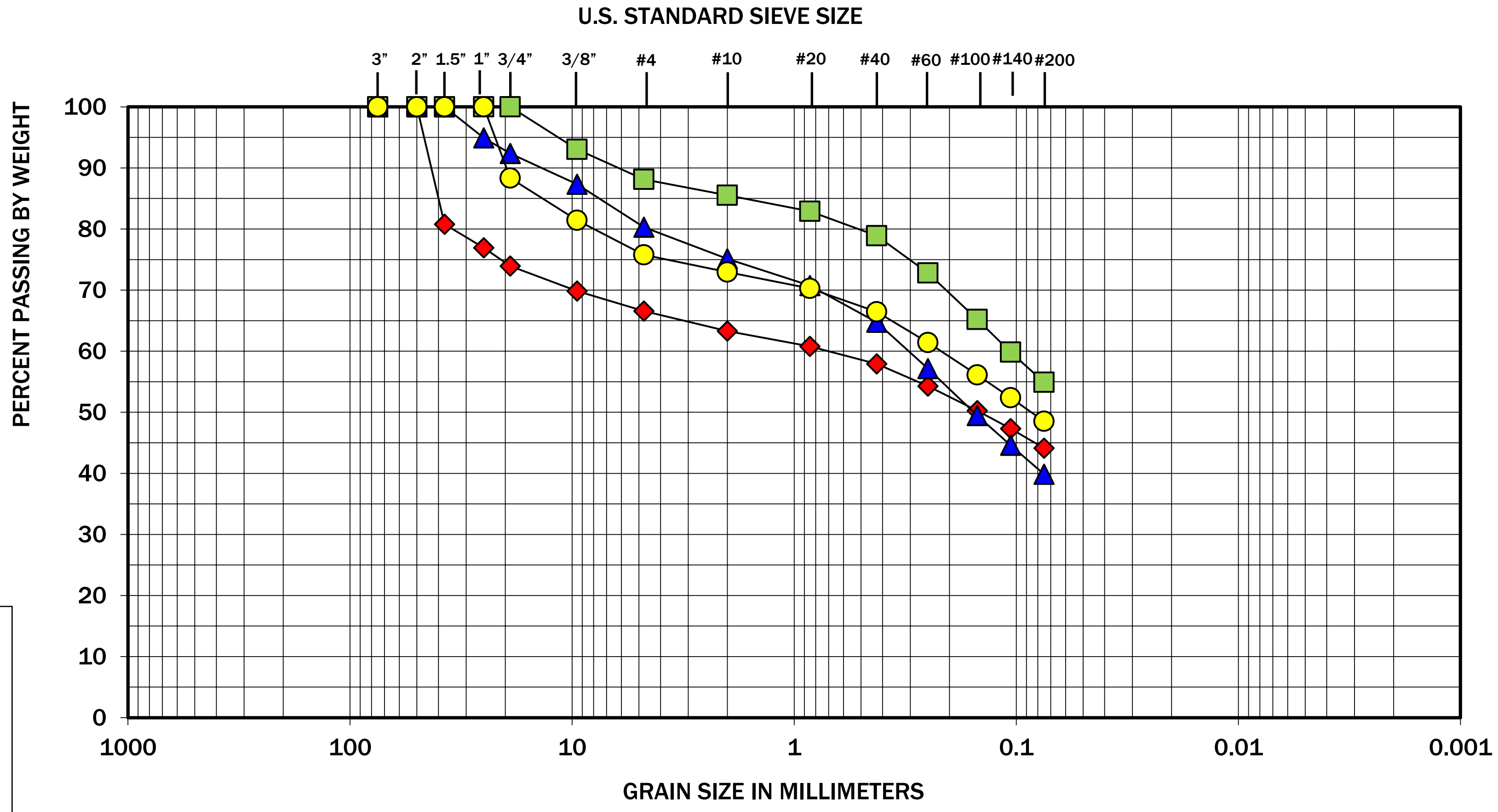
The grain size analysis results were obtained in general accordance with ASTM D 6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

Husky Village
Bothell, Washington

Sieve Analysis Results

Figure B-1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-4	5	8	Silty coarse gravel with sand (GM)
🟩	B-4	10	11	Sandy silt with occasional gravel (ML)
▲	B-5	2.5	18	Silty fine to medium sand with gravel (SM)
🟡	B-6	5	10	Silty fine sand with gravel (SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GEOENGINEERS

Husky Village
Bothell, Washington

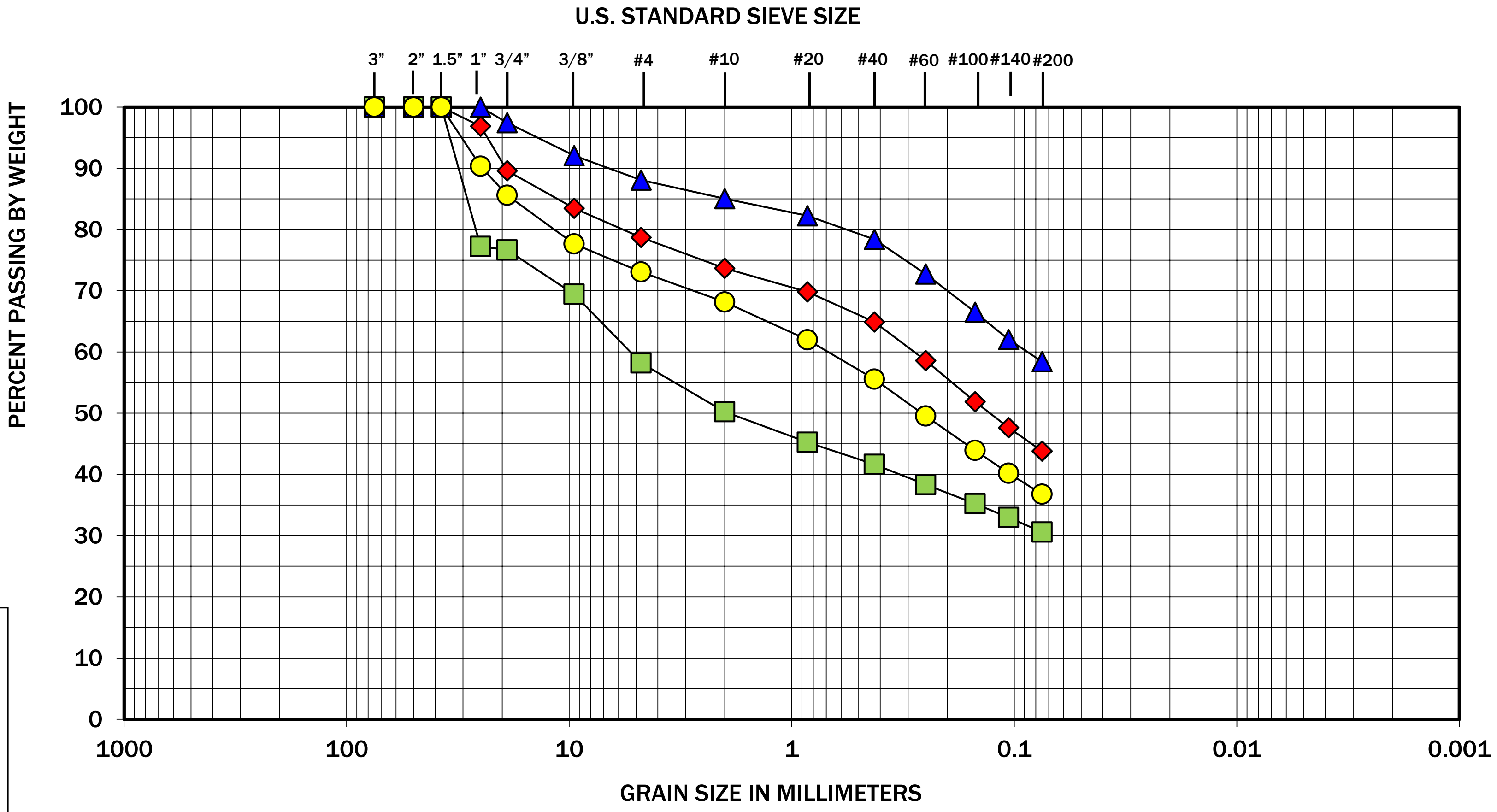
Sieve Analysis Results

Figure B-2

Sieve Analysis Results

Husky Village
Bothell, Washington

Figure B-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-8	7.5	9	Silty fine sand with gravel (SM)
🟩	B-9	2.5	10	Silty fine to coarse gravel with sand (GM)
▲	B-10	5	15	Sandy silt with occasional gravel (ML)
🟡	B-11	5	15	Silty fine to medium sand with gravel (SM)

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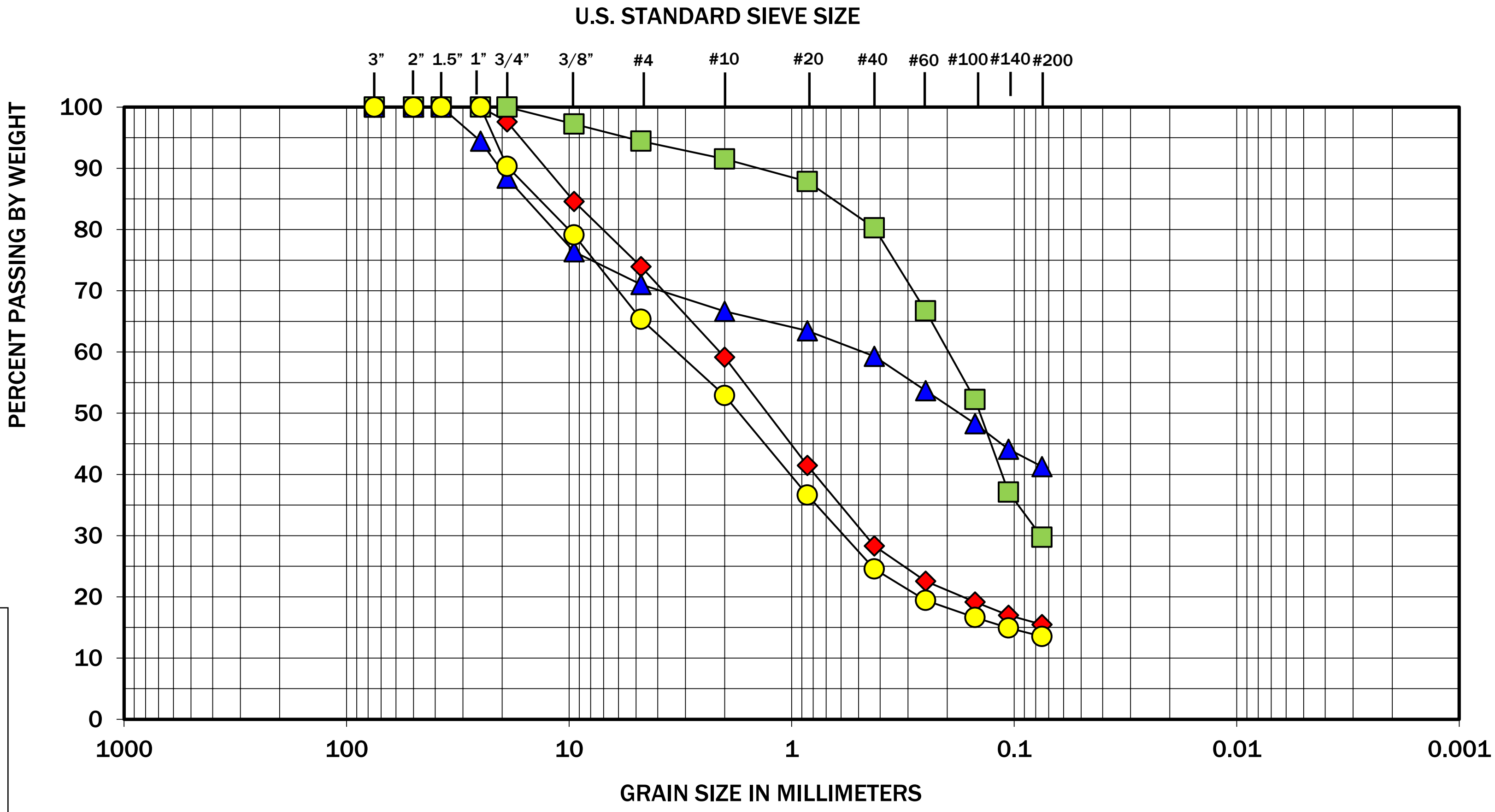

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-12	5	3	Silty fine to coarse sand with gravel (SM)
🟩	B-13	7.5	13	Silty fine to medium sand with occasional gravel (SM)
▲	B-14	2.5	9	Silty fine sand with gravel (SM)
○	B-15	5	3	Silty fine to coarse sand with gravel (SM)

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GEOENGINEERS

Husky Village
Bothell, Washington

Sieve Analysis Results

Figure B-4

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-15	20	11	Sandy silt with gravel (ML)

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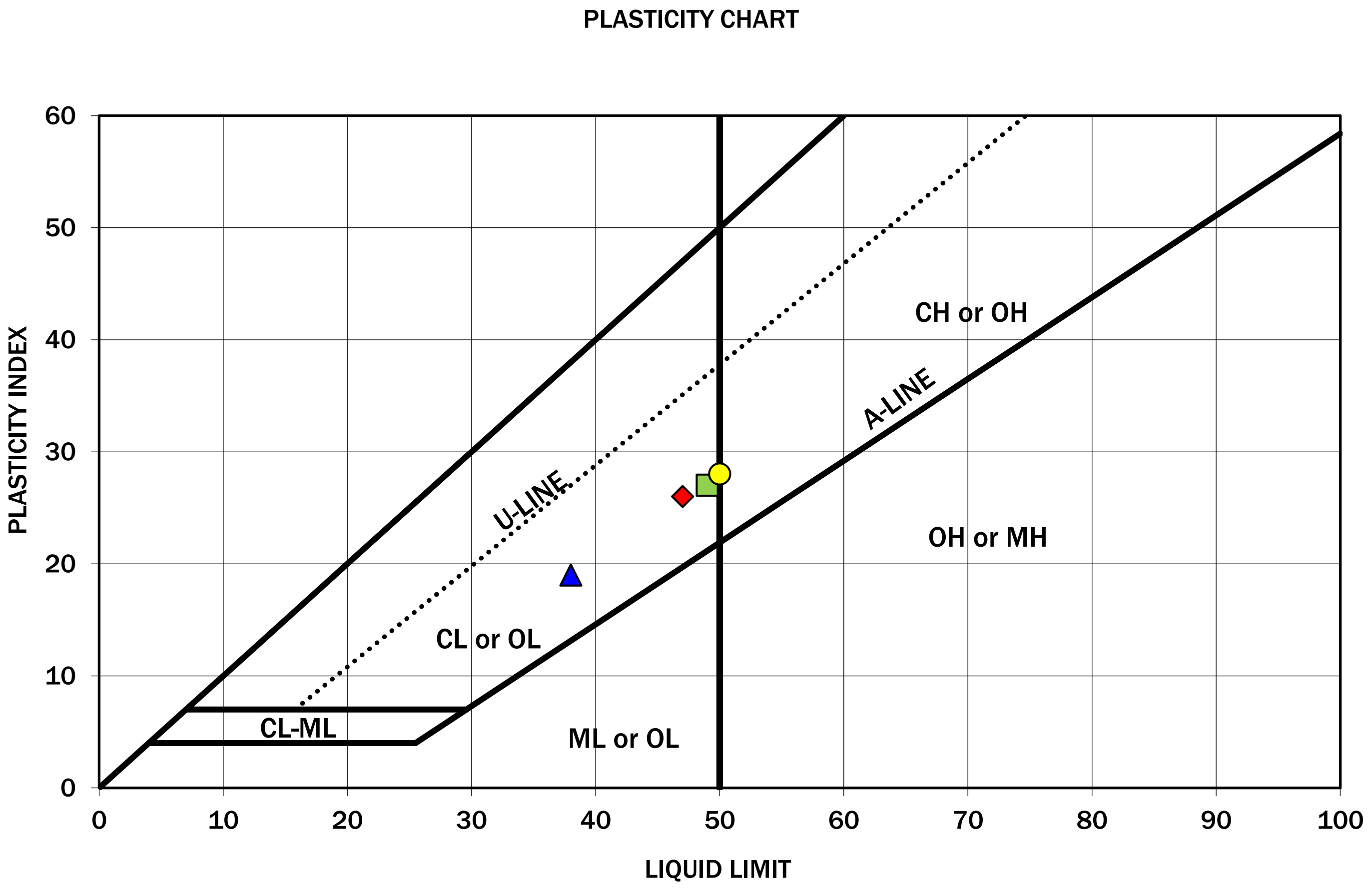
The grain size analysis results were obtained in general accordance with ASTM D 6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GeoEngineers

Husky Village
Bothell, Washington

Sieve Analysis Results

Figure B-5



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	B-1	30	21	47	26	Lean clay with occasional sand (CL)
🟩	B-2	15	23	49	27	Lean clay (CL)
▲	B-3	25	19	38	19	Lean clay (CL)
🟡	B-4	20	26	50	28	Fat clay (CH)

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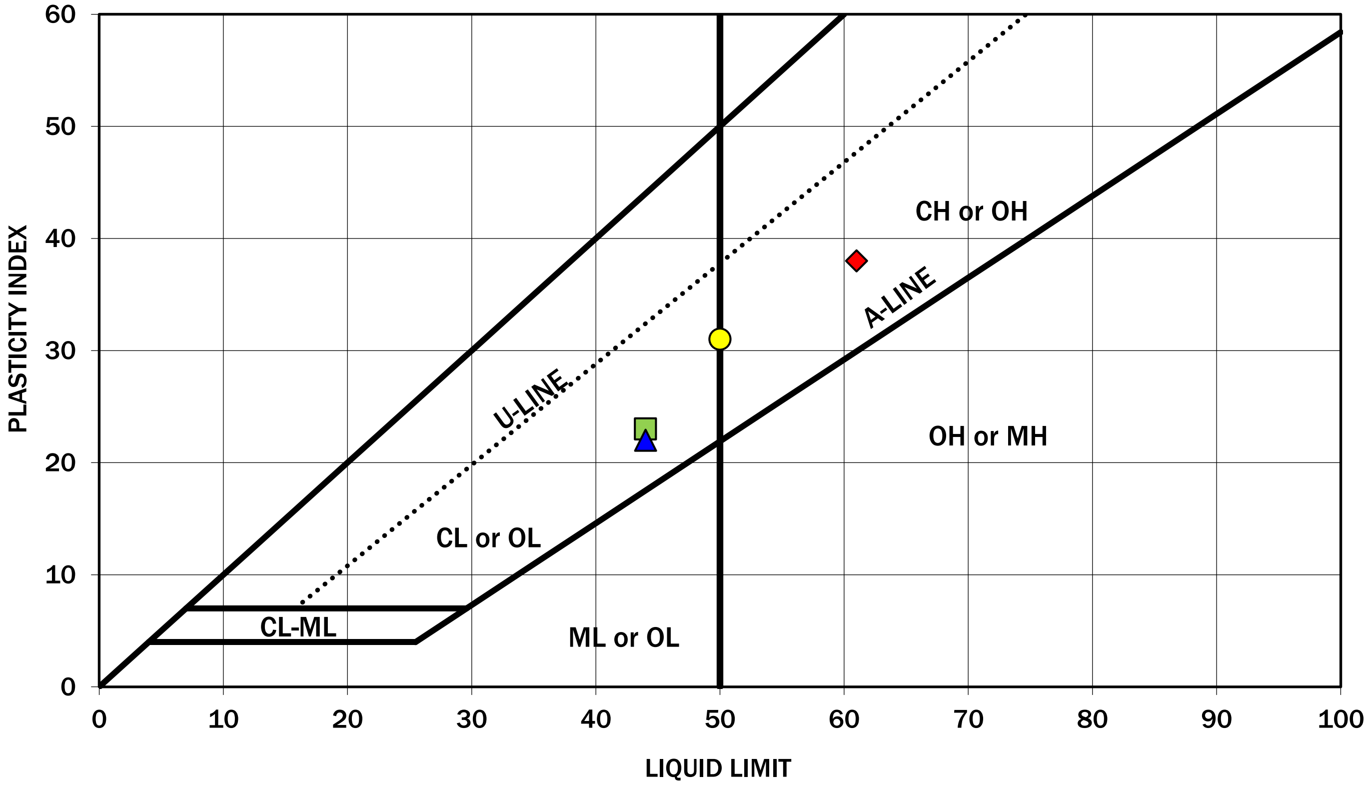
Atterberg Limits Test Results

Husky Village
Bothell, Washington

Figure B-6

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	B-5	15	29	61	38	Fat clay (CH)
🟩	B-6	20	26	44	23	Lean clay (CL)
▲	B-7	5	24	44	22	Lean clay (CL)
🟡	B-8	15	27	50	31	Fat clay (CH)

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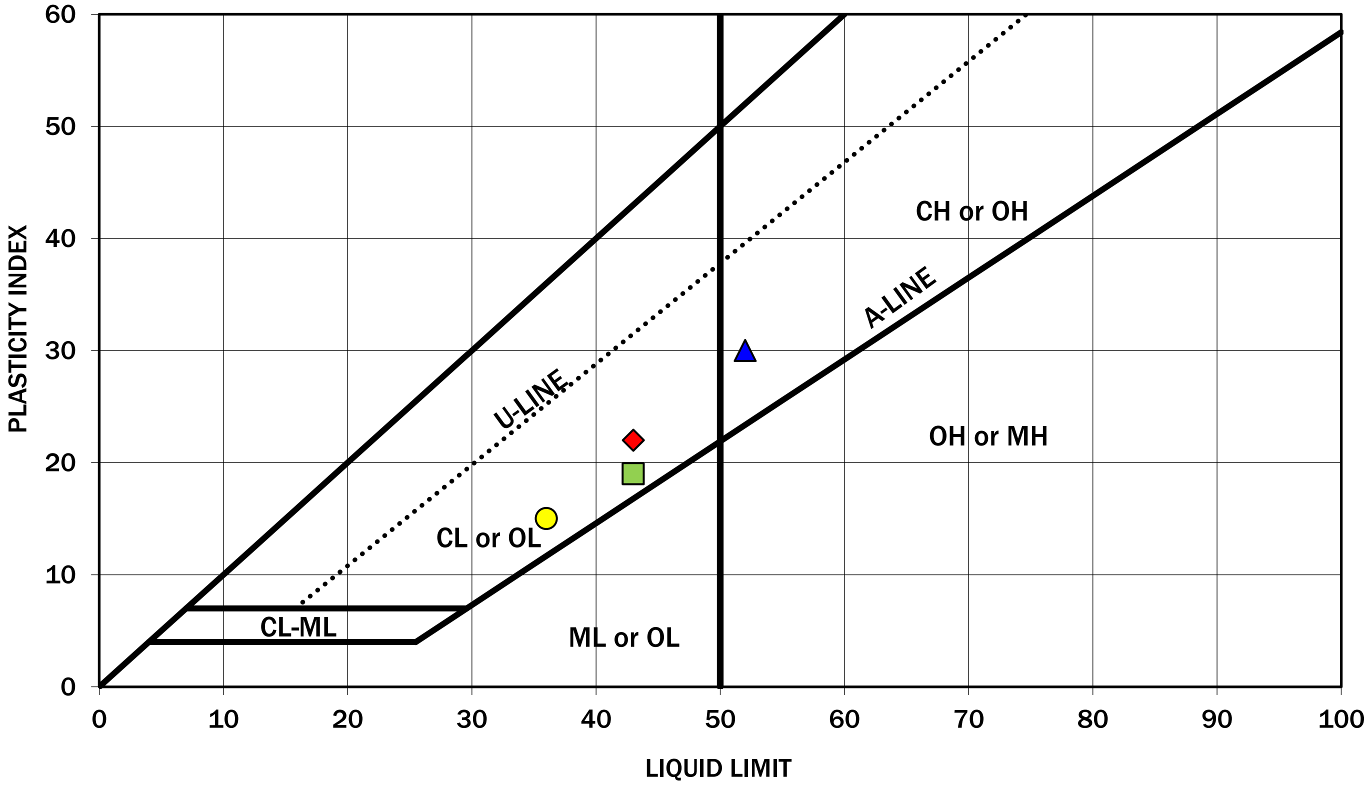
Atterberg Limits Test Results

Husky Village
Bothell, Washington

GEOENGINEERS

Figure B-7

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	B-9	15	21	43	22	Lean clay (CL)
■	B-10	15	23	43	19	Lean clay (CL)
▲	B-11	25	32	52	30	Fat clay with occasional sand (CH)
●	B-14	15	20	36	15	Lean clay with sand and occasional gravel (CL)

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Atterberg Limits Test Results

Husky Village
Bothell, Washington

GeoEngineers

Figure B-8

APPENDIX C

Exploration Logs from Previous Studies

APPENDIX C
EXPLORATION LOGS FROM PREVIOUS STUDIES

Included in this section are relevant logs from the following reports completed for previous developments:

- Geotechnical Engineering Services, UWB/CCC Co-Located Campus Phase I Design Development, Uplands Development, and Off-Site Improvements, Bothell, Washington," by GeoEngineers dated May 5, 1998.
- North Creek Valley Development, Bothell, Washington," by Earth Consultants dated April 1985.
- Beardslee Road Property, Beardslee Road at 108th N.E., Bothell, Washington," by Cascade Testing Laboratory dated June 1, 1984.

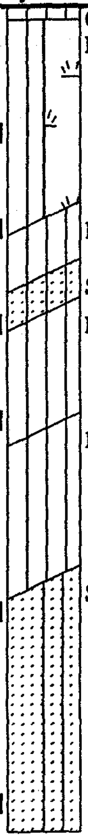
TEST DATA

BORING B-11

DESCRIPTION

Surface Elevation (ft.): 34.0

DEPTH IN FEET



Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION
					OL	Brown organic silt (soft, wet)
					ML/PT	Gray fine sandy silt with lenses of peat (very soft, moist) (fill?)
MD	23	104	2	■		
MD, CS	28	98	6	■	ML	Gray silt with fine sand (soft, moist)
					SM	Brown silty fine sand (loose, moist)
			7	■	ML	Brown silt with fine sand (medium stiff, moist)
MD, CS	25	100	5	■	ML	Gray silt (soft, moist)
						Gravelly drilling 13 to 15 feet
					SP-SM	Gray fine to medium sand with silt (medium dense, wet)
MD	18	112	11	■		
			25	■		

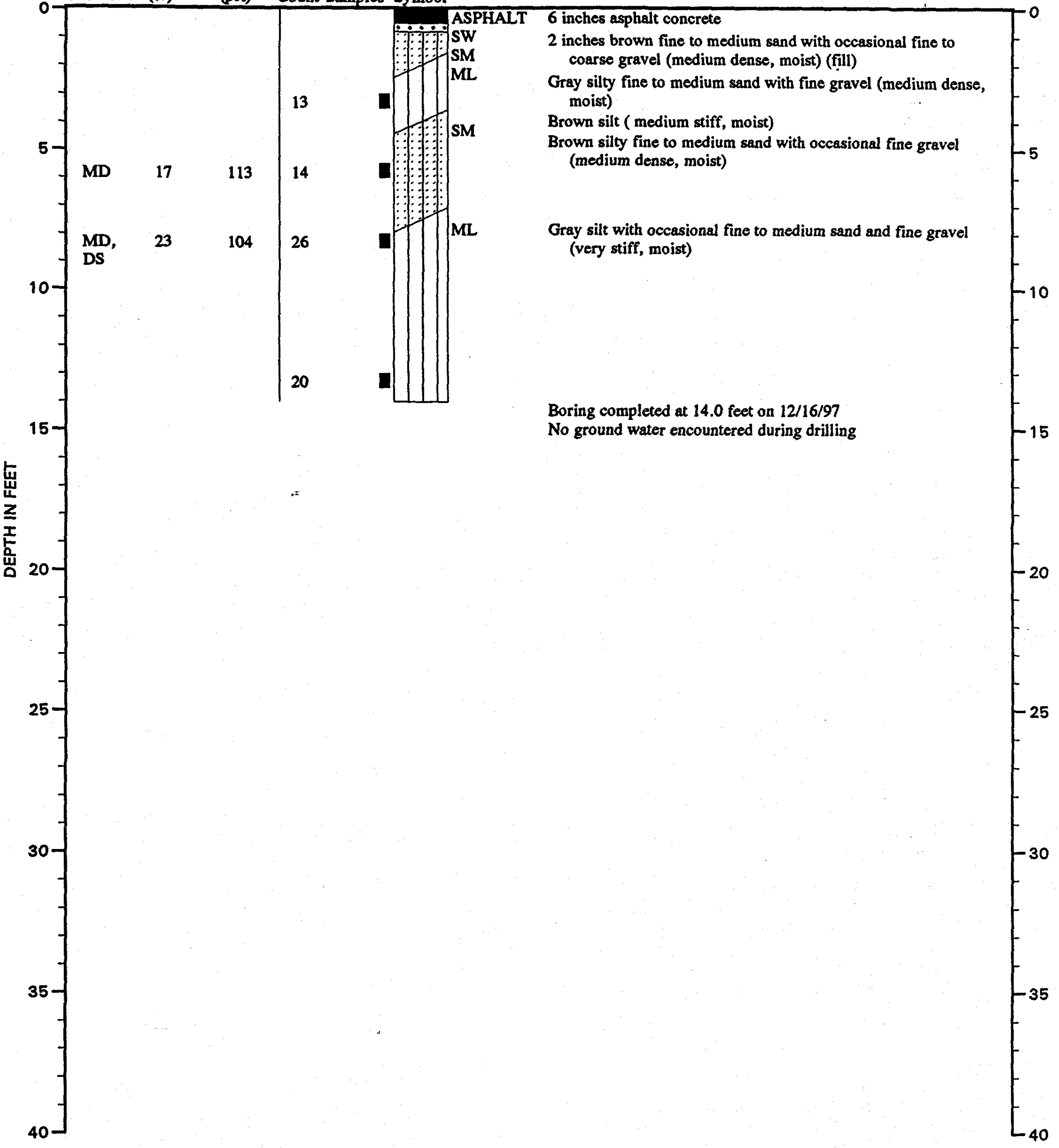
Boring completed at 21.5 feet on 12/05/97
Ground water encountered at 15.0 feet during drilling

Note: See Figure A-2 for explanation of symbols

0113-020-06-1130 :BEB:DJM:CMS 3/6/98

TEST DATA

BORING B-12



Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples
			13	■
MD	17	113	14	■
MD, DS	23	104	26	■
			20	■

DESCRIPTION

Surface Elevation (ft.): 58.5

Group Symbol	Description
ASPHALT	6 inches asphalt concrete
SW	2 inches brown fine to medium sand with occasional fine to coarse gravel (medium dense, moist) (fill)
SM	Gray silty fine to medium sand with fine gravel (medium dense, moist)
ML	Brown silt (medium stiff, moist)
SM	Brown silty fine to medium sand with occasional fine gravel (medium dense, moist)
ML	Gray silt with occasional fine to medium sand and fine gravel (very stiff, moist)

Boring completed at 14.0 feet on 12/16/97
No ground water encountered during drilling

Note: See Figure A-2 for explanation of symbols

GeoEngineers

LOG OF BORING

FIGURE A-14

0113-020-06-1130 :BEB:DJM:CMS 5/1/98

TEST DATA

BORING B-13

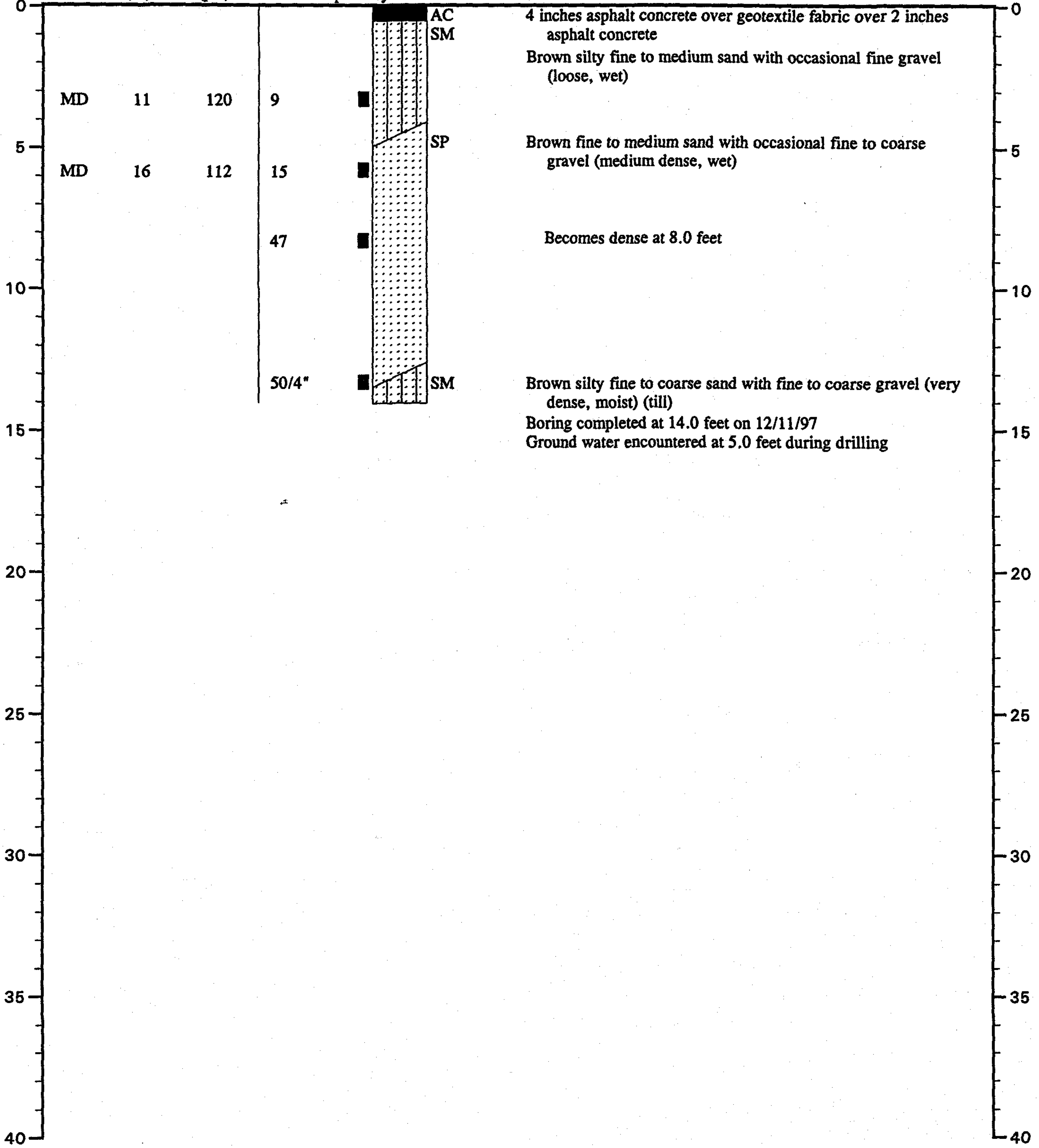
DESCRIPTION

Surface Elevation (ft.): 56.0

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	Description
					AC	4 inches asphalt concrete over geotextile fabric over 2 inches asphalt concrete
					SM	Brown silty fine to medium sand with occasional fine gravel (loose, wet)
MD	11	120	9	■		
					SP	Brown fine to medium sand with occasional fine to coarse gravel (medium dense, wet)
MD	16	112	15	■		
			47	■		Becomes dense at 8.0 feet
			50/4"	■	SM	Brown silty fine to coarse sand with fine to coarse gravel (very dense, moist) (till)

Boring completed at 14.0 feet on 12/11/97

Ground water encountered at 5.0 feet during drilling



Note: See Figure A-2 for explanation of symbols

0113-020-06-1130 :BEB:DJM:CMS 3/6/98

GeoEngineers

LOG OF BORING

FIGURE A-15

TEST DATA

BORING B-17

DEPTH IN FEET	Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION Surface Elevation (ft.): 88.0
0						AC	3 inches asphalt concrete
						ML	Brown silt with fine to coarse sand and fine to coarse gravel (medium stiff, moist) (fill)
	MD, GS	16	81	11	■	ML	Brown fine to coarse sandy silt with occasional fine gravel (medium stiff, moist) (fill)
5						ML	Brown silt with occasional fine sand (stiff, moist)
				19	■		
	MD	28	95	7	■		Becomes medium stiff
							Boring completed at 9.0 feet on 12/11/97 No ground water encountered during drilling
10							
15							
20							
25							
30							
35							
40							

Note: See Figure A-2 for explanation of symbols

0113-020-06-1130 :BEB:DJM:CMS 3/6/98

GeoEngineers

LOG OF BORING

FIGURE A-19

TEST DATA

BORING B-18

DESCRIPTION

Surface Elevation (ft.): 85.0

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION
					AC	4 inches asphalt concrete
					SM	Brown silty fine to coarse sand with fine to coarse gravel (loose, moist) (fill)
			7	■		
					ML	Gray silt with fine to coarse sand and fine to coarse gravel (stiff, moist)
MD	9	127	14	■		
					SM	Brown silty fine to coarse sand with fine to coarse gravel (very dense, moist)
MD	11	130	63/11"	■		

Boring completed at 9.0 feet on 12/11/97

No ground water encountered during drilling

DEPTH IN FEET

Note: See Figure A-2 for explanation of symbols

GeoEngineers

LOG OF BORING

FIGURE A-20

TEST DATA

TEST PIT TP-31

DESCRIPTION

Surface Elevation (ft.): 44.0

DEPTH IN FEET	Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	Description
0						SOD	1 inch sod layer
						ML	Dark brown silt with sand and occasional fine to coarse gravel (loose, moist) (topsoil)
1						SM	Light brown silty fine to medium sand with occasional fine to coarse gravel (medium dense, wet) (fill)
2	SM	20			☐		Clay pipe encountered at 2.4 feet
3						SP-SM	Brown fine to medium sand with silt and occasional fine gravel (medium dense, wet) (alluvium or recessional outwash)
4	MD	20	106		■		
5					☐	SM	Brown silty fine to coarse sand with fine to coarse gravel and occasional cobbles (dense, moist) (till)
9							Becomes very dense at 9.5 feet
12	SM	11			☐		
13							Test pit completed at 13.0 feet on 12/09/97 Moderate ground water seepage observed between 3.0 and 5.0 feet Severe caving observed between 3.0 and 5.0 feet

Note: See Figure A-2 for explanation of symbols

:BEB:DJM:CMS 3/6/98

0113-020-06-1130

GeoEngineers

LOG OF TEST PIT

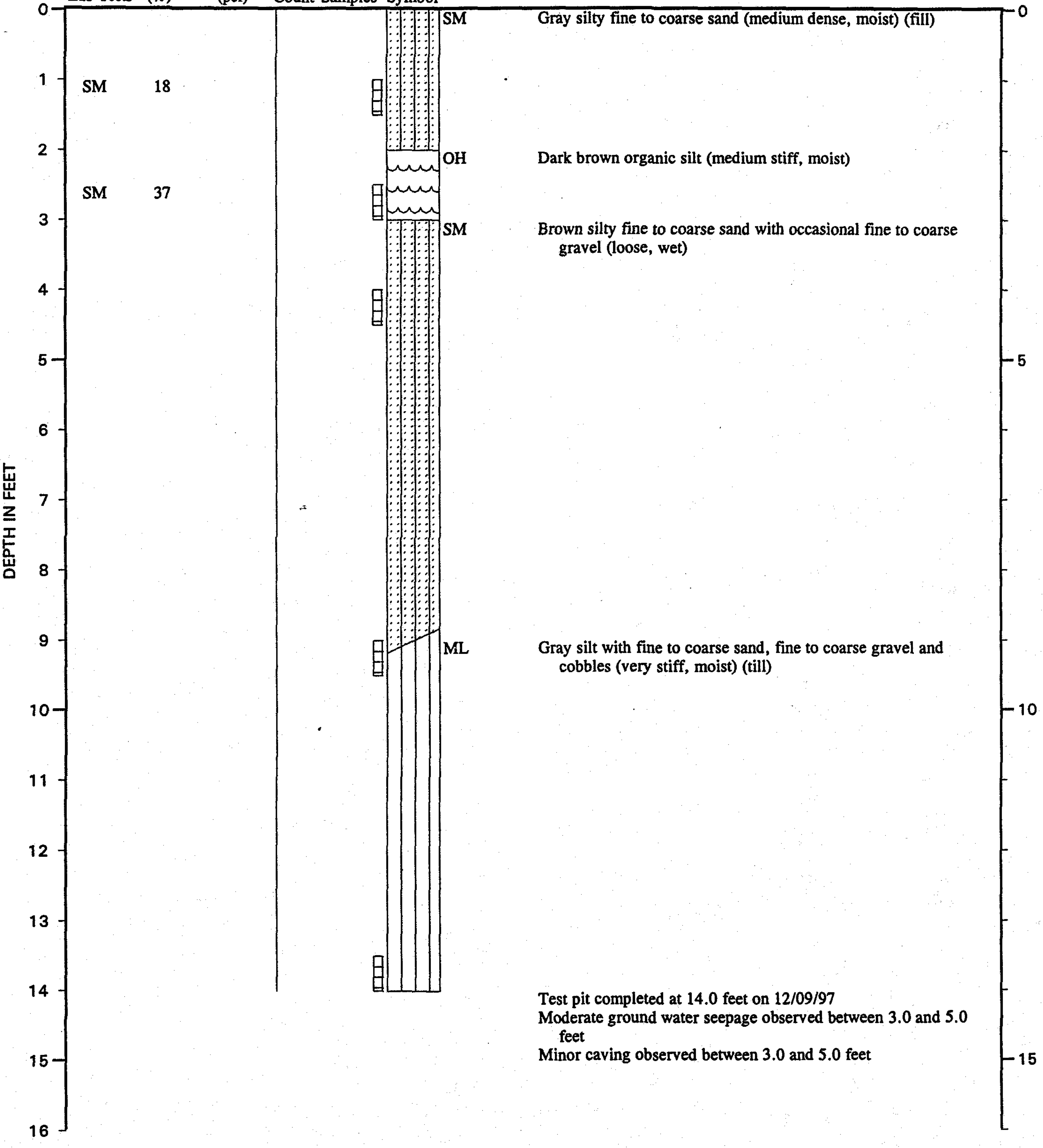
FIGURE A-38

TEST DATA

TEST PIT TP-32

DESCRIPTION

Surface Elevation (ft.): 42.5



Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	Description
					SM	Gray silty fine to coarse sand (medium dense, moist) (fill)
SM	18					
					OH	Dark brown organic silt (medium stiff, moist)
SM	37					
					SM	Brown silty fine to coarse sand with occasional fine to coarse gravel (loose, wet)
					ML	Gray silt with fine to coarse sand, fine to coarse gravel and cobbles (very stiff, moist) (till)

Test pit completed at 14.0 feet on 12/09/97

Moderate ground water seepage observed between 3.0 and 5.0 feet

Minor caving observed between 3.0 and 5.0 feet

Note: See Figure A-2 for explanation of symbols

0113-020-06-1130 :BEB:DJM:CMS 3/6/98

GeoEngineers

LOG OF TEST PIT

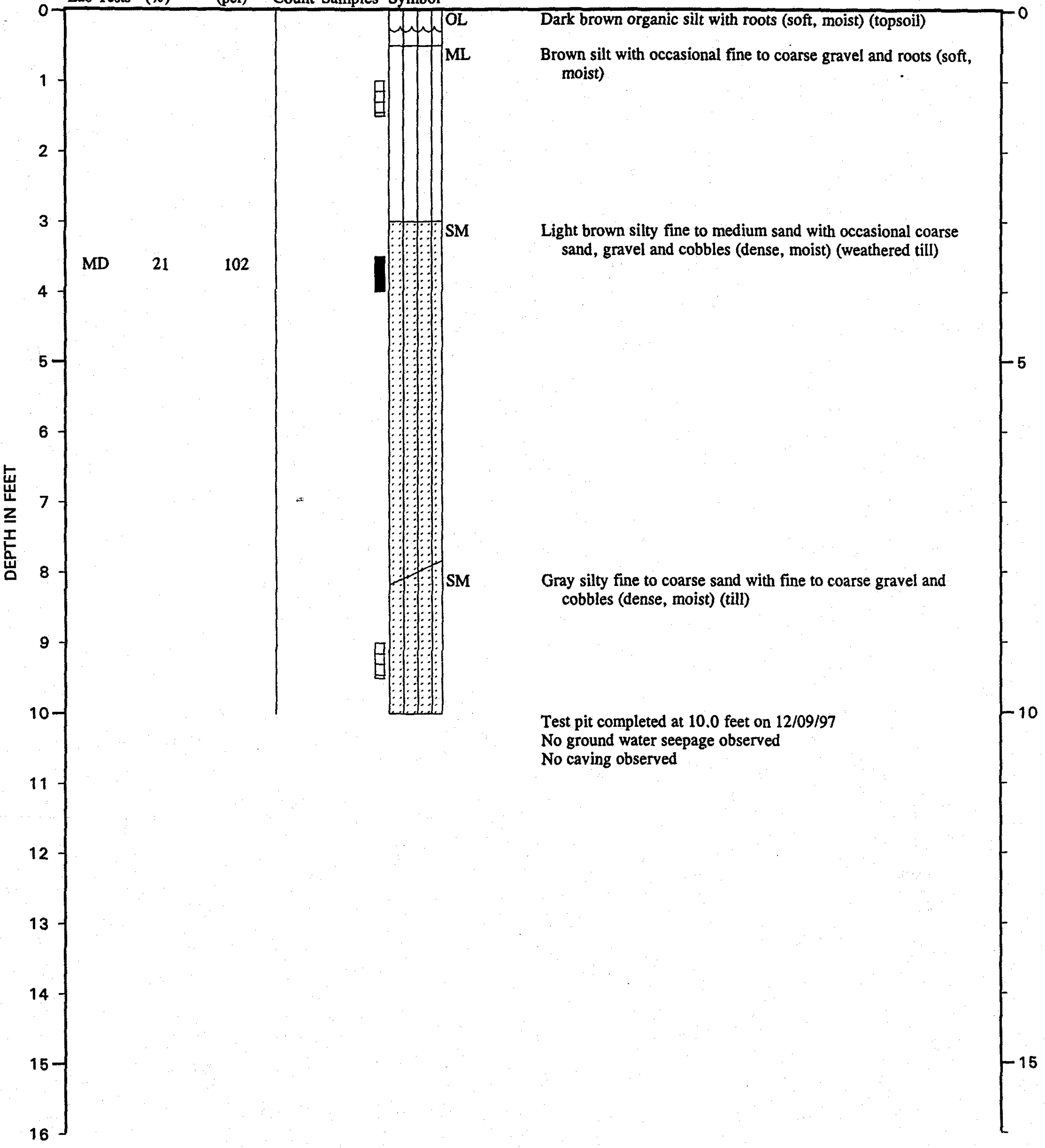
FIGURE A-39

TEST DATA

TEST PIT TP-33

DESCRIPTION

Surface Elevation (ft.): 61.0



Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	Description
					OL	Dark brown organic silt with roots (soft, moist) (topsoil)
					ML	Brown silt with occasional fine to coarse gravel and roots (soft, moist)
					SM	Light brown silty fine to medium sand with occasional coarse sand, gravel and cobbles (dense, moist) (weathered till)
MD	21	102				
					SM	Gray silty fine to coarse sand with fine to coarse gravel and cobbles (dense, moist) (till)

Test pit completed at 10.0 feet on 12/09/97
No ground water seepage observed
No caving observed

Note: See Figure A-2 for explanation of symbols

GeoEngineers

LOG OF TEST PIT

FIGURE A-40

TEST PIT NO. 3

Logged By JWJ

Date 3/21/85

Elev. 31.83

Depth (ft.)	USCS	Soil Description	W (%)
0		TOPSOIL, dark, organic	
	ml	Tan rusty sandy SILT with gravel, (TILL), wet, medium dense	
5	sp sm	Blue SAND with silt with silty SAND layers and lenses, moist, very dense	21
	gp	Tan sandy GRAVEL with cobbles, wet, dense	6
10 15		Test pit terminated at 8.5' below existing grade. Light groundwater seepage encountered at 1 to 3' during excavation, heavy 6 to 8.5'.	

TEST PIT NO. 4

Logged By JWJ

Date 3/21/85

Elev. 50.10

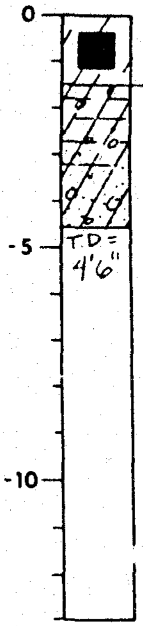
Depth (ft.)	USCS	Soil Description	W (%)
0		TOPSOIL, dark, organic	
	ml	Tan, reddish, sandy SILT, moist, medium dense, non-plastic	23
5	sm	Greyish, sandy SILT with gravel and cobbles (TILL), moist, dense	15
	ml	Grading to silty SAND (TILL), wet, dense	19
10 15		Test pit terminated at 9' below existing grade. Heavy groundwater seepage encountered at 8 to 9' during excavation.	

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

TEST PIT LOGS
NORTH CREEK VALLEY DEVELOPMENT
BOTHELL, WASHINGTON

Proj. No. 2586 **Date** Apr. '85 **Plate** A-8

T.P. - 1	Soil Description and Classification

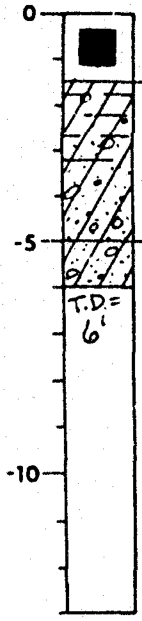


SILTY, HUMUS, TOPSOIL, ROOTS, ORGANICS

VERY DENSE, RED-BROWN TO GRAY-BROWN, CLAYEY TO SANDY SILT, WITH GRAVEL, COBBLES, OCCASIONAL BOULDERS (TILL)

Notes: VERY HARD TO DIG.

T.P. - 2	Soil Description and Classification



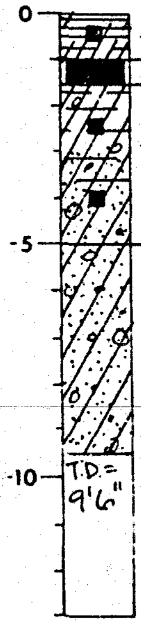
HUMUS TOPSOIL, ROOTS, ORGANICS.

VERY DENSE, LIGHT BROWN TO RED BROWN, CLAYEY TO SANDY SILT, WITH GRAVEL, COBBLES, OCCASIONAL BOULDERS, SUBROUNDED TO ROUNDED, COARSE MATERIALS (TILL).

VERY DENSE, GRAY, SANDY SILT WITH GRAVEL AND COBBLES (TILL).

Notes: VERY HARD TO DIG.

T P - 3	Soil Description and Classification



SOFT, GRAY, SILTY CLAY TO CLAYEY SILT WITH ORGANICS. (FILL).

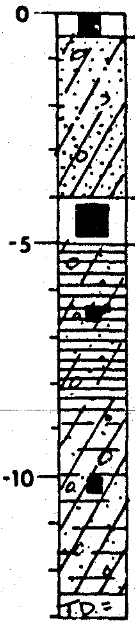
BROWN PEAT, ORGANICS.

LIGHT BROWN TO RED BROWN, CLAYEY TO SANDY SILT, WITH MINOR GRAVEL, COBBLES, AND BOULDERS, SOME ORGANICS (TILL).

GRAY TO GRAY BROWN, SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS (TILL).

Notes: SLIGHTLY LESS DENSE.

T P - 4	Soil Description and Classification



BROWN TO RED BROWN, HUMUS TOPSOIL.

MEDIUM DENSE, GRAY BROWN, SILTY SAND TO SANDY SILT, MINOR GRAVEL, COBBLES, WET (FILL).

SILTY HUMUS, ORGANICS, ROOTS, OXIDATION ZONE.

MEDIUM DENSE, GRAY BROWN, SILTY CLAY TO CLAYEY SILT, SOME SAND, GRAVEL, COBBLES, AND BOULDERS, MINOR ORGANICS (FILL).

Notes: SLOUGH BELOW 1'. WATER AT 4'.

TEST PIT LOG

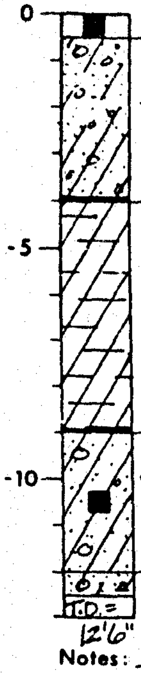
BEARDSLEE ROAD PROPERTY

BOTHELL · WASHINGTON

Cascade Testing Laboratory, Inc.
Engineers · Geologists
14120 N E 21st Street Bellevue Wash 98007
Phone 641-2573

DATE 5-21-84	CERT NO 845-446	DWN BY PHELAN	CHKD BY

T.P-5	Soil Description and Classification



TOPSOIL, ROOTS, ORGANICS.

LOOSE, GRAY-BROWN, SILTY SAND TO SANDY SILT, SOME GRAVEL, MINOR COBBLES, BOULDERS (FILL).

HUMUS SOILS AT 4'.

SLIGHTLY MOTTLED, GRAY-BROWN, CLAYEY SILT, SOME GRAVEL, COBBLES AND BOULDERS, MINOR PEAT. (FILL)

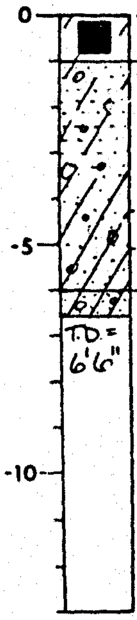
HUMUS SOILS AT 9'.

LOOSE, RED-BROWN, SANDY SILT, MINOR GRAVEL, COBBLES AND BOULDERS, PEAT.

HARD, RED-BROWN, SILTY SAND TO SANDY SILT, MINOR GRAVEL, COBBLES, AND BOULDERS. (TILL).

Notes: GROUNDWATER AT 4'.

T.P-6	Soil Description and Classification



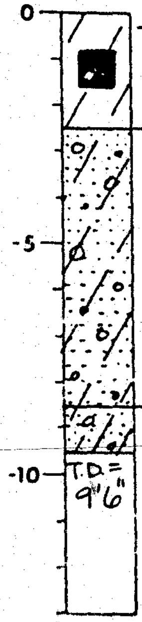
TOPSOIL, HUMUS, ROOTS AND ORGANICS, SILTS.

VERY HARD, GRAY-BROWN, SILTY SAND TO SANDY SILT, WITH SOME GRAVEL, COBBLES, BOULDERS, SUBROUNDED TO ROUNDED. (TILL)

VERY HARD, GRAY, SANDY SILT, MINOR GRAVEL, COBBLES AND BOULDERS (TILL).

Notes:

T.P-7	Soil Description and Classification



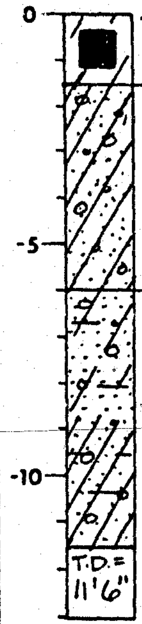
TOPSOIL, HUMUS, ROOTS, AND ORGANICS, SILT.

DENSE, RED-BROWN, SILTY SAND, MINOR GRAVEL, COBBLES AND BOULDERS, SUBROUNDED, LOCALLY SILTY (FILL OR TILL?).

VERY HARD, GRAY, SILTY SAND TO SANDY SILT, MINOR GRAVEL, COBBLES AND BOULDERS, CLAY (TILL).

Notes: SEEPAGE AT 6'6".

T.P-8	Soil Description and Classification



TOPSOIL, HUMUS, ROOTS, ORGANICS, SILT.

LOOSE, GRAY-BROWN, SANDY SILT, MINOR GRAVEL, COBBLES, AND BOULDERS (FILL).

HARD, RED-BROWN, SILTY SAND TO SANDY SILT, MINOR TO SOME, GRAVEL, COBBLES, AND BOULDERS, MOTTLED, MINOR CLAY (TILL).

Notes:

TEST PIT LOG

BEARDSLEE ROAD PROPERTY

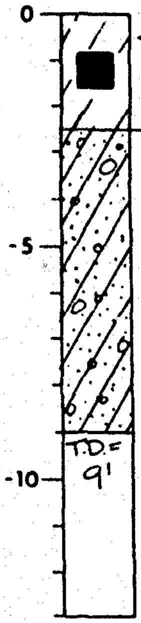
BOTHELL · WASHINGTON

Cascade Testing Laboratory, Inc.
Engineers · Geologists
14120 N E 21st Street Bellevue, Wash 98007
Phone 641-2573

DATE 5-21-84	CERT NO 845-446	DWN BY PHELAN	CHKD BY

T.P. - 9

Soil Description and Classification



TOPSOIL, HUMUS, ROOTS, ORGANICS, SILT.

VERY HARD, TAN, SANDY SILT, MINOR GRAVEL, COBBLES, AND BOULDERS, MINOR SAND LENSES, DRY.

Notes:

T.P. -

Soil Description and Classification

0

-5

-10

Notes:

T.P. -

Soil Description and Classification

0

-5

-10

Notes:

T.P. -

Soil Description and Classification

0

-5

-10

Notes:

TEST PIT LOG

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Phone 641-2573

DATE 5-21-84	CERT. NO 845-446	DWN BY PHELAN	CHKD BY

APPENDIX D

Report Limitations and Guidelines for Use

APPENDIX D
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

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

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of Capstone Development Partners and members of the design team. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

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

A Geotechnical Engineering or Geologic Report Is Based on a Unique Set of Project-specific Factors

This report has been prepared for the proposed Husky Village Student Housing project at the University of Washington in Bothell, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

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

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

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;

---

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

- Composition of the design team; or
- Project ownership.

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

Subsurface Conditions Can Change

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

Most Geotechnical and Geologic Findings Are Professional Opinions

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

Geotechnical Engineering Report Recommendations Are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

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

Do Not Redraw the Exploration Logs

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

Give Contractors a Complete Report and Guidance

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

Contractors Are Responsible for Site Safety on Their Own Construction Projects

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

Read These Provisions Closely

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

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

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

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

GeoEngineers

Husky Village Redevelopment

SEPA Consistency Memo Appendices

Appendix B

WETLAND DELINEATION REPORT

Husky Village Redevelopment
City of Bothell, Washington

December 31, 2020

RAEDEKE ASSOCIATES, INC.

Raedeke
Associates, Inc.

Wetland & Aquatic Sciences
Wildlife Ecology
Landscape Architecture

Report To:	Mr. Rick Meserve Capstone Development Partners LLC 720 S. Colorado Blvd, Ste 550 North Denver, CO 80246
Title:	Wetland Delineation Report for Husky Village Redevelopment City of Bothell, Washington
Project Number:	2016-087-102
Date:	December 31, 2020

2111 N. Northgate Way, Ste 219 Seattle, WA 98133 206-525-8122 raedeke.com

Raedeke
Associates, Inc.

Wetland & Aquatic Sciences
Wildlife Ecology
Landscape Architecture

Project Manager:	Will Hohman, B.S., P.W.S. Senior Wetland Ecologist
Project Personnel:	Christopher W. Wright, B.S. Vice President / Soils and Wetland Scientist
	Annamaria Clark. B.S. Wetland Technician
	Anne Cline, P.L.A. Landscape Architect

Submitted by:

Signature

Will Hohman
Printed Name

December 31, 2020
Date:

TABLE OF CONTENTS

Page

LIST OF FIGURES IV

1.0 INTRODUCTION 3

  1.1 Statement of Purpose 3
  1.2 Project Location 3
  1.3 Responsible Parties & Qualifications 3
  1.4 General Project Site Description 3
  1.5 Summary of Findings, Proposed Impacts And Mitigation Approach 4

2.0 METHODS 5

  2.1 Definitions and Methodologies 5
  2.2 Background Research 7
  2.3 Field Sampling Procedures 7

3.0 EXISTING CONDITIONS 9

  3.1 Results of Background Investigation 9
  3.2 On-Site Wetlands 10

4.0 WETLAND RATINGS AND BUFFER CONDITIONS 13

5.0 REGULATORY CONSIDERATIONS 16

  5.1 Federal Clean Water Act (U.S. Army Corps of Engineers) 16
  5.2 State of Washington 16
  5.3 City of Bothell 17
  5.4 Mitigation Sequencing 17

6.0 LIMITATIONS 19

7.0 LITERATURE CITED 20

FIGURES 24

APPENDIX A: Wetland Determination Data Sheets A-1

APPENDIX B: Ecology Wetland Rating B-1

APPENDIX C: WDFW Priority Habitats and Species Report C-1

LIST OF FIGURES

Figure **Page**

1. Site Vicinity Map 25
2. King County Parcel Map 26
3. Bothell Parcel Map 27
4. Existing Conditions 28
5. NRCS Web Soil Survey 29
6. USFWS National Wetland Inventory Map 30
7. WDNR Forest Practice Water Type Map 31
9. SalmonScape 32
10. WDFW Fish Passage Map 33

1.0 INTRODUCTION

This document describes Raedeke Associates, Inc.'s wetland delineation, wetland rating, and overall results of our critical areas study to date for the project site known as the Husky Village Redevelopment project in Bothell, Washington. This preliminary report has been prepared to assist the project team in discussion with the City of Bothell in preparation of a formal site plan review submittal and to support preliminary review of the project approach to the Bothell Municipal Code Title 14 Environment Chapter 14.04 Critical Area Regulations (Bothell 2020).

1.1 STATEMENT OF PURPOSE

The purpose of this report is to present the wetland delineation work performed to date including a summary of existing critical areas and associated buffer conditions at the project location.

1.2 PROJECT LOCATION

The Husky Village Redevelopment property totals approximately 4.4 acres in size and consists of one parcel located at 18612 Beardslee Blvd in the City of Bothell Washington. The parcel is bordered to the south by Campus Way NE, to the east by 110th Ave NE, and to the northwest by Beardslee Boulevard. Specifically, the study area of this proposal is located in Section 5, Township 26 North, Range 05 East, W.M. and is identified as King County tax parcel number 0526059175 as reviewed on King County iMap Interactive Mapping Tool (Figures 1 and 2) and City of Bothell GIS COBMap Interactive mapping Tool (Figure 3).

1.3 RESPONSIBLE PARTIES & QUALIFICATIONS

Three project biologists/wetland scientists worked on this project from Raedeke Associates, Inc. Annamaria Clark, Wetland Biologist and Wetland Professional in Training, and Christopher W. Wright, Vice President/Soil and Wetland Scientist of Raedeke Associates, Inc. performed the field work and assisted with data analysis and report preparation. Will Hohman is the project manager on this project and is a Professional Wetland Scientist.

Ms. Clark has more than 5 years of experience, Mr. Wright has more than 25 years of experience, and Mr. Hohman has more than 15 years of experience in wetlands science and critical areas work.

1.4 GENERAL PROJECT SITE DESCRIPTION

The project site is a developed property the majority of which consists of student apartments, paved parking and driving surfaces, a stormwater detention pond, and landscaped areas. The site generally slopes down to the northeast. A stormwater pond is located along the eastern property boundary that appears to outlet to the identified Wetland 1 which is described in further detail below.

The surrounding area consists primarily of residential property and public access roads. The project site is bound by Beardslee Boulevard to the northwest, 110th Avenue NE to the east, and NE 185th Street to the south. A large wetland is located approximately 500 feet east of the project site.

1.5 SUMMARY OF FINDINGS, PROPOSED IMPACTS AND MITIGATION APPROACH

During our site visit, we delineated one wetland that extends on to the project site from the parcel east of and contiguous to the project site identified parcel no. 0526059057). The wetland is located just west of 110th Avenue NE. Wetland 1 (Figure 4) is a slope geomorphic class wetland with stormwater flowing into and out of it. Wetland 1, under current City of Bothell code, is afforded a 75-foot buffer, portions of which consist of apartment buildings, a stormwater pond, and paved roads and walking paths/sidewalks.

2.0 METHODS

2.1 DEFINITIONS AND METHODOLOGIES

Wetlands and streams are protected by federal law as well as by state and local regulations. Federal law (Section 404 of the Clean Water Act) prohibits the discharge of dredged or fill material into "Waters of the United States," including certain wetlands, without a permit from the U.S. Army Corps of Engineers (USACE 2017). The U.S. Army Corps of Engineers (USACE) makes the final determination as to whether an area meets the definition of a wetland and whether the wetland is under their jurisdiction.

The USACE wetland definition was used to determine if any portions of the project area could be classified as wetland. A wetland is defined as an area "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Register 1986:41251).

We based our investigation upon the guidelines of the USACE Wetlands Delineation Manual (Environmental Laboratory 1987), as further clarified in the Regional Supplement to the Corps of Engineers Delineation Manual: Western Mountains, Valleys, and Coasts Region (USACE 2010). The USACE wetlands manual is required by state law (WAC 173-22-035, as revised) for all local jurisdictions. As outlined in the 1987 wetland delineation manual, wetlands are distinguished by three diagnostic characteristics: hydrophytic vegetation (wetland plants), hydric soil (wetland soil), and wetland hydrology. Definitions for these terms are provided below.

Hydrophytic vegetation is defined as "macrophytic plant life growing in water, soil or substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Environmental Laboratory 1987). The U.S. Army Corps of Engineers National Wetland Plant list Wetland Indicator Status (WIS) ratings were used to make this determination (Lichvar et al. 2016). The WIS ratings "reflect the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetland versus non-wetland across the entire distribution of the species" (Reed 1988:8). Plants are rated, from highest to lowest probability of occurrence in wetlands, as obligate (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and upland (UPL), respectively. In general, hydrophytic vegetation is present when the majority of the dominant species are rated OBL, FACW, and FAC. Common and scientific names of plants identified within each data plot and encountered during the field investigation were recorded. Pertinent data for purposes of this report is presented in Appendix A.

A hydric soil is defined as "a soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register 1995: 35681). The morphological characteristics of the soils in the study area were examined to determine whether any could be classified as hydric.

According to the 1987 methodology, wetland hydrology could be present if the soils were saturated (sufficient to produce anaerobic conditions) within the majority of the rooting zone (usually the upper 12 inches) for at least 5% of the growing season, which in this area is usually at least 2 weeks (USACE 1991a). It should be noted, however, that areas having saturation to the surface between 5% and 12% of the growing season may or may not be wetland (USACE 1991b). Depending on soil type and drainage characteristics, saturation to the surface would occur if water tables were shallower than about 12 inches below the soil surface during this time period.

Positive indicators of wetland hydrology include direct observation of inundation or soil saturation, as well as indirect evidence such as driftlines, watermarks, surface encrustations, and drainage patterns (Environmental Laboratory 1987). Hydrology was further investigated by noting drainage patterns and surface water connections between wetlands and streams within and adjacent to the project area.

We based our delineation of the ordinary high water mark (OHWM) for streams on definitions provided under the Washington State Shorelines Management Act of 1971. The Washington State definition for the OHWM is as follows:

> *Ordinary high water line" or "OHWL" means the mark on the shores of all waters that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual and so long continued in ordinary years, as to mark upon the soil or vegetation a character distinct from that of the abutting upland, provided that in any area where the ordinary high water line cannot be found, the ordinary high water line adjoining saltwater shall be the line of mean higher high water, and the ordinary high water line adjoining freshwater shall be the elevation of the mean annual flood."*…(RCW 90.58.030(2)(b) and WAC173-22-030(5); WDOE 1994).

As outlined in the Washington Department of Ecology (WDOE 1994) Shoreline Administrators Manual, the general guidelines for determining the OHWM include: (1) a clear vegetation mark; (2) wetland/upland edge; (3) elevation; (4) a combination of changes in vegetation, elevation, and landward limit of drift deposition; (5) soil surface changes from algae or sediment deposition to areas where soils show no sign of depositional processes; and/or (6) soil profile changes from wetter conditions (low chroma, high soil organic matter, and lack of mottling) to drier conditions (higher chroma, less organic matter, or brighter mottles).

2.2 BACKGROUND RESEARCH

Prior to conducting our field investigations, we collected and analyzed background information available for the site from the U.S.D.A. Natural Resources Conservation Service (NRCS 2020) Web Soil Survey, the U.S. Fish and Wildlife Service (USFWS 2020) National Wetland Inventory (NWI), City of Bothell (2020) Maps, King County (2020) Public GIS Maps, and the Washington Department of Natural Resources (WDNR 2020) Forest Practices Activity Maps. We also reviewed information from the Washington Department of Fish and Wildlife (WDFW 2020) priority habitats and species database, SalmonScape databases (WDFW 2020a), including State Fish Passage Maps for understanding existing barriers (WDFW 20120b) for documented information on the potential occurrence of federal- or state-listed endangered, threatened, sensitive, candidate, other priority, or monitor wildlife species within the study area. We also reviewed series of aerial photographs available at Google Earth (2019) and United States Geological Survey (USGS 2020) 7.5-minute topographic maps to assist in the definition of existing plant communities, drainage patterns, hydrography, and land use. We also reviewed Federal Emergency Management Agency (FEMA 2020) effective Flood Insurance Rate Maps to understand flooding at the project site.

2.3 FIELD SAMPLING PROCEDURES

Raedeke Associates Inc. delineated the wetland in the vicinity project site on October 11, 2020. Raedeke Associates, Inc. staff also visited the site and investigated for critical areas previously in December of 2016. Generally, the delineated wetland was observed to be in the same location and of similar size as identified during our previous site reconnaissance performed in 2016.

During the October 2020 site visit, we formally delineated the wetland with field flagging. Our field flags were professional surveyed by Bush, Roed, and Hitchings, Inc.. The survey was provided to Raedeke Associates, Inc. by Capstone Development Partners (Capstone) on October 23, 2020. Additional site existing conditions survey information (building locations, contour elevations, site appurtenances, etc.) was provided to Raedeke Associates, Inc. by Capstone and Walker Macy in November 2020. Based on this site survey information, we prepared the existing conditions figure (Figure 4).

During our field investigation, we inventoried, classified, and described representative areas of plant communities, soil profiles, and hydrologic conditions in both uplands and wetlands. We searched specifically for areas with positive indicators of hydrophytic vegetation, hydric soil, and wetland hydrology.

Vegetation, soils, and hydrology were examined in representative portions of the investigated area according to the procedures described in the USACE Wetlands Delineation Manual (Environmental Laboratory 1987). Areas investigated were examined per the 1987 Manual as updated by the Regional Supplement (USACE 2010). Plant communities were inventoried, classified, and described during our field investigation. We estimated the percent coverage of each species. Plant identifications were made according to standard taxonomic procedures described in Hitchcock and Cronquist (1976), with nomenclature as updated by the U.S. Army Corps of Engineers National Wetland Plant List (Lichvar et al. 2016). Wetland classification follows the USFWS wetland classification system (Cowardin et al. 1992). We determined the presence of a hydrophytic vegetation community using the procedure described in the 1987 Manual (Environmental Laboratory 1987), and the Regional Supplement (USACE 2010), which requires the use of the dominance test, unless positive indicators of hydric soils and wetland hydrology are also present, in which case the prevalence index or the use of other indicators of a hydrophytic vegetation community as described in the Regional Supplement (USACE 2010) was required.

We excavated pits to at least 18 inches below the soil surface, where possible, in order to describe the soil and hydrologic conditions throughout the study area. We sampled soil at locations that corresponded with vegetation sampling areas and potential wetland areas. Soil colors were determined using the Munsell Soil Color Chart (Munsell Color 2009). We used the indicators described in the 1987 Manual and Regional Supplement (USACE 2010) to determine the presence of hydric soils and wetland hydrology for wetland areas.

Our evaluation of the wetland boundaries was based on the presence of hydric soil, hydrophytic vegetation, and indicators of wetland hydrology. Topographic changes within the context of the landscape were used to aid in our review of the wetland boundaries as well as supporting aerial imagery and review of contributing drainage areas on and in the vicinity of the site for wetland hydrology.

In addition to delineating the wetland unit in the vicinity of the project site, we collected data and information about the on-site wetland buffer areas. We noted characteristics of the buffer such as landscape, landform, land-use, cover type, drainage, and soil conditions at the time of our site visit. Lastly, we collected observations from on-site of off-site and adjacent land uses to determine if adjacent properties potentially contained critical areas wetlands and streams.

3.0 EXISTING CONDITIONS

As described above, much of the project site consists of student apartment buildings, paved parking and road access, and landscaped areas. The site slopes down to the east and northeast toward a culvert which crosses under 110th Ave NE. There are areas of unmaintained mixed forest along the east edge of the site adjacent to 110th Avenue NE. It is within this eastern forested strip that Wetland 1 was identified and delineated. The following section summarizes results of our background research used to support this delineation.

3.1 RESULTS OF BACKGROUND INVESTIGATION

3.1.1 Natural Resource Conservation Service (NRCS) Web Soil Survey

The USDA NRCS (2020) Web Soil Survey, has mapped soils of the project area as Alderwood gravelly sandy loam and Seattle muck (Figure 5). Soil series boundaries or mapping units are mapped from aerial photographs with limited field verification. Thus, the location and extent of the boundaries between mapping units may be approximate for a given parcel of land within the survey area. In addition, mapping units described by the NRCS may encompass smaller inclusions that were not shown as separate units on the survey maps. For example, non-hydric soil units may contain areas of poorly-drained to very poorly-drained hydric soil, which could be classified as wetland. Conversely, there may be areas of well-drained or moderately well-drained soils within mapping units designated as hydric.

According to the USDA NRCS (2020) Web Soil Survey, Alderwood gravelly sandy loam (AgC) is not a hydric soil. It is derived from glacial drift or outwash over dense glaciomarine deposits. Alderwood series may contain minor hydric soil components composed of Norma and Shalcar soils. Seattle muck soils are identified as a hydric soil and are derived from grassy organic material. USDA NRCS (2020) Web Soil Survey maps Alderwood soils on the majority of the project site while Seattle muck soils are identified on the eastern portion of the site, primarily where the stormwater pond is located (Figure 6). After review of hydric ratings by soil map unit, Alderwood soils are composed of 1-32% hydric soil components while Seattle muck soils are made up of 100% hydric soil components.

3.1.2 National Wetland Inventory

The USFWS (2020) NWI, (Figure 7), depicts the stormwater pond located in the central eastern area of the site as a freshwater pond. No wetlands, streams, or other bodies of water are depicted on site. Downslope from the project site and across 110th Avenue NE, two small off-site wetlands and a larger wetland complex associated with North Creek are depicted.

3.1.3 King County GIS Center Mapping

The King County (2020) iMap GIS Center provides public on-line geographical information systems (GIS) data regarding various environmental features such as critical areas, floodplains, floodways, and parcels (Figure 2). The King County (2020) iMap GIS Center depicts the stormwater pond in the central eastern area of the site and does not depict any other bodies of water. No on-site environmentally sensitive areas such as wetlands, erosion hazards, streams, wildlife networks, etc. were depicted on King County GIS maps.

3.1.4 City of Bothell Mapping

The City of Bothell (2020) provides effective jurisdiction maps on their document center City web page for public review. Review of these maps indicate the presence of a wetland along the eastern edge of the project site in the general location of Wetland 1. A larger wetland complex is also depicted off-site, downslope to the east of the project site and east of 110th Ave NE (Figure 3).

3.1.5 WDNR Forest Practice Water Type Map

The WDNR (2020) Forest Practice Activity Water Type Map for the study area depicts the stormwater pond in the central eastern area of the site as a Type N body of water. Approximately 500 feet east of the site, North Creek is depicted as a Type S stream (Figure 7). Type N streams are defined as non-fish bearing streams, Type S streams are designated as “shorelines of the state” defined in chapter 90.58.030 RCW.

3.1.6 WDFW Priority Species Database, SalmonScape, and Fish Passage Maps

The WDFW (2020) PHS database map does not depict any State or Federal listed species (threatened, endangered, or sensitive) within the project site or its immediate vicinity (Appendix C). The PHS database does map the North Creek and adjacent wetlands off-site, to the east side. These wetlands are depicted in similar locations as the NWI and City of Bothell maps. Upon review of the PHS database maps, Salmonscape, and Fish Passage maps, no streams are mapped onsite or in the immediate vicinity withing 300 feet. The nearest creek and/or assessed and prioritized blockages or structures associated with fish are located more than 500 feet away from the project site similar to the WDNR map described in the previous section of this report (Figures 8 and 9).

3.1.7 FEMA Flood Insurance Mapping

The Federal Emergency Management Agency maps the site as a Zone X flood zone with the nearest next mapped flood zone located more than 500 feet east for 110th Ave NE as Zone AE. Zone X is defined as other areas located outside the 0.2% chance floodplain (FEMA 2020). Therefore, the project site is not located within the 100-year floodplain. Zone AE is defined as a special flood hazard area subject to inundation by the 1% annual chance flood event (i.e. 100-year flood) and has an established flood elevation.

3.2 ON-SITE WETLANDS

During our field investigations, Raedeke Associates, Inc. identified one wetland primarily located on the parcel east of project site. Wetland 1 is situated in a drainage swale along the west side of 110th Avenue NE and north of NE 185th Street. The wetland consists of a slope wetland hydrogeomorphic classification dominated by a forest canopy. The following sections describe the vegetation, soils, and hydrology associated with the wetland including a description of the associated buffer area and adjacent uplands onsite and adjacent to the project site. Results of supporting upland and wetland sample plots typical to the project site are presented in Appendix A.

3.2.1 Wetland 1

Wetland 1 is comprised of a slope geomorphic class wetland unit originating near the intersection of 110th Avenue NE and NE 185th Street where three pipes are located and appear to contribute hydrology to the wetland area. The wetland slopes down to the north and ends near the location of a large culvert which routes water eastward beneath 110th Avenue NE (See Figure 2 in Appendix B). The wetland is located between the project site and 110th Ave NE. A small portion of this wetland extends on to the project site near the middle of the project site's eastern parcel boundary.

Vegetation

Wetland 1 consists of palustrine, forested, scrub-shrub, and emergent communities dominated by reed canary grass (*Phalaris arundinacea,* FACW), sitka willow (*Salix sitchensis*, FACW), Himalayan blackberry (*Rubus armeniacus*, FAC), balsam poplar (*Populus balsamifera*, FAC), and red alder (*Alnus rubra*, FAC). Other non-dominant species noted on-site and in the wetland during the delineation included fringed willowherb (*Epilobium ciliatum*, FACW), lesser herbrobert (*Geranium robertianum*, FACU), sword fern (*Polystichum munitum*, FACU), hairy bittercress (*Cardamine hirsuta*, FACU), creambush (*Holodiscus discolor*, FACU), red osier (*Cornus alba*, FACW), common morning-glory (Ipomoea purpurea, UPL), and climbing nightshade (*Solanum dulcamara*, FAC).

Soils and Hydrology

During our October 2020 and December 2016 site investigations, we found soils within the wetland to be hydric, consisting of silt loam to gravelly sandy loam soils. Saturation was observed in sample plots at depths ranging from 6 to 8 inches within Wetland 1. In other areas of the wetland, we observed saturation at surface and areas of shallow surficial flow associated with drainage from culvert pipes. Four pipes in total appear to be draining into Wetland 1. Three of the four are culvert pipes originating at the south end of the wetland near the intersection of 110th Avenue NE and NE 185th Street. Another pipe located along the western wetland boundary appears to be conveying water into the wetland from the stormwater pond located directly uphill to the west. Secondary indicators of wetland hydrology include water-stained leaves and drainage patterns. Wetland 1 meets criteria of the slope hydrogeomorphic classification (HGM). Water is entering Wetland 1 through pipes at the top of slope and draining north and east unidirectionally toward the culvert under 110th Ave NE. Observed drainage patterns do not meet criteria to be classified as streams.

During our site investigations soils were identified as being hydric. Sampled areas consisted of up to 8 inches of very dark gray (10YR 3/1) silt loam to very dark grayish brown (10YR 3/2) gravelly sandy loam over 4 to 8 inches of dark grayish brown (2.5Y 4/2 to 10YR 4/2) clay and silt loam soils with dark yellowish brown (10YR 3/6 to 4/6) redoximorphic features over greater than 7 inches of very dark gray (10YR 3/1) clay loam with dark yellowish brown (10YR 4/6) redoximorphic features. Soils met the depleted matrix (F3) hydric soil indicator (Appendix A).

Determination and Classification

Based on our site investigations, we observed hydrophytic vegetation, wetland hydrology, and hydric soils in the wetland. Positive indicators for each of the three wetland parameters at the time of our site investigation means that the delineated area meets the necessary criteria for designation as a wetland according to the guidelines of the USACE (Environmental Laboratory 1987) and the Regional Supplement (USACE 2010). Wetland 1 consists of a palustrine, forested, scrub-shrub, and emergent persistent wetland according to the USFWS (Cowardin et al. 1992) wetland classification system.

3.2.2 Adjacent Uplands & Surrounding Area

Uplands adjacent to Wetland 1 consist of paved streets, developed impervious parking, and unmaintained mixed forested areas dominated by Douglas-fir (*Pseudotsuga menziesii*, FACU), western arborvitae (*Thuja plicata*, FAC), Himalayan blackberry (*Rubus armeniacus*, FAC), English ivy (*Hedera helix*, FACU), lesser herbrobert (*Geranium robertianum*, FACU), field horsetail (*Equisetum arvense*, FAC), reed canary grass (*Phalaris arundinacea*, FACW), and creeping buttercup (*Ranunculus repens*, FAC). Coniferous trees dominate the upland slopes directly adjacent to the wetland. Vegetation does not meet criteria to be considered hydrophytic.

Soils consist mainly of 1 inch of very dark brown (10YR 2/2) gravelly sandy loam soil with cobbles up to 3 inches in diameter, over up to 12 inches of very dark grayish brown (10YR 3/2) to dark olive brown (2.5Y 3/3) gravelly sandy and silt loam soils over great than 4 inches of dark brown (10YR 3/3) gravelly silt loam soils. No redoximorphic features or other indicators of hydric soil were observed. No primary or secondary indicators of wetland hydrology were observed in these upland areas during our site visits. Lack of hydrophytic vegetation, hydric soils and/or wetland hydrology indicators confirmed upland areas on the project site. During our field investigations, Raedeke Associates, Inc. identified one wetland located on the project site which extends offsite on to an adjacent parcel.

Residential and commercially developed properties exist north, west, and south of the project site. The larger wetland complex and natural area associated with North Creek is located east of Wetland 1.

4.0 WETLAND RATINGS AND BUFFER CONDITIONS

Per requirements of Bothell Municipal Code (BMC 2020), we rated the wetland using the Washington Department of Ecology's (WDOE) 2014 Wetland Rating System for Western Washington (Hruby 2014). The WDOE 2014 Wetland Ratings system provides an analysis of the rarity, sensitivity to disturbances, and functions and values of wetlands in order to determine the level of protection, via buffers, that local jurisdictions require when working in or near wetland areas.

Bothell Municipal (2020) code requires base buffer widths ranging from 40-225 feet for Category IV, III, II, and I wetlands and based on functional scores found in the wetland rating. City of Bothell also requires a building setback of 15 feet from the edge of any wetland buffer for buildings and other structures.

4.1 WETLAND UNIT AND RATING

Based on recent updates in training and guidance from WDOE regarding the 2014 WDOE Wetland Rating System for Western Washington (Hruby 2014), Wetland 1 was rated as a slope wetland. We defined the break in hydrogeomorphology by the culvert and roads providing hydrology to Wetland 1, namely 110th Avenue NE to the east, NE 185th Street to the south, and the culvert conveying stormwater from the west. Hydrology outlets through a culvert at the north end of the wetland that conveys water east beneath 110th Avenue NE. For purposes of the wetland rating, the surrounding area is considered "high" intensity land use.

4.1.1 Wetland 1 (Category III)

Wetland 1 meets the criteria as a Category III because it scored a total of 17 points on the rating form (5 for habitat functions). The wetland rating form is provide in Appendix B. The base buffer width for a Category III wetland with a habitat score of 5 is 75 feet according to City of Bothell (BMC 2020) Municipal Code Section 14.04.530.F.1.a.

4.1.3 Off-site Wetlands

Background materials and aerial images depict off-site wetlands downslope east of the project site. The large wetland is approximately 150 to 500 feet east of the project site associated with North Creek. The project site is separated from these wetlands by 110th Avenue NE which creates a break in the wetland buffers per BMC 2020. Since the project site and Wetland 1 are bound by roadways and the City of Bothell 2020 Municipal code section 14.04.530.F.1.b recognizes non-standard buffer widths, we do not anticipate any off-site wetland buffers to extend on to the project site or the identified Wetland 1 or its buffer. Bothell 2020 Municipal code defines non-standard buffers in this case to extend only to the nearest edge of the established roadway.

4.1.4 Summary of Project Wetland Ratings, Stream Classification, and Buffers

Table 1 on the next page summarizes the wetlands and stream associated with this project.

Table 1: Wetland Rating and Buffer Summary

Critical Area	Location	Wetland HGM Class/Stream Classification	Habitat Score	Category	BMC Buffer Width (ft.)
Wetland 1	Northwest of intersection of 110th Avenue NE and NE 185th Street	Slope	5	III	75

4.2 ON-SITE BUFFER EVALUATION

In general, buffers may consist of relatively undisturbed vegetated zones adjacent to critical areas (Granger et al. 2005, Hruby 2013). To better understand buffers, they are vegetated areas adjacent to wetlands that can reduce impacts from adjacent land uses through various physical, chemical, and/or biological processes (Granger et al. 2005). Buffers can help protect and enhance water quality by blocking the entrance of pollutants or greatly reducing the concentration of the pollutants into the resource that is of concern to protect. In other words, buffers can prevent polluting or impacting wetlands and streams negatively, for example, by filtering pollutants from surface water runoff before it enters the wetland, which could potentially degrade water quality or species biodiversity. The vegetative cover within a buffer in combination with soils, width, and slope will determine the amount of subsurface and surface pollutant removal (i.e. treatment) that will occur before water reaches the wetland or stream that it serves to protect and provide habitat for. A buffer planted in grass can adequately perform many functions including trapping sediment and other contaminants (Sweeney and Newbold 2014), but if highly managed as lawn, regularly accessed and disturbed, provides only very limited habitat and water quality functions. Well-vegetated buffers typically function substantially better than poorly vegetated buffers (Granger et al. 2005) and provide function and value to protect and service the critical area by providing protection from noise, light, and runoff pollution.

In addition, these upland buffer areas adjacent to wetlands provide habitat for various wildlife species that utilize or live in and around the wetland. For example, in Western Oregon forested habitats, reptiles and amphibians that depend upon riparian buffer areas may require buffers of at least 240 feet (Gomez and Anthony 1996). If these areas are regularly accessed such as by the existing uses observed at the project site (mowing, parking, etc.), the ecosystem services that these buffer areas provide for fish and wildlife species is further reduced and potentially degrade the buffer and wetland. These authors similarly noted that many species may also require preservation of large areas of old growth and upland habitat, where available, as well. Moreover, buffers can also provide protection from wind and sound for species that are sensitive to these types of disturbances. The following section provides a basic functional assessment of the existing on-site buffer conditions.

4.2.1 Wetland 1 Buffer

The on-site vegetated portions of the Wetland 1 buffer are located directly adjacent to the wetland swale and consist of 10-20 foot wide slopes to the west, east, and south which are dominated by coniferous trees. The vegetated buffer north of Wetland 1 is also dominated by coniferous trees but extends approximately 350 feet from the north boundary of the wetland. The forested buffer areas seem relatively undisturbed. In some areas of the buffer blackberry is growing. Stormwater leaving the wetland is not treated and drains through a culvert beneath 110th and then appears to outlet into a vegetated area that may contribute hydrology to a larger wetland unit east of 110th. Unvegetated portions of the buffer for Wetland 1 consist of paved streets or parking lots that provide no function or value at protecting the wetland and stream in areas of existing paved access and parking.

5.0 REGULATORY CONSIDERATIONS

Wetlands and streams are protected by Section 404 of the Federal Clean Water Act and other state and local policies and ordinances of the City of Bothell municipal code (BMC 2020). Regulatory considerations pertinent to wetlands and streams at the site are subject to Federal, State, and City of Bothell BMC (2020) Critical Area Regulations discussed below; however, this discussion should not be considered comprehensive. Additional information may be obtained from agencies with jurisdictional responsibility for, or interest in, the site (i.e. authorities having jurisdiction). Each applicable federal, state, and local regulatory agency has final authority to determine and approve the location and extent of resources such as wetlands and buffer critical areas including but not limited to allowed and/or permitted uses or impacts to said critical areas. A brief overview of federal and state regulations and City of Bothell policy, relative to wetlands, is presented below.

5.1 FEDERAL CLEAN WATER ACT (U.S. ARMY CORPS OF ENGINEERS)

Federal law (Section 404 of the Clean Water Act) discourages the discharge of dredged or fill material into the nation's waters, including most wetlands and streams, without a permit from the U.S. Army Corps of Engineers (USACE). The USACE makes the final determination as to whether an area meets the definition of “Waters of the U.S.” as defined by the federal government (Federal Register 1986:41251), and thus, if it is under their jurisdiction.

We should caution that the placement of fill within wetlands or other “Waters of the U.S.” without authorization from the USACE is not advised, as the USACE makes the final determination regarding whether any permits would be required for any proposed alteration (USACE 2017). If any modification of wetlands or streams is proposed, either directly or indirectly through temporary or permanent activities, a jurisdictional determination (preliminary or approved) from the USACE along with an appropriate federal permit will be required prior to any construction activities. Ultimate authority and jurisdiction to verify that your project is compliant with applicable Federal law lies with USACE.

5.2 STATE OF WASHINGTON

Under Section 401 of the Clean Water Act, an activity involving a discharge in waters of the U.S. and authorized by the USACE must also receive certification that the federally permitted activity complies with the federal Clean Water Act, state water quality laws, and any other appropriate state laws (such as the Water Resources Act and Hydraulic Code). In Washington State, the certifying agency is usually the Washington Department of Ecology (WDOE). In addition, if the USACE-authorized permit is for actions within the 15 coastal counties, including King County, then the WDOE must confirm or deny that the proposed action complies with the Washington Coastal Zone Management Program.

5.3 CITY OF BOTHELL

5.3.1 Critical Areas

Bothell Municipal (2020) Code regulates wetlands and streams as critical areas under Title 14 Environment Chapter 14.04 Critical Area Regulations. Critical areas as defined by Chapter 14.04005 includes aquifer recharge areas, fish and wildlife habitat conservation areas, special flood hazard areas, geologically hazardous areas, and wetlands. This report is limited to only wetlands, streams, and associated critical areas buffers.

We rated the wetland within the project area using the 2014 WDOE Wetland Rating System for Western Washington (Hruby 2014), as required and clarified by the City Bothell Municipal (2020) Code for determination of wetland buffer widths which are described earlier in this report.

Buffers, per BMC 2020, are measured perpendicular from the critical area wetland and stream. Standard, or prescriptive buffers, presume the existence of native forest vegetation community adequate enough to protect critical area functions and values. In certain circumstances, the City may require an increase in buffer width or additional native plantings within a standard buffer area if vegetation is inadequate or protection of the critical area is lacking.

Alterations of wetlands or streams and their buffers are generally prohibited, except as allowed or permitted by the City under certain conditions and circumstances. Allowed/permitted development activities are detailed in section 14.04.150 of BMC 2020 and generally include emergency situations, normal and routine maintenance of existing structural utilities, removal of invasive plants, removal of dangerous trees, enhancement and restoration plantings, livestock grazing, mowing of hay/grass/grain, maintenance of drainage facilities, etc. All development activities in wetlands or their buffers shall be mitigated for by repairing, rehabilitating, or restoring the impacted area where the impacts cannot be completely avoided altogether.

5.4 MITIGATION SEQUENCING

Should any project proposed in the vicinity of the critical area and buffer described herein result in unavoidable impacts, the project shall demonstrate mitigation sequencing required by federal, state, and local regulations. Mitigation has been defined by the State Environmental Policy Act (SEPA) (WAC 197-11-768; cf. Cooper 1987), and more recently in a Memorandum of Agreement between the Environmental Protection Agency and the U.S. Army Corps of Engineers (Anonymous 1989). In order of desirability, mitigation may include:

1. ***Avoidance*** - avoiding impacts by not taking action or parts of an action;

2. ***Minimization*** - minimizing impacts by limiting the degree or magnitude of the action and its implementation;

3. ***Compensation*** - which may involve:

    a) repairing, rehabilitating, or restoring the affected environment;
    b) replacing, enhancing, or creating substitute resources or environments;
    c) mitigation banking.

Mitigation sequencing is outlined in further detail in the City of Bothell 2020 Municipal Code section 14.04.210,.

6.0 LIMITATIONS

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

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

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

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FIGURES

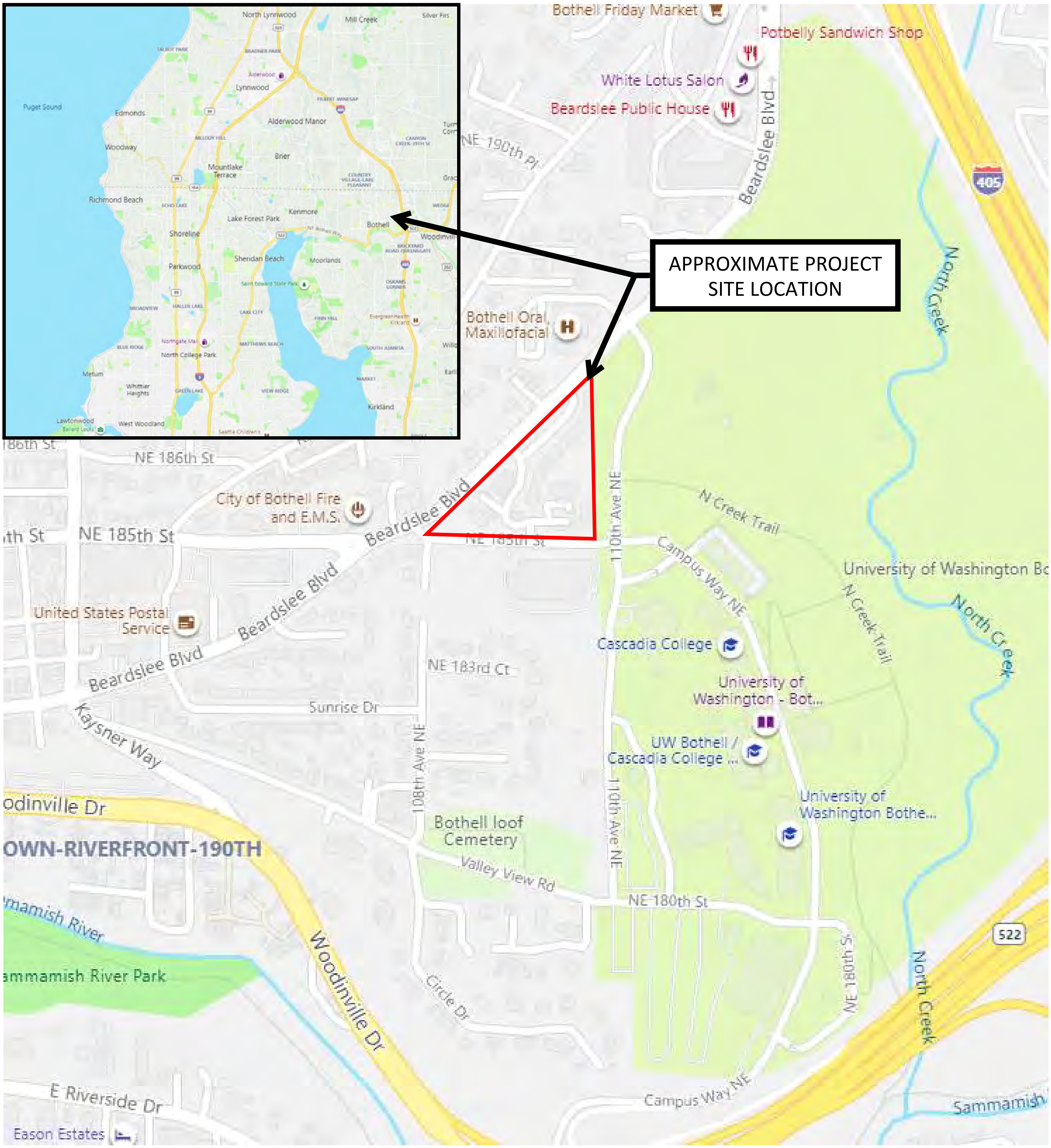


FIGURE 1 - SITE VICINITY MAP

HUSKY VILLAGE REDEVELOPMENT

18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/23/2020

BY: WH

Raedeke Associates, Inc.

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

SOURCE INFORMATION: SNAPSHOT IMAGES FROM https://www.bing.com/maps

King County GIS CENTER

FIGURE 2 - KING COUNTY PARCEL MAP

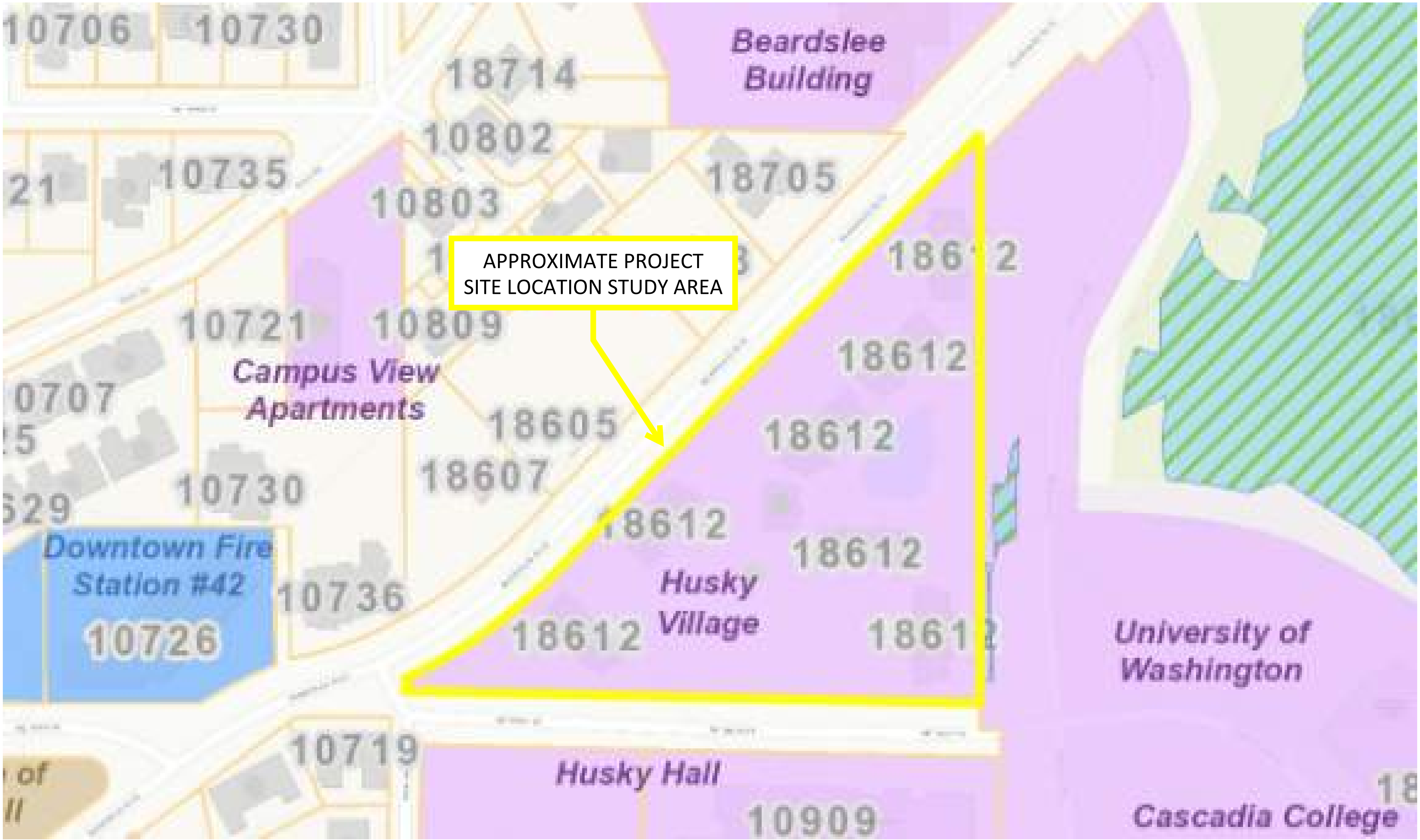
HUSKY VILLAGE REDEVELOPMENT

18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102
PREPARED: 12/28/2020
BY: AIC

SOURCE INFORMATION: KING COUNTY iMAP GIS INTERACTIVE MAPPING TOOL
https://gismaps.kingcounty.gov/imap/

Raedeke Associates, Inc.
2111 N. Northgate Way, Suite 219
Seattle, Washington 98133



LEGEND:

Rivers or Streams
— Open Stream
--- Piped Stream
▨ Wetland

▢ Bothell City Limits
🟦 Local Government
🟥 Public Services
🟪 Public School
🟫 Mobile/Multi-Family

FIGURE 3 - BOTHELL PARCEL MAP
HUSKY VILLAGE REDEVELOPMENT
18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

City of Bothell

Raedeke Associates, Inc.

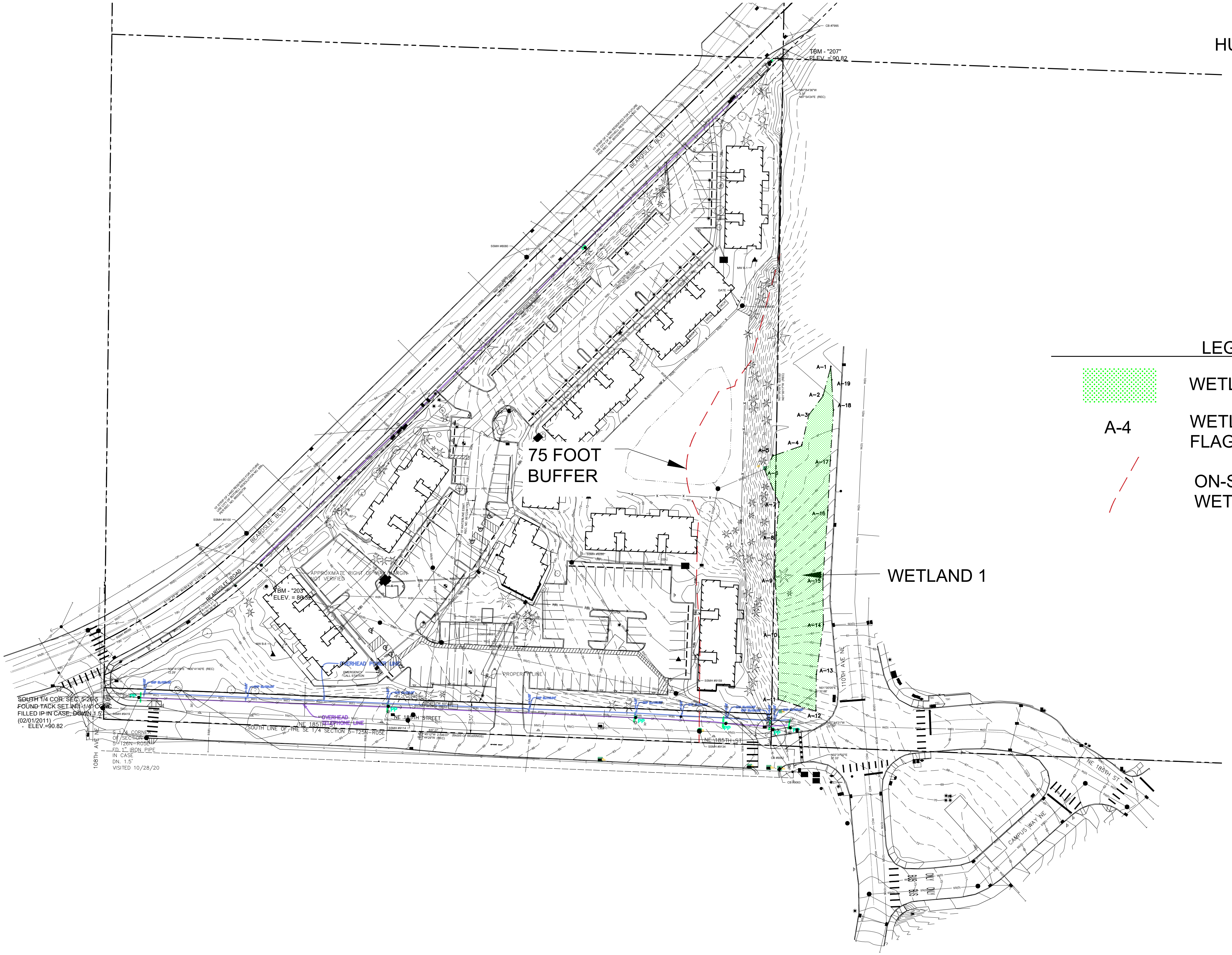
2111 N. Northgate Way, Suite 219
Seattle, Washington 98133

FIGURE 4

HUSKY VILLAGE REDEVELOPMENT PROJECT

PRELIMINARY CRITICAL AREAS REPORT

EXISTING CONDITIONS



LEGEND

🟩	WETLAND 1
A-4	WETLAND ALPHA-# FLAGGING SEQUENCING
/ /	ON-SITE 75-FOOT WETLAND BUFFER

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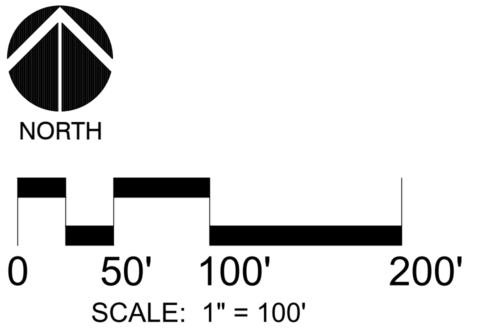


SCALE: 1" = 100'

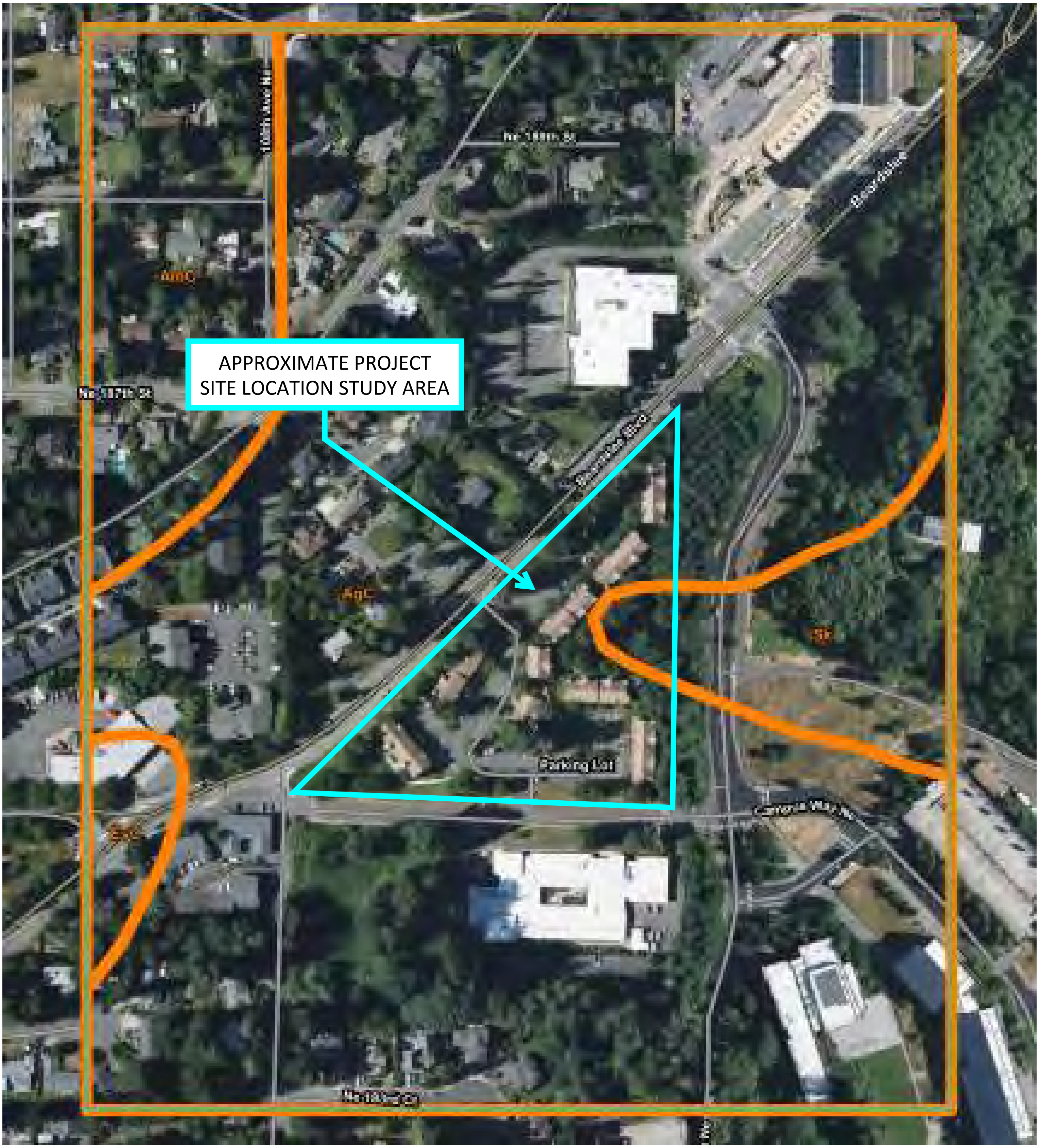
RAI PROJECT: 2016-087

DATE: 12/29/2020

DRAWN BY:AC PM: WH

SOURCE FILE INFO: Wetland base survey file provided by Bush, Roed, and Hitchings, Inc. on 10/23/2020; Existing conditions base file information from Walker Macy on 11/20/2020.

Q:\2016\2016-087 UW Bothell\2016-087 UW Bothell.dwg



Natural Resources
Conservation Service

Map Unit Symbol	Map Unit Name
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes
AmC	Arents, Alderwood material, 6 to 15 percent slopes
EvC	Everett very gravelly sandy loam, 8 to 15 percent slopes
Sk	Seattle muck

SOURCE INFORMATION: NRCS WEB SOIL SURVEY
websoilsurvey.sc.egov.usda.gov

FIGURE 5 - NRCS WSS MAP
HUSKY VILLAGE REDEVELOPMENT
18612 Beardslee Blvd, Bothell, WA 98011
RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

N

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

LEGEND:

Wetlands

- 🟦 Estuarine and Marine Deepwater
- 🟩 Estuarine and Marine Wetland
- 🟩 Freshwater Emergent Wetland
- 🟩 Freshwater Forested/Shrub Wetland
- 🟦 Freshwater Pond
- 🟪 Lake
- 🟫 Other
- 🟦 Riverine

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

FIGURE 6 - USFWS NATIONAL WETLAND INVENTORY MAP

HUSKY VILLAGE REDEVELOPMENT

18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

SOURCE INFORMATION:
https://www.fws.gov/wetlands/data/Mapper.html

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Seattle, Washington 98133**

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, Department of Natural Resources, Forest Practices Division

NATURAL RESOURCES

FIGURE 7 - DNR WATER TYPE MAP
HUSKY VILLAGE REDEVELOPMENT
18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

Map Symbols

- - -	Harvest Boundary	◐	Landing
▪ ▪ ▪	Road Construction	▽	Waste Area
~	Stream	▲	Clumped WRTS/GRTS
▨	RMZ / WMZ Buffers	⌂	Existing Structure
⚒	Rock Pit		

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WASHINGTON DEPARTMENT OF FISH & WILDLIFE

SalmonScape

LEGEND:

— All SalmonScape Species

Other Barriers

▼ Total Blockage

▼ Total Blockage, Fishway Present

▼ Partial Blockage

▼ Partial Blockage, Fishway Present

▼ Unknown Blockage

Dams

■ Total Blockage

FIGURE 8 - SALMONSCAPE MAP

HUSKY VILLAGE REDEVELOPMENT

18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

N

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Washington State Fish Passage

LEGEND:

- Not a barrier
- Partial Fish Passage Blockage
- Total Fish Passage Blockage
- Barrier, Unknown Percent Passable
- Diversion
- Natural Barrier - Verified
- On a Non-Fish Bearing Stream
- Unknown
- Corrected Barriers

FIGURE 9 - WDFW FISH PASSAGE MAP
HUSKY VILLAGE REDEVELOPMENT
18612 Beardslee Blvd, Bothell, WA 98011

RAI PROJECT: 2016-087-102

PREPARED: 12/28/2020
BY: AIC

Raedeke Associates, Inc.
2111 N. Northgate Way, Suite 219
Seattle, Washington 98133

APPENDIX A

Wetland Determination Data Sheets

SOIL

Sampling Point: SP 1

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					Gr S Loam	with fire peds
8-16+	2.5Y 4/2	85	10YR 3/6	15	C	M	Silt Loam	

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

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

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

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ______________

Hydric Soil Present? Yes ☒ No ☐

Remarks: Hydric soil criteria F3 met

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (2 or more required)

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

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): __________

Water Table Present? Yes ☐ No ☒ Depth (inches): __________

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 8

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks: Saturated soil within root zone observed

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

Project/Site: Husky Village City/County: City of Bothell / King Sampling Date: 10/13/2020
Applicant/Owner: University of Washington / EA Engineering Science and Technology State: WA Sampling Point: SP 2
Investigator(s): A. Clark and C. Wright Section, Township, Range: S8, T26N, R5E, W.M.
Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Convex Slope (%): 15
Subregion (LRR): Northwest Forests & Coasts (LRR A) Lat: 47.762057 Long: -122.193475 Datum: Unknown
Soil Map Unit Name: Seattle Muck NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks: Sample Plot 2 is located in an upland area approximately 20FT west of Sample Plot 1. Latitude and longitude are in degrees, approximated from Google Earth.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5 m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Western Arborvitae (Thuja plicata)	60	Y	FAC
2.			
3.			
4.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 3 m)			
1. Himalayan Blackberry (Rubus armeniacus)	40	Y	FAC
2. English Ivy (Hedera helix)	20	Y	FACU
3. Common Morning-Glory (Ipomoea purpurea)	1	N	UPL
4.			
5.			
	61	= Total Cover	
Herb Stratum (Plot size: 1 m)			
1. Lesser Herbrobert (Geranium robertianum)	10	Y	FACU
2. Field Horsetail (Equisetum arvense)	5	Y	FAC
3. Common Dandelion (Taraxacum officinale)	1	N	FACU
4. Pineland Sword Fern (Polytichum munitum)	1	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	17	= Total Cover	
Woody Vine Stratum (Plot size: 3 m)			
1.			
2.			
	0	= Total Cover	
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	105	x 3 = 315
FACU species	32	x 4 = 128
UPL species	1	x 5 = 5
Column Totals:	138 (A)	448 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? **Yes** ☐ **No** ☒

Remarks: Area dominated by FAC and drier species

SOIL

Sampling Point: SP 2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/2	100					Gr S Loam	with cobbles 1-3 IN diameter
1-12+	2.5Y 3/3	100					Gr S Loam	

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

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

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

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ☐ No ☒

Remarks: No indicators of hydric soil observed

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (2 or more required)

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

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): ____________

Water Table Present? Yes ☐ No ☒ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): ____________

Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks: No indicators of hydrology were observed.

APPENDIX B

Washington Department of Ecology 2014 Wetland Rating Forms for Western Washington

Wetland name or number 1

RATING SUMMARY – Western Washington

Name of wetland (or ID #): UW Bothell Husky Village Wetland 1 Date of site visit: 10/13/2020

Rated by A. Clark Trained by Ecology? ✓ Yes ___No Date of training 9/29/16

HGM Class used for rating Slope Wetland has multiple HGM classes?___Y ✓ N

NOTE: Form is not complete without the figures requested *(figures can be combined)*.

Source of base aerial photo/map Google Earth, WDOE

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics___)

1. Category of wetland based on FUNCTIONS

_______**Category I** – Total score = 23 - 27

_______**Category II** – Total score = 20 - 22

✓ **Category III** – Total score = 16 - 19

_______**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
			Circle the appropriate ratings	
Site Potential	H M [✓ L]	H M [✓ L]	H [✓ M] L	
Landscape Potential	H [✓ M] L	H [✓ M] L	H M [✓ L]	
Value	[✓ H] M L	[✓ H] M L	H [✓ M] L	**TOTAL**
Score Based on Ratings	6	6	5	17

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	**CATEGORY**
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	NA

Wetland name or number 1

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

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

Riverine Wetlands

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

Lake Fringe Wetlands

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

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	1
Hydroperiods	H 1.2	1
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	1
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	1
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	3
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	4

Wetland name or number 1

HGM Classification of Wetlands in Western Washington

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

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

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

[✓ NO – go to 2] **YES** – the wetland class is **Tidal Fringe** – go to 1.1

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

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**

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

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

[✓ NO – go to 3] **YES** – The wetland class is **Flats**

If your wetland can be classified as a Flats wetland, use the form for ***Depressional*** *wetlands.*

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

___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;

___At least 30% of the open water area is deeper than 6.6 ft (2 m).

[✓ NO – go to 4] **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

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

✓ The wetland is on a slope (*slope can be very gradual*),

✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,

✓ The water leaves the wetland **without being impounded**.

NO – go to 5 [✓ **YES –** The wetland class is **Slope**]

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

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

____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,

____The overbank flooding occurs at least once every 2 years.

Wetland name or number 1

[✓ NO – go to 6] **YES –** The wetland class is **Riverine**

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

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

[✓ NO – go to 7] **YES –** The wetland class is **Depressional**

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

[✓ NO – go to 8] **YES –** The wetland class is **Depressional**

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

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

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

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

Wetland name or number 1

SLOPE WETLANDS

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

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

Rating of Site Potential If score is:**___12 = H ___6-11 = M _✓_0-5 = L** *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources stormwater Yes = 1 No = 0	1
Total for S 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is:**_✓_1-2 = M ___0 = L** *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	1
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list.* Yes = 1 No = 0	1
S 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the basin in which unit is found.* Yes = 2 No = 0	2
Total for S 3 Add the points in the boxes above	4

Rating of Value If score is:**_✓_2-4 = H ___1 = M ___0 = L** *Record the rating on the first page*

Wetland name or number 1

SLOPE WETLANDS

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

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

S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > $^{1}/_{8}$ in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 All other conditions points = 0	0

Rating of Site Potential If score is: **____1 = M [✓ 0 = L]** *Record the rating on the first page*

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

S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 No = 0	1

Rating of Landscape Potential If score is: **[✓ 1 = M] ____0 = L** *Record the rating on the first page*

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

S 6.1. Distance to the nearest areas downstream that have flooding problems: The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) points = 2 Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	2
S 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for S 6 Add the points in the boxes above	2

Rating of Value If score is: **[✓ 2-4 = H] ____1 = M ____0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number 1

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

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

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

____Aquatic bed
____Emergent
____Scrub-shrub (areas where shrubs have > 30% cover)
✓ Forested (areas where trees have > 30% cover)
If the unit has a Forested class, check if:
✓ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

4 structures or more: points = 4
3 structures: points = 2
2 structures: points = 1
1 structure: points = 0

2

H 1.2. Hydroperiods

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

____Permanently flooded or inundated
✓ Seasonally flooded or inundated
____Occasionally flooded or inundated
____Saturated only
____Permanently flowing stream or river in, or adjacent to, the wetland
✓ Seasonally flowing stream in, or adjacent to, the wetland
____**Lake Fringe wetland** **2 points**
____**Freshwater tidal wetland** **2 points**

4 or more types present: points = 3
3 types present: points = 2
2 types present: points = 1
1 type present: points = 0

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

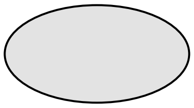
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

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

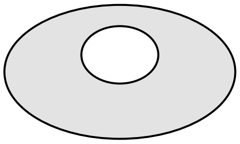
1

H 1.4. Interspersion of habitats

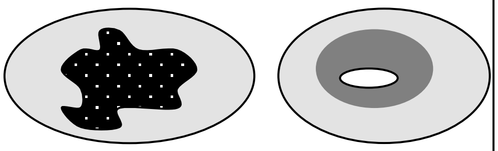
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always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



None = 0 points

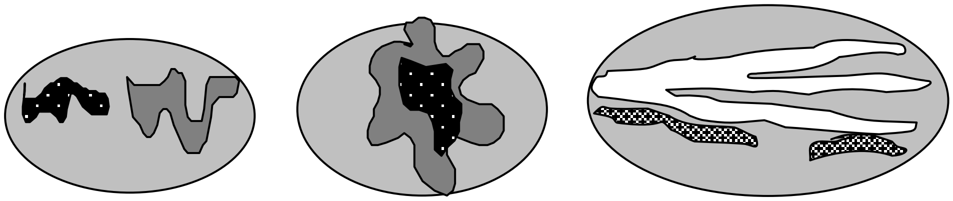


Low = 1 point



Moderate = 2 points

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



1

Wetland name or number 1

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ✓ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ____Standing snags (dbh > 4 in) within the wetland ✓ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	2
Total for H 1 Add the points in the boxes above	7

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

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 0 = 1 % If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat 12 + [(% moderate and low intensity land uses)/2] 1 = 13 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

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

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

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

Wetland name or number 1

WDFW Priority Habitats

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

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

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

✓ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

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

Wetland name or number 1

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

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

SC 3.0 - A field identified bog community is in the middle of the south portion of the wetland. Aerial photo interpretation indicates that there is a bog community fringing the central open water area.

Wetland name or number 1

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). Yes = **Category I** No **= Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* Yes – Go to **SC 5.1** [✓ No = **Not a wetland in a coastal lagoon**] SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^{1}/_{10}$ ac (4350 ft^{2}) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 Yes – Go to **SC 6.1** [✓ No = **not an interdunal wetland for rating**] SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	NA

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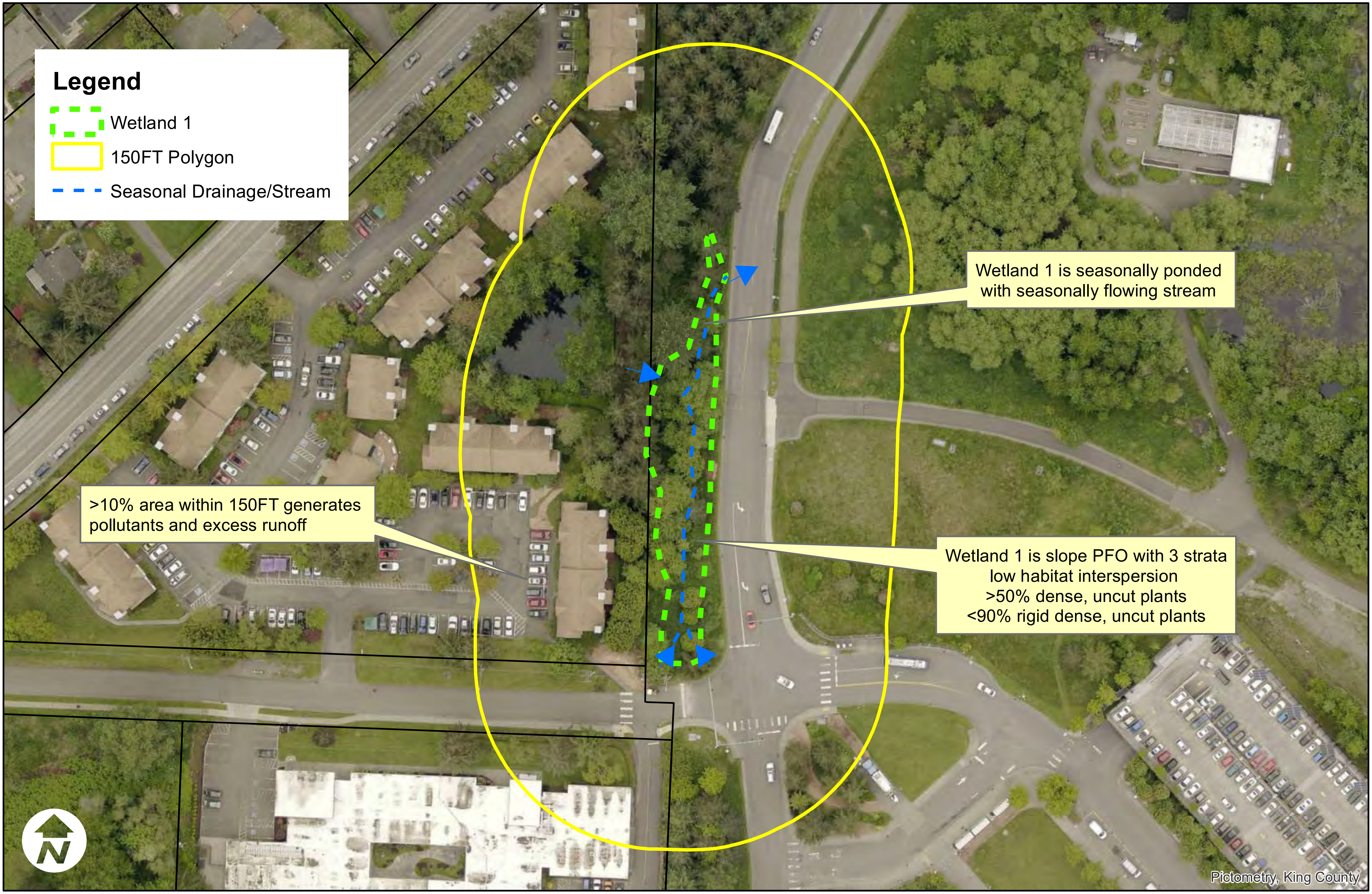

Wetland 1 is seasonally ponded with seasonally flowing stream

>10% area within 150FT generates pollutants and excess runoff

Wetland 1 is slope PFO with 3 strata
low habitat interspersion
>50% dense, uncut plants
<90% rigid dense, uncut plants

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RAI Project #: 2016-087
Date Created: 12/16/2020
Map Created By: A. Clark

Note: Wetland Boundaries are based on GPS coordinates. Boundaries are approximate.

Wetland 1 - Figure 1

Questions: H1.1, 1.2, 1.4
S1.3, 2.1, 4.1, 5.1

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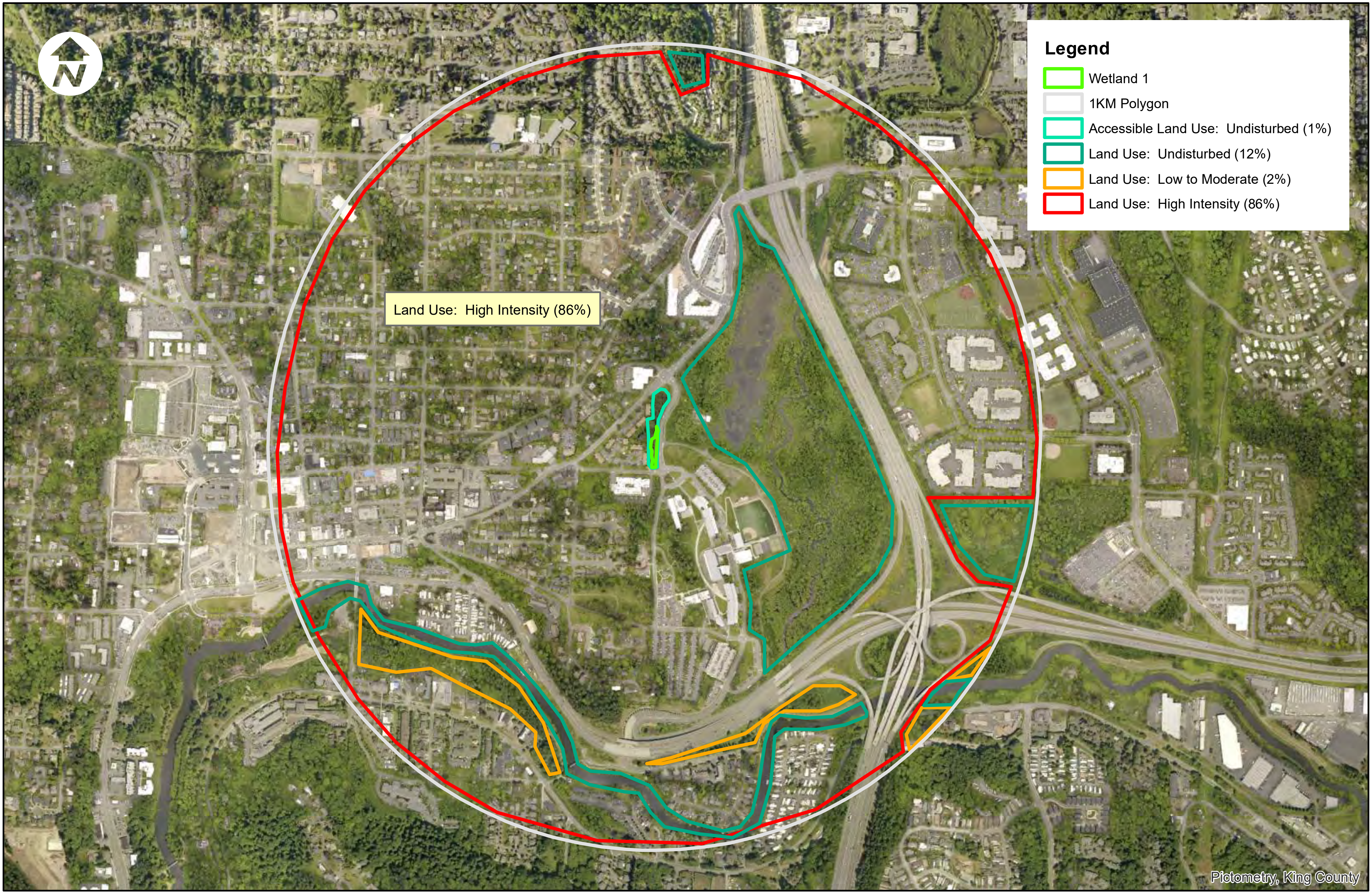
2111 N. Northgate Way, Ste. 219
Seattle, WA 98133
Phone 206-525-8122

Wetland Science
Wildlife Biology
Landscape Architecture



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RAI Project #: 2016-087
Date Created: 12/16/2020
Map Created By: A. Clark

Note: Wetland Boundaries are based on GPS coordinates. Boundaries are approximate.

Wetland 1 - Figure 2

Questions: H2.1, 2.2, 2.3

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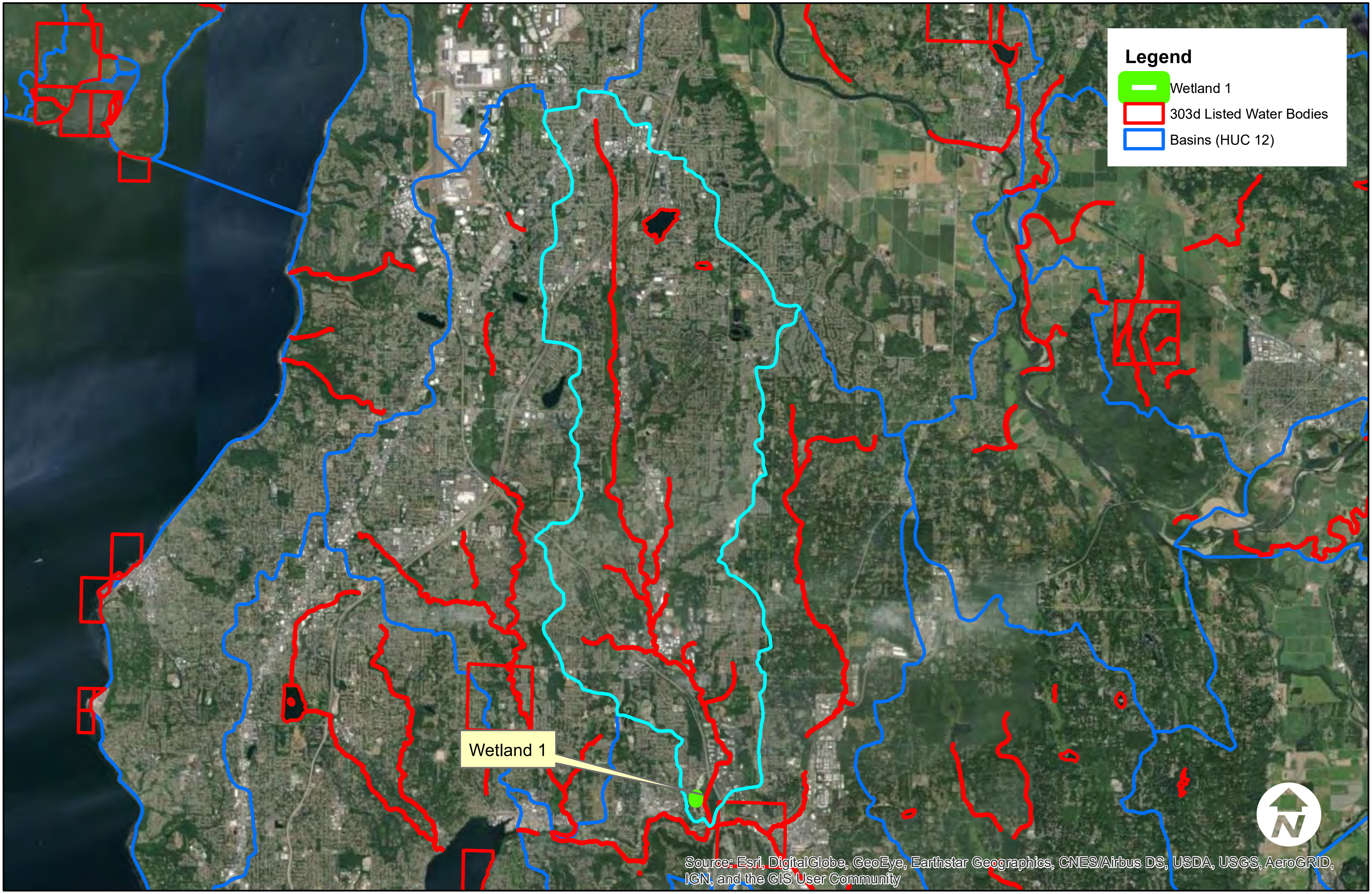
Wetland Science
Wildlife Biology
Landscape Architecture



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

UW Bothell

RAI Project #: 2016-087
Date Created: 12/16/2020
Map Created By: A. Clark

Note: Wetland Boundaries are based on GPS coordinates. Boundaries are approximate.

Wetland 1 - Figure 3

Questions: S3.1 3.2

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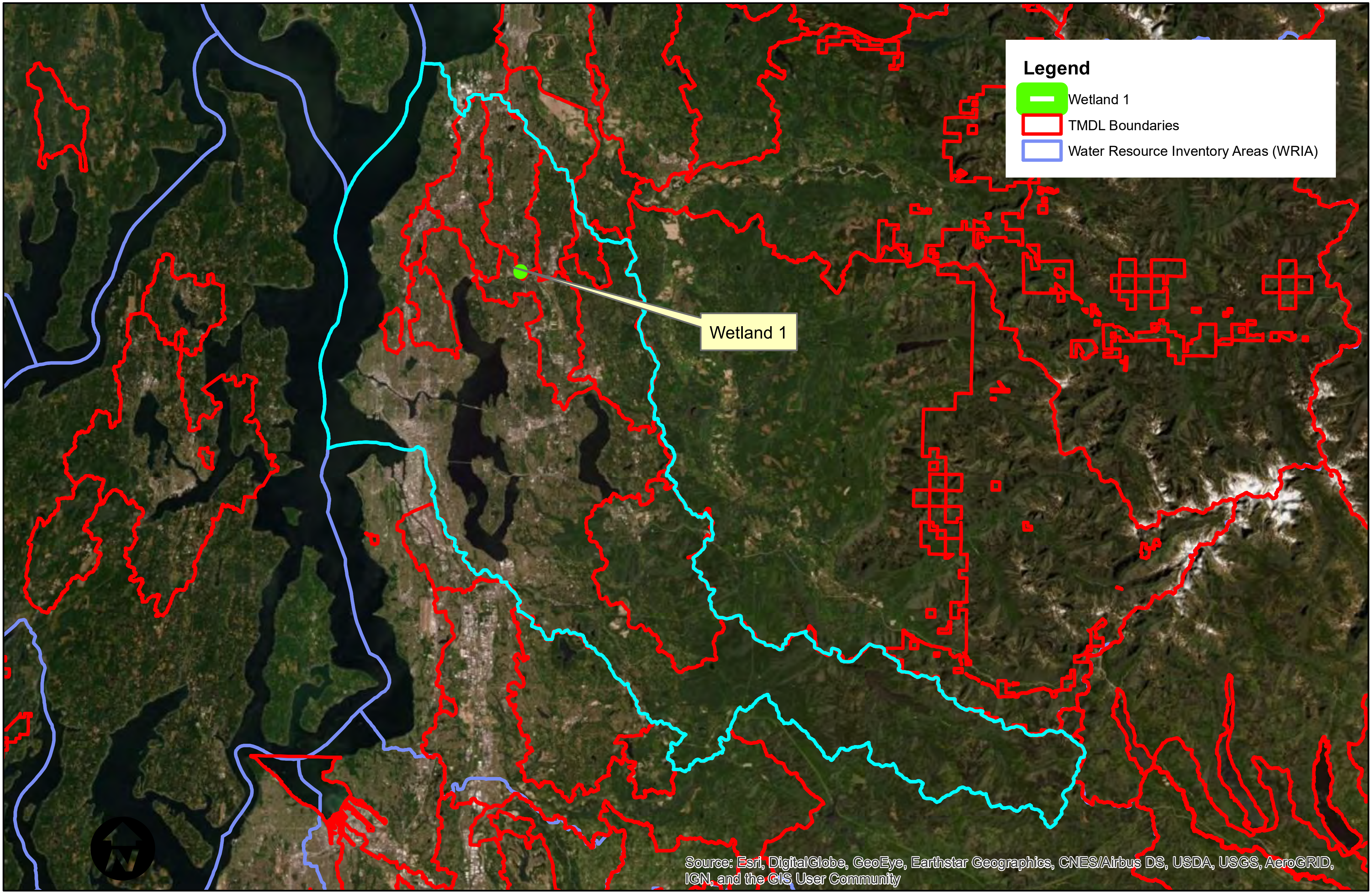

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

UW Bothell

RAI Project #: 2016-087
Date Created: 12/16/2020
Map Created By: A. Clark

Note: Wetland Boundaries are based on GPS coordinates. Boundaries are approximate.

Wetland 1 - Figure 4

Questions: S3.3

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

Project/Site: Husky Village City/County: City of Bothell / King Sampling Date: 10/13/2020

Applicant/Owner: University of Washington / EA Engineering Science and Technology State: WA Sampling Point: SP 1

Investigator(s): A. Clark and C. Wright Section, Township, Range: S8, T26N, R5E, W.M.

Landform (hillslope, terrace, etc.): Sloped drainage way Local relief (concave, convex, none): Convex Slope (%): 2-5

Subregion (LRR): Northwest Forests & Coasts (LRR A) Lat: 47.762057 Long: -122.193475 Datum: Unknown

Soil Map Unit Name: Seattle Muck NWI classification: None

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

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

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

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

Remarks: Sample Plot 1 is located near south end of wetland. Latitude and longitude are in degrees, approximated from Google Earth.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5 m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 3 m)			
1. Himalayan Blackberry (Rubus armeniacus)	20	Y	FAC
2. Common Morning-Glory (Ipomoea purpurea)	5	N	UPL
3. Climbing Nightshade (Solanum dulcamara)	5	N	FAC
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size: 1 m)			
1. Reed Canary Grass (Phalaris arundinacea)	60	Y	FACW
2. Hairy Bittercress (Cardamine hirsuta)	15	N	FACU
3. Lesser Herbrobert (Geranium robertianum)	10	N	FACU
4. Fringed Willowherb (Epilobium ciliatum)	5	N	FACW
5. Garden Bird's-Foot-Trefoil (Lotus corniculatus)	2	N	FAC
6. Pineland Sword Fern (Polytichum munitum)	1	N	FACU
7. Western Lady Fern (Athyrium cyclosorum)	1	N	FAC
8.			
9.			
10.			
11.			
	94 = Total Cover		
Woody Vine Stratum (Plot size: 3 m)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

☐ 1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0[1]
☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
☐ 5 - Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? **Yes** ☒ **No** ☐

Remarks:

APPENDIX C

WDFW Priority Habitats and Species Report

Priority Habitats and Species on the Web

Report Date: 12/28/2020

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Generalized Location
Freshwater Forested/Shrub Wetland	N/A	N/A	No

PHS Species/Habitats Details:

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

Husky Village Redevelopment

SEPA Consistency Memo Appendices

Appendix C

Updated Phase II
Environmental Site Assessment

UW Bothell Husky Village Site
Bothell, Washington

for
Capstone Development Partners

December 9, 2020

GeoEngineers
Earth Science + Technology

Updated Phase II
Environmental Site Assessment

UW Bothell Husky Village Site
Bothell, Washington

for
Capstone Development Partners

December 9, 2020

GeoEngineers

2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

Updated Phase II Environmental Site Assessment

UW Bothell Husky Village Site
Bothell, Washington

File No. 0183-141-01

December 9, 2020

Prepared for:

Capstone Development Partners
720 South Colorado Boulevard, Suite 550 North
Denver, Colorado 80246

Attention: Rick Meserve

Prepared by:

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Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION 1

3.0 SCOPE OF SERVICES 1

4.0 PHASE II ESA 2

4.1. Historical Review 2
4.2. Cleanup Levels 3
4.3. General 3
4.4. Surface Conditions 3
4.5. Subsurface Soil Conditions 4
4.6. Groundwater Conditions 4
4.7. Soil and Sediment Field Screening and Chemical Testing Results, August 2019 4
  4.7.1. Soil Chemical Analytical Results 5
  4.7.2. Sediment Chemical Analytical Results 5
4.8. Soil Field Screening and Chemical Testing Results, August 2020 6
  4.8.1 Soil Chemical Analytical Results 6
4.9. 2019 Groundwater and Surface Water Chemical Testing Results 6
  4.9.1. Groundwater Sampling 6
  4.8.2 Surface Water Sampling 7

5.0 IDW DRUM DISPOSAL 7

6.0 CONCLUSIONS 7

7.0 LIMITATIONS 9

8.0 REFERENCES 9

LIST OF TABLES

Table 1. Soil and Sediment Chemical Analytical Results –Petroleum Hydrocarbons, Metals and cPAHs
Table 2. Groundwater and Surface Water Chemical Analytical Results –Petroleum Hydrocarbons, Metals and cPAHs

LIST OF FIGURES

Figure 1. Vicinity Map
Figure 2. Site Plan and Soil Analytical Results

APPENDICES

Appendix A. Field Procedures and Boring Logs
  Figure A-1 – Key to Exploration Logs
  Figures A-2 through A-16 – Logs of Borings
Appendix B. Chemical Analytical Data
Appendix C. Report Limitations and Guidelines for Use

1.0 INTRODUCTION

This report presents the updated results of the Phase II Environmental Site Assessment (ESA) for the University of Washington's (UW's) Student Housing project at Husky Village (Site) on the UW/Cascadia College co-located campus in Bothell, Washington. The Site is located on the north side of the UW Bothell Campus, where Husky Village currently resides, and is shown relative to surrounding physical features on Figure 1, Vicinity Map. The layout of the Site is shown on Figure 2, Site Plan.

We understand the results of this Phase II ESA will be used by UW and Capstone Development Partners (Capstone) to evaluate environmental conditions associated with redevelopment of the Site, including planning for soil and water disposal during construction. GeoEngineers, Inc.'s (GeoEngineers) environmental services have been completed in general accordance with the scope of services outlined in our Agreement for Professional Services for the University of Washington executed on July 23, 2019 and in our Supplemental Geotechnical and Environmental Services During Design proposal for Capstone executed on August 21, 2020. This updated Phase II ESA was completed concurrently with GeoEngineers' geotechnical engineering study for the project, the results of which are provided in a separate report.

2.0 PROJECT DESCRIPTION

The Husky Village Site is owned by UW and is currently occupied by eight, three-story wood-frame apartment buildings used for student housing and an associated community center building. A stormwater detention pond lies in the east-central area of the Site between three of the apartment buildings. The site slopes down from west to east.

We understand that the project will include construction of multi-story student housing buildings and supporting infrastructure, including underground utilities, hardscape and landscape elements. We anticipate that the housing buildings will either step up the site to the west or will be cut into the slope. We anticipate that cuts may range up to 15 feet below existing site grades.

UW and Capstone are interested in evaluating environmental soil and groundwater conditions at the Site as part of construction planning.

3.0 SCOPE OF SERVICES

The purpose of this updated Phase II ESA is to review environmental documents and evaluate the potential presence of contaminated soil, groundwater, sediment and surface water at the Site by submitting samples for chemical testing. The following scope of services is based on our experience at similar sites, and discussions with UW staff:

1. Conduct a review of readily available geotechnical and environmental reports obtained from UW and Capstone pertaining to environmental conditions on and adjacent to Husky Village. The review is intended to evaluate historical land uses that may have resulted in the presence of soil and groundwater contamination at the Site.

2. Monitor drilling activities at each of the 15 hollow-stem auger (HSA) geotechnical boring locations, completed in August 2019 and August 2020, five of which were completed as groundwater monitoring wells. Complete the borings to depths ranging from 21 to 51 feet below existing ground surface (bgs).
3. Obtain soil samples at 2.5-foot intervals from the upper 10 to 15 feet in the borings, then at 5-foot intervals below 15 feet in deep borings. Field screen soil samples (emphasis on fill soils) from each 2019 boring and selected 2020 borings for evidence of contamination using visual, water sheen and headspace vapor using a photoionization detector (PID).
4. Based on field screening results, submit one or more soil samples from five representative borings for chemical analysis of the following: petroleum hydrocarbon identification by method Northwest Total Petroleum Hydrocarbon – hydrocarbon identification (NWTPH-HCID) and metals; or diesel- and oil-range petroleum hydrocarbons by method Northwest Method NWTPH-Dx. Where hydrocarbons are detected by the HCID analysis, complete follow up analyses to quantify concentrations of the detected petroleum. The soil testing focused on fill soil that will be excavated during construction.
5. Collect two sediment samples from the edge of the stormwater detention pond (above the geomembrane lining) using manual equipment. Collect one surface water sample from the detention pond. Evaluate the shallow sediment (upper 0.5 foot) and pond water by chemical analysis of gasoline-, diesel- and oil-range petroleum; carcinogenic polycyclic aromatic hydrocarbons (cPAHs); and metals.
6. Collect a groundwater sample from the well completed closest to the stormwater detention pond for the geotechnical study. Submit the sample for chemical analysis of gasoline-, diesel- and oil-range petroleum.
7. Evaluate the soil, pond sediment, groundwater and surface water chemical analytical results relative to Model Toxics Control Act (MTCA) Method A cleanup levels and landfill disposal criteria.
8. Coordinate and subcontract disposal of the drummed soil cuttings and decontamination water generated during the drilling activities at Cadman’s Everett, Washington facility (a UW-approved disposal facility).

4.0 PHASE II ESA

4.1. Historical Review

Phase I ESA reports pertaining to the Site (Hart Crowser 2011 and 2020) were obtained from UW and Capstone for review. The Phase I ESAs found no evidence of recognized environmental conditions (RECs), including the presence of current or historic underground storage tanks, in connection with the Site. The current Site structures have been in use as apartment buildings-community center since 1986 and have reportedly always used electric heating. According to the Phase I ESAs, a previous structure on the Site was heated by a wood stove. In their 2020 report, Hart Crowser noted GeoEngineers’ discovery in 2019 of low concentrations of heavy oil-range total petroleum hydrocarbons and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) discussed in Section 4.7 of this report; Hart Crowser described these conditions as non-REC “Additional Conditions of Interest.” The 2011 report concluded that “current and past use of the subject property presents a low potential for significant environmental impacts to the subject property”; the 2020 report stated that the “assessment revealed no evidence of RECs in connection with the Property.”

4.2. Cleanup Levels

Potential contaminants of concern (COCs) at the Site are gasoline-, diesel- and oil-range petroleum hydrocarbons, PAHs and metals. MTCA Method A cleanup levels for unrestricted land use were selected for soil and groundwater data evaluation purposes in this study. MTCA Method B cleanup levels were used for selected metals when a Method A cleanup level was not available. Cleanup levels for the potential COCs are shown in Table 1, Soil and Sediment Chemical Analytical Results, Petroleum Hydrocarbons, Metals and cPAHs and Table 2, Groundwater and Surface Water Chemical Analytical Results, Petroleum Hydrocarbons, Metals and CPAHs.

4.3. General

Nine borings were completed with HSA drilling equipment on August 12 through 14, 2019, to evaluate soil and groundwater conditions at the Site. Seven of the borings (B-2 and B-4 through B-9) were drilled to depths ranging from approximately 26 to 31 feet bgs. Boring B-1 was drilled to 42 feet bgs; boring B-3 was advanced to a depth of 51 feet bgs in the east-central portion of the Site, downgradient (east) of the stormwater detention pond. Monitoring wells were installed in borings B-1, B-3, B-5, B-7 and B-9 to depths of 22 to 40 feet bgs to evaluate groundwater conditions. The purpose of the explorations was to evaluate subsurface conditions from a geotechnical design and environmental assessment standpoint. A representative of GeoEngineers observed and documented subsurface conditions in the borings and obtained soil samples for field screening and chemical analysis.

An additional six borings were completed with HSA drilling equipment on August 27 through 28, 2020, to further evaluate soil conditions at the Site from a geotechnical design and environmental assessment standpoint. Boring B-10 was drilled to 31.5 feet bgs; borings B-11 through B-15 were each advanced to depths of approximately 21 feet bgs. Borings B-11 and B-12, located at the south and north edges of the detention pond, respectively- were selected to further evaluate environmental conditions in soil in the vicinity of the pond. B-11 and B-12 are located approximately 80 feet southwest and northwest of 2019 boring B-3 that had petroleum detections in shallow soil. A representative of GeoEngineers observed and documented subsurface conditions in the borings and obtained soil samples from borings B-11 and B-12 for field screening and chemical analysis.

The approximate locations of the borings, detention pond and planned building locations are shown on Figure 2. Field procedures and boring logs are presented in Appendix A, Field Procedures and Boring Logs.

4.4. Surface Conditions

The Husky Village project Site is located on the north side of the UW Bothell campus along the south side of Beardslee Boulevard. Eight existing apartment buildings and a community center are located on the property with associated lawn and asphalt pavement parking areas between the buildings. The ground surface in the project area is relatively flat on the west and central portions of the Site, but drops off on the east side along 110th Avenue NE. The ground surface slopes down from approximately Elevation 87 feet at the southwest corner of the Site to about Elevation 50 feet at the base of the slope on the east side of the Site, adjacent to 110th Avenue NE. Most of the elevation change occurs at the approximately 15- to 20-foot-high slope along the east side of the Site. Vegetation generally consists of tall grass, shrubs and large conifer and deciduous trees. A 6- to 8-foot-high rockery is present along the east side of Aspen Hall in the northeast corner of the Site. A small geomembrane-lined stormwater detention pond is located at the top of the slope in the east-central portion of the Site. Numerous underground utilities associated with the existing apartments and campus development are located around the Site.

4.5. Subsurface Soil Conditions

Several soil units were encountered in the explorations including asphalt pavement and base course, topsoil, fill, weathered and unweathered glacial till, and glaciolacustrine deposits. Observed subsurface soil conditions are summarized below.

Topsoil: Topsoil was observed in all of the borings completed in the grass and forested areas and generally consisted of loose dark brown sandy silt and silty sand, typically ranging from 2 to 4 inches thick. A geosynthetic liner was observed beneath the topsoil in boring B-3 on the east side of the stormwater pond. We understand the geosynthetic liner underlies the pond and surrounding ground surface.

Fill: Fill was encountered in all of the borings completed except for borings B-6 through B-8, B-12 and B-14. Fill generally consisted of loose to medium dense silty sand with varying amounts of gravel and organic matter. Oxidation staining was present in many of the fill samples. Silty gravel and sandy silt also were observed within the fill material in borings B-1, B-4 and B-3, B-5 and B-9, respectively. Fill at the Site was encountered from ground surface to depths of approximately 6 to 12 feet bgs.

Glacial Till: Glacial till was observed below the fill and topsoil in B-1, B-2, B-4, B-6 and B-8. The glacial till generally consisted of dense to very dense silty sand with varying amounts of gravel. Weathered glacial till was observed in borings B-6, B-12 and B-14 directly beneath the ground surface. The glacial till ranged from 6 to 17 feet thick.

Alluvium: Alluvium associated with the wetland and creek to the east of the Site was encountered in borings B-3, B-11 and B-15. The alluvium consisted of soft, horizontally bedded silt with sand, indicating that the material was deposited in slow moving water. The alluvium was encountered beneath 12 to 13 feet of fill that makes up the hillside-slope along the east side of the Site.

Glaciolacustrine Deposits: Glaciolacustrine deposits generally consist of stiff to hard gray silt/clay and were observed to the depths explored in all of the borings. The glaciolacustrine deposits were observed as shallow as directly beneath the ground surface in the southwest corner of the Site, and up to 23 feet bgs in the northeast portion of the Site.

4.6. Groundwater Conditions

The groundwater table was not encountered at the time of drilling in any of the borings completed at the Site. Perched groundwater was encountered above and within permeable layers of the glacially consolidated soils in many of the borings. Groundwater monitoring wells were installed in borings B-1, B-3, B-5, B-7 and B-9 to evaluate groundwater conditions. Groundwater was observed in B-1 and B-9, 2 days after wells had been installed, indicating that the glaciolacustrine soils are saturated. Depths to groundwater on September 9, 2019, ranged from 18 to 28 feet bgs in B-1 and B-3, and 5 to 9 feet bgs in B-5, B-7 and B-9.

4.7. Soil and Sediment Field Screening and Chemical Testing Results, August 2019

Discrete soil samples from the borings completed in August 2019 were screened in the field for evidence of petroleum contamination using visual, water sheen and headspace vapor screening methods. Field screening methods are described in Appendix A.

Discrete soil samples were obtained at 2.5- to 5-foot-depth intervals in the borings for field screening and possible chemical analysis. Field screening evidence of petroleum contamination (odor, moderate to heavy sheens, and/or elevated headspace vapor readings) was not observed in samples from the borings except for the 2.5- and 5.0-foot soil samples in B-3. Moderately elevated vapor readings of 52 and 38 parts per million (ppm), respectively, were measured in those samples. No odors or significant sheens were noted in any soil samples.

Two surface sediment samples were collected from the edge of the stormwater detention pond; one sample near the inlet to the pond, the other near the pond outlet. Field screening conducted for the sediment samples noted no significant PID readings, odors or sheens in either sample.

Field screening results are shown on the boring logs and in Table 1.

4.7.1. Soil Chemical Analytical Results

Six soil samples were selected from three of the nine borings (B-2, B-3 and B-6) as soil representative of Site conditions. The samples were submitted for chemical analysis of gasoline-, diesel- and oil-range petroleum and metals to evaluate potential contamination at the Site. Chemical analytical results for the soil samples are discussed in this section and summarized in Table 1 and Figure 2. A copy of the laboratory reports is provided in Appendix B.

4.7.1.1. Petroleum Hydrocarbons

Low levels of heavy oil-range petroleum were detected in three soil samples from boring B-3 at depths of 2.5 feet (150 milligrams per kilogram [mg/kg]), 5.0 feet (210 mg/kg) and 7.5 feet bgs (76 mg/kg). These concentrations of oil-range petroleum are well below the MTCA Method A cleanup level of 2,000 mg/kg. Petroleum was not detected in the B-3 soil sample from 15.0 feet bgs, indicating that oil-impacted soil is limited to fill approximately 0 to 8 feet bgs in the vicinity of boring B-3 (east-central portion of the Site). Oil-range petroleum was not detected in soil samples from borings B-2 and B-6. The source of the low level oil-range detections is not known but may be related to imported fill.

Gasoline- and diesel-range petroleum were not detected in any of the samples.

4.7.1.2. Metals

MTCA metals (arsenic, cadmium, chromium, lead and mercury) were not detected or were detected at low concentrations in the six soil samples that were analyzed for metals. The concentrations of detected metals were less than or similar to typical Puget Sound soil “background” concentrations. Additional metals (barium, selenium and silver) were analyzed for the 2.5-foot sample from B-3 for the purpose of waste disposal profiling; these results were either well below the MTCA Method B cleanup level (barium) or not detected (selenium and silver).

4.7.2. Sediment Chemical Analytical Results

The two surface sediment samples collected from the edge of the stormwater detention pond were submitted for chemical analysis of gasoline-, diesel- and oil-range petroleum, cPAHs, and metals. Chemical analytical results for the sediment samples are discussed in this section and summarized in Table 1. A copy of the laboratory reports is provided in Appendix B.

4.7.2.1. Petroleum Hydrocarbons

Gasoline-, diesel- and oil-range petroleum were not detected in either of the sediment samples.

4.7.2.2. Carcinogenic PAHs

cPAHs were detected in surface sediment sample SED-1, collected near the inlet of the detention pond, at a concentration (0.029 mg/kg) less than the MTCA Method A cleanup level (0.1 mg/kg). The sediment sample collected near the pond outlet, SED-2, was non-detect for cPAHs. The low-level detections of cPAHs in SED-1 are likely related to contaminants in runoff from the surrounding apartment building parking lots.

4.7.2.3. Metals

MTCA metals were not detected or were detected at low concentrations in the two sediment samples. The concentrations of detected metals were less than or similar to typical Puget Sound soil background concentrations.

4.8. Soil Field Screening and Chemical Testing Results, August 2020

Discrete soil samples from August 2020 borings B-11 and B-12 were screened in the field for evidence of petroleum contamination using visual, water sheen and headspace vapor screening methods. Field screening methods are described in Appendix A.

Discrete soil samples were obtained at 2.5- to 5-foot-depth intervals in the B-11 and B-12 for field screening and possible chemical analysis. Field screening evidence of petroleum contamination (odor, moderate to heavy sheens, and/or elevated headspace vapor readings) was not observed in samples from the borings. No odors or significant sheens were noted in any soil samples. Field screening results are shown on the boring logs and in Table 1.

4.8.1 Soil Chemical Analytical Results

Four soil samples were selected from borings B-11 and B-12 as soil representative of Site conditions and close to boring B-3 that had low level petroleum detections in soil in 2019. The samples were submitted for chemical analysis of diesel- and oil-range petroleum to further evaluate potential contamination at the Site. Chemical analytical results for the soil samples are discussed in this section and summarized in Table 1 and Figure 2. A copy of the laboratory report is provided in Appendix B.

Low levels of heavy oil-range petroleum were detected in the two soil samples from boring B-11 at depths of 2.5 feet (64 mg/kg) and 7.5 feet bgs (95 mg/kg), and in the two soil samples from boring B-12 at depths of 2.5 feet (98 mg/kg) and 7.5 feet bgs (72 mg/kg). These concentrations of oil-range petroleum are below the MTCA Method A cleanup level of 2,000 mg/kg. As with boring B-3, the source of the low concentrations of oil-range petroleum is not known but may be related to imported fill.

4.9. 2019 Groundwater and Surface Water Chemical Testing Results

4.9.1. Groundwater Sampling

One groundwater sample (GEI-3) was collected on August 19, 2019 from the monitoring well installed in boring B-3. Well B-3 is located east of the stormwater detention pond near 110th Avenue NE. The sample was analyzed to evaluate groundwater quality at the Site. The sample was analyzed for gasoline-, diesel- and oil-range petroleum. Chemical analytical results are discussed in this section and summarized in Table 2. A copy of the laboratory report is provided in Appendix B.

4.8.1.1 Petroleum Hydrocarbons

Gasoline-, diesel- and oil-range petroleum were not detected in the groundwater sample collected from well B-3.

4.8.2 Surface Water Sampling

One surface water sample was collected from the stormwater detention pond on August 19, 2019. The sample was analyzed to evaluate potential contaminants in surface runoff collected from the Site. The sample was analyzed for gasoline-, diesel- and oil-range petroleum; metals; and cPAHs. Chemical analytical results are discussed in this section and summarized in Table 2. A copy of the laboratory report is provided in Appendix B.

4.8.2.1 Petroleum Hydrocarbons

Gasoline-, diesel- and oil-range petroleum were not detected in the surface water sample collected from the stormwater detention pond.

4.8.2.2 Carcinogenic PAHs

cPAHs were not detected in the surface water sample collected from the stormwater detention pond.

4.8.2.3 Metals

Total and dissolved metals (arsenic, cadmium, chromium, lead and mercury) were not detected in the surface water sample collected from the stormwater detention pond.

5.0 IDW DRUM DISPOSAL

GeoEngineers subcontracted and coordinated disposal of the drummed soil cuttings and decontamination water generated during the drilling activities at the Site. Soil generated during August 2019 drilling was drummed and removed from the Site and disposed at Cadman's Everett, Washington facility (a UW-approved disposal facility) on September 19, 2019. Soil generated during August 2020 drilling is currently pending removal.

6.0 CONCLUSIONS

GeoEngineers completed a Phase II ESA in 2019 and 2020 at the Husky Village Student Housing Site on the UW/Cascadia College co-located campus in Bothell, Washington. The primary purpose of the Phase II ESA was to identify historic land use and evaluate environmental soil, groundwater, sediment and surface water conditions at the Site. The following conclusions are based on review of Phase I ESA reports, observations of subsurface conditions during drilling, and the results of chemical analyses for soil, sediment, groundwater and surface water samples collected at the Site.

- Phase I ESA reports conducted in 2011 and 2020 for the Site found no evidence of RECs, including the presence of current or historic underground storage tanks, on-adjacent to the Site. The current Site structures have been in use as apartment buildings-community center since 1986, and reportedly have always used electric heating. A previous structure on the Site was heated by a wood stove.
- Environmental soil conditions were evaluated by obtaining soil samples from geotechnical borings completed across the Site for field screening and chemical analysis. Soil samples from five borings were collected from depths of 2.5 to 15 feet bgs and submitted for chemical testing with a focus on shallow fill soil. Based on field screening results and chemical analytical data, much of the soil excavated during construction at the Site can be handled-disposed as "clean" (unregulated) material. Shallow petroleum-impacted soil was identified in three borings. Key findings are as follows:

  - Oil-range petroleum was detected at concentrations well below the MTCA Method A cleanup level in the 2.5-foot, 5-foot and 7.5-foot samples from boring B-3 located east of the stormwater detention pond near 110th Avenue NE, and in the 2.5-foot and 7.5-foot samples from borings B-11 and B-12 located south and north of the detention pond, respectively. Oil-range petroleum was not detected in the soil sample from 15 feet bgs from boring B-3. Oil-range petroleum-impacted soil appears to be limited to approximately the upper 8 feet at these locations adjacent to the detention pond. A possible source of the oil-range petroleum in this area is imported fill. Oil-range petroleum was not detected in shallow fill samples from borings B-2 (north end of Site) and B-6 (south-central area of Site). Gasoline- and diesel-range petroleum were not detected in any of the samples.
  - Metals (chromium, lead) were detected in soil samples from the three borings at low levels. The concentrations of these metals were within the range of Puget Sound “background” soil concentrations and do not represent an environmental concern. Arsenic, cadmium and mercury were not detected in the soil samples.
- Shallow sediment conditions at the stormwater detention pond were evaluated by testing samples from two locations at the edge of the pond (near pond inlet and outlet). Key findings are as follows:
  - Gasoline-, diesel- and oil-range petroleum were not detected in the pond sediment samples.
  - cPAHs were detected in surface sediment sample SED-1, near the inlet of the detention pond, at concentrations less than the MTCA Method A cleanup level. The sediment sample collected near the pond outlet, SED-2, was non-detect for cPAHs. The low-level detections of cPAHs in SED-1 are likely related to contaminants in runoff from the surrounding apartment building parking lots.
  - Metals (chromium and lead) were detected in both sediment samples at low levels within the range of Puget Sound “background” soil concentrations. These metals detections do not represent an environmental concern. Arsenic, cadmium and mercury were not detected in the sediment samples.
- Petroleum- and cPAH-impacted soil-sediment removed from the Site during construction will need to be disposed at a UW-approved landfill such as Cadman or Waste Management under a soil waste profile signed by UW EH&S staff. The low-level soil identified at borings B-3, B-11 and B-12, and at the pond inlet locations classifies as Cadman Class 2. Additional sampling to better define the lateral extent of the low-level petroleum contamination is recommended in areas where construction excavation plans call for removing soil-sediment from the vicinity of the detention pond (including Building C and D). If evidence of “hot spot” soil contamination (staining, odor, etc.) is observed during construction excavation in areas that were not explored during this study, we recommend testing to evaluate the suspect soil for contamination prior to disposal.
- The petroleum detected in borings B-3, B-11 and B-12, and cPAHs detected in the pond inlet sediment sample are present at relatively low levels. Because the contaminant levels in these samples are less than MTCA Method A cleanup levels, the Site does not need to be reported to Washington State Department of Ecology.
- A groundwater sample was collected from monitoring well B-3 for chemical analysis of petroleum. Gasoline-, diesel- and oil-range petroleum were not detected in the groundwater sample from B-3.
- A surface water sample was collected from the stormwater detention pond for chemical analysis; contaminants of concern were not detected in the sample.

7.0 LIMITATIONS

We have prepared this report for the exclusive use of Capstone Development Partners and their authorized agents to evaluate environmental conditions at the UW Bothell Husky Village site in Bothell, Washington. This report is not intended for use by others, and the information contained herein is not applicable to other sites. The updated Phase II ESA described in this report was completed in general accordance with the Agreement for Professional Services for the University of Washington executed on July 23, 2019 and in our Supplemental Geotechnical and Environmental Services proposal to Capstone Development Partners that was executed on August 21, 2020. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

8.0 REFERENCES

Hart Crowser. 2011. Phase I Environmental Site Assessment (Phase I), Beardslee Cove Apartments, Bothell, WA 98011, dated January 12, 2011.

Hart Crowser. 2020. Draft Phase I Environmental Site Assessment, Husky Village Property, 18632 Beardslee Boulevard, Bothell, Washington, dated December 3, 2020.

Table 1

Soil and Sediment Chemical Analytical Results

Petroleum Hydrocarbons, Metals and cPAHs

University of Washington Husky Village Site

Bothell, Washington

Exploration ID[1]	Sample Identification	Sample Depth (feet bgs)	Sample Date	Field Screening[2]		Petroleum Hydrocarbons[3]			Total Metals[4]								Calculated TEQ[5] for cPAHs[6]
				Sheen	Headspace Vapor (ppm)	Gasoline Range	Diesel Range	Heavy Oil Range	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
Hollow Stem Auger Borings, August 2019																	
B-2	B-2-2.5	2.5	8/13/2019	NS	< 1	< 23	< 57	< 110	< 11	--	< 0.57	**45**	< 5.7	< 0.28	--	--	--
B-3	B-3-2.5	2.5	8/14/2019	NS	52	< 22	< 28[7]	**150**[7]	< 11	**84**	< 0.56	**30**	**17**	< 0.28	< 11	< 1.1	--
	B-3-5.0	5.0	8/14/2019	NS	38	< 23	< 28[7]	**210**[7]	< 11	--	< 0.56	**27**	**14**	< 0.28	--	--	--
	B-3-7.5	7.5	8/14/2019	NS	< 1	< 24	< 30[7]	**76**[7]	< 12	--	< 0.60	**30**	**11**	< 0.30	--	--	--
	B-3-15.0	15.0	8/14/2019	NS	2	< 25	< 63	< 130	--	--	--	--	--	--	--	--	--
B-6	B-6-2.5	2.5	8/13/2019	NS	< 1	< 23	< 57	< 120	< 11	--	< 0.57	**28**	< 5.7	< 0.29	--	--	--
Hollow Stem Auger Borings, August 2020																	
B-11	B-11-2.5	2.5	8/27/2020	NS	< 1	--	< 27[7]	**64**[7]	--	--	--	--	--	--	--	--	--
	B-11-7.5	7.5	8/27/2020	NS	< 1	--	< 30[7]	**95**[7]	--	**--**	**--**	**--**	**--**	**--**	**--**	--	--
B-12	B-12-2.5	2.5	8/27/2020	NS	< 1	--	< 26[7]	**98**[7]	--	--	--	--	--	--	--	--	--
	B-12-7.5	7.5	8/27/2020	NS	< 1	--	< 29[7]	**72**[7]	--	--	--	--	--	--	--	--	--
Sediment Grab Samples, August 2019																	
SED-1	POND SED-1	0.5	8/19/2019	NS	< 1	< 5.6[7]	< 31[7]	< 62[7]	< 12	--	< 0.62	**28**	**12**	< 0.31	--	--	**0.029**
SED-2	POND SED-2	0.5	8/19/2019	NS	< 1	< 7.7[7]	< 37[7]	< 75[7]	< 15	--	< 0.75	**29**	**16**	< 0.37	--	--	ND
MTCA Method A Cleanup Level for Unrestricted Land Use						100[8]	2,000	2,000	20	16,000[9]	2	2,000[10]	250	2	400[9]	400[9]	0.1
Puget Sound Background Concentration[11]									7	NA	1	48	24	0.07	NA	NA	

Notes:

[1] Approximate exploration locations are shown in Figure 2.

[2] Field screening methods are described in Appendix A.

[3] Petroleum hydrocarbon identification screening analyzed by Northwest Method NWTPH-HCID, except as noted below.

[4] Total metals analyzed by U.S. Environmental Protection Agency (EPA) 6020/7471.

[5] Total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) calculated using the toxicity equivalency (TEQ) methodology specified in Washington Administrative Code (WAC) 173-340-780(8). cPAHs that were not detected were assigned half the value of the detection limit for these calculations.

[6] PAHs analyzed by EPA Method 8270 SIM. Only TEQs for cPAHs are shown; refer to laboratory reports in Appendix B for complete list of method analytes and detection limits.

[7] Gasoline-range hydrocarbons analyzed by Northwest Method NWTPH-Gx; diesel- and heavy oil-range hydrocarbons analyzed by Northwest Method NWTPH-Dx.

[8] Cleanup level when no detectable benzene in soil.

[9] Model Toxics Cleanup Act (MTCA) Method B cleanup level for direct contact derived from Ecology's "CLARC Master Spreadsheet.xlsx" interim update May 2019.

[10] Cleanup level for Chromium III.

[11] Naturally occurring background soil metal concentration in Puget Sound region (Department of Ecology, 1994).

< = analyte not detected at a concentration greater than the indicated detection limit

-- = not analyzed

bgs = below ground surface

mg/kg = milligrams per kilogram

MTCA = Model Toxics Control Act

NA = Not applicable.

ND = Individual cPAHs were not detected.

NS = No sheen

ppm = parts per million

Bolded value indicates analyte was detected at the listed concentration.

Chemical analytical testing by OnSite Environmental, Inc. in Redmond, Washington. Laboratory analytical reports in Appendix B.

Table 2

Groundwater and Surface Water Chemical Analytical Results

Petroleum Hydrocarbons, Metals and cPAHs

University of Washington Husky Village Site

Bothell, Washington

Sample Location[1]	Sample ID	Depth to Groundwater (from TOC)	Petroleum Hydrocarbons (µg/L)			Total and Dissolved Metals[4] (µg/L)					cPAHs[5] (µg/L)
			Gasoline Range[2]	Diesel Range[3]	Heavy Oil Range[3]	Arsenic	Cadmium	Chromium	Lead	Mercury	
Sampled August 19, 2019											
Well B-3	GEI-3-08192019	17.8	< 100	< 250	< 410	--	--	--	--	--	--
Pond	Pond Water-08192019	NA	< 100	< 250	< 410	< 3.3	< 4.4	< 11	< 1.1	< 0.50	ND
MTCA Method A Cleanup Level Protective of Drinking Water			800/1,000[6]	500	500	5	5	100[7]	15	2	0.1

Notes:

[1] Monitoring well and detention pond locations shown on Figure 2.

[2] Gasoline-range hydrocarbons analyzed by Northwest Method NWTPH-Gx.

[3] Diesel- and heavy oil-range hydrocarbons analyzed by Northwest Method NWTPH-Dx.

[4] Total and dissolved metals analyzed by U.S. Environmental Protection Agency (EPA) 200.8/7470A. Reporting limits shown for total metals (similar reporting limits for dissolved metals)

[5] Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) analyzed by EPA Method 8270 SIM. Refer to laboratory report for individual analytes and detection limits.

[6] When benzene is present, the gasoline range cleanup level is 800 µg/L; when benzene is not present the gasoline range cleanup level is 1,000 µg/L.

[7] Cleanup level for Chromium III.

< = analyte not detected at a concentration greater than the indicated detection limit

-- = not analyzed

µg/L = micrograms per liter

NA = Not applicable.

ND = Not Detected

TOC = top of casing

Bolding indicates analyte was detected.

Chemical analytical testing by OnSite Environmental, Inc. in Redmond, Washington. Laboratory analytical reports in Appendix B.

FIGURES

GeoEngineers

P:\0\0183141\GIS\MXD\018314100_F01_VicinityMap.mxd Date Exported: 09/13/19 by ccabrera

Vicinity Map

Husky Village
Bothell, Washington

GEOENGINEERS

Figure 1

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

Legend

B-12 ◎ Boring by GeoEngineers, Inc., 2020

B-1 ● Boring with Monitoring Well by GeoEngineers, Inc., 2019

B-2 ◆ Boring by GeoEngineers, Inc., 2019

B-11 ⊕ Boring by GeoEngineers, Inc., 1998

TP-31 ⊞ Test Pit by GeoEngineers, Inc., 1998

EC-TP-4 ■ Test Pit by Earth Consultants, 1985

TP-1 ▣ Test Pit by Cascade Testing Laboratory, 1984

8.5' Depth to Glacially Consolidated Soils

▭ Proposed Building

🟢 All Analytes Not Detected at Concentrations Greater than Laboratory Reporting Limits, or Metals Detected at Concentrations Within naturally Occurring Background Levels for the Lower Puget Sound Region

🟡 Oil-range Petroleum Hydrocarbons Detected in One or More Samples at a Concentration less than the MTCA Method A Cleanup Level of 2,000 mg/kg

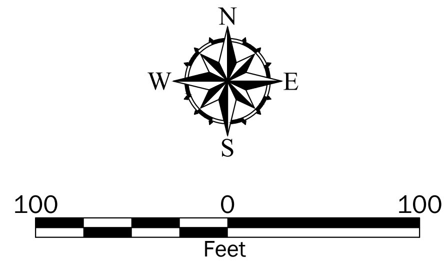
Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from David Evans and Associates, Inc., dated 10/30/19.

Vertical Datum: NAVD 88.

Projection: NAD83 Washington State Planes, North Zone, US Foot.



Site Plan and Soil Analytical Results

Husky Village
Bothell, Washington

GeoEngineers

Figure 2

\\geoengineers.com\WAN\Projects\0\0183141\CAD\01\Environmental\018314101_F02 Site Plan and Soil Analytical Results.dwg TAB:F02 Date Exported: 10/08/20 - 9:36 by tbyrd

GEOENGINEERS

APPENDIX A

Field Procedures and Boring Logs

APPENDIX A
FIELD PROCEDURES AND BORING LOGS

Soil Sampling

Subsurface conditions at the Site were evaluated by completing 15 hollow-stem auger (HSA) explorations using equipment owned and operated by Advance Drill Technologies, Inc. of Snohomish, Washington. Drilling was conducted in general accordance with Washington Administrative Code (WAC) 173-760 by a Washington state-licensed drilling company.

The explorations extended to depths ranging from approximately 21 to 51 feet below the ground surface (bgs). Soil samples were obtained using a 2-inch-diameter, split-barrel sampler. The sampler was driven a maximum of 18 inches by a 140-pound weight falling a vertical distance of approximately 30 inches. The number of blows needed to advance the sampler the final 12 inches or other specified distance is indicated on the boring log. Using a stainless-steel knife or new gloves, soil from the middle section of the spit-barrel sampler was placed in containers provided by the testing laboratory for potential chemical analysis. The remaining portion of the sample was placed in a plastic bag for field screening. The sampling equipment was decontaminated before each sampling attempt with a Liqui-Nox® solution wash and a distilled water rinse.

A representative from our staff selected the exploration locations and observed and classified the soil encountered. Soil in the explorations was visually classified in general accordance with ASTM International (ASTM) D 2488-94. Figure A-1, Key to Exploration Logs provides an explanation key for the logs. The boring logs are presented in Figures A-2 through A-16.

Selected samples from the borings were submitted for chemical analysis based on field screening results and depth relative to the proposed construction excavations. Samples submitted for chemical analysis are designated with “CA” on the logs. The soil samples were placed in a cooler with ice for transport to the laboratory. Standard chain-of-custody procedures were followed in transporting the soil samples to the laboratory.

Drill cuttings and decontamination water generated during drilling activities were temporarily stored on site in labeled 55-gallon drums prior to removal for offsite disposal at the UW-approved Cadman facility in Everett, Washington.

Surface Sediment Sampling

Surface sediment conditions at the Site stormwater detention pond were evaluated by collecting sediment samples from the upper 0.5 foot near the edge of the pond (above the geomembrane lining) using manual equipment. Sediment samples were obtained using a stainless-steel hand trowel and clean, disposable gloves and placed in containers provided by the testing laboratory for potential chemical analysis. A portion of the sample was placed in a plastic bag for field screening. The sampling equipment was decontaminated before each sampling attempt with a Liqui-Nox® solution wash and a distilled water rinse.

Field Screening of Soil and Sediment Samples

Soil samples obtained from the borings and sediment samples obtained from the detention pond were screened in the field for evidence of contamination using (1) visual examination; (2) sheen screening; and

(3) vapor headspace screening with a photoionization detector (PID). The results of headspace and sheen screening are included on the boring logs and in Table 1.

Visual screening consists of inspecting the soil for stains indicative of petroleum-related contamination. Visual screening is generally more effective when contamination is related to heavy petroleum hydrocarbons, such as motor oil or hydraulic oil, or when hydrocarbon concentrations are high. Sheen screening and headspace vapor screening are more sensitive methods that have been effective in detecting contamination at concentrations less than regulatory cleanup guidelines. Sheen screening involves placing soil in a pan of water and observing the water surface for signs of sheen. Sheen classifications are as follows:

No Sheen (NS)	No visible sheen on water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly.
Moderate Sheen (MS)	Light to heavy sheen, may have some color/iridescence; spread is irregular to flowing; few remaining areas of no sheen on water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic sample bag. Air is captured in the bag and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a PID is inserted in the bag and the instrument measures the concentration of combustible vapor in the air removed from the sample headspace. The PID measures concentrations in ppm (parts per million) and is calibrated to isobutylene. The PID is designed to quantify combustible gas and organic vapor concentrations up to 2,500 ppm. The PID has a lower threshold of significance of 1 ppm in this application. Field screening results are site-specific and vary with soil type, soil moisture content, temperature and type of contaminant.

Monitoring Well Installation

Five geotechnical explorations were completed with monitoring wells. The well depths ranged from approximately 22 to 40 feet bgs. Please refer to the boring logs in this appendix for monitoring well installation details.

Groundwater and Surface Water Sample Collection and Handling

Water samples were obtained from monitoring well B-3 (groundwater) and from the stormwater detention pond (surface water) using a peristaltic pump with new, disposable tubing. The groundwater sample was obtained after approximately three well volumes of water were purged to reduce turbidity. Groundwater and surface water samples were transferred to laboratory-prepared sample containers. Sample containers were filled to minimize headspace. The samples were placed in a cooler with ice pending transport to the analytical laboratory. Standard chain-of-custody procedures were followed in transporting the samples to the laboratory.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	○	**GW**	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
			∘	**GP**	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	**GM**	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	**GC**	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	⁘	**SW**	WELL-GRADED SANDS, GRAVELLY SANDS
			⋰	**SP**	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	**SM**	SILTY SANDS, SAND - SILT MIXTURES
			▨	**SC**	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	**ML**	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	**CL**	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			┆	**OL**	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
			▨	**CH**	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	**OH**	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			◡	**PT**	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
■	**AC**	Asphalt Concrete
▨	**CC**	Cement Concrete
●	**CR**	Crushed Rock/ Quarry Spalls
⩚	**SOD**	Sod/Forest Duff
⁘	**TS**	Topsoil

Groundwater Contact

▼ **Measured groundwater level in exploration, well, or piezometer**

▼ **Measured free product in well or piezometer**

Graphic Log Contact

— **Distinct contact between soil strata**

/ **Approximate contact between soil strata**

Material Description Contact

— **Contact between geologic units**

– – – **Contact between soil of the same geologic unit**

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

Sampler Symbol Descriptions

◫ **2.4-inch I.D. split barrel**

☒ **Standard Penetration Test (SPT)**

■ **Shelby tube**

☰ **Piston**

◧ **Direct-Push**

◫ **Bulk or grab**

▥ **Continuous Coring**

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

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Figure A-1

Drilled	Start 8/12/2019	End 8/12/2019
Total Depth (ft)	41.5	
Logged By	CWM	
Checked By	AP	
Driller	Advance Drill Technologies, Inc.	
Drilling Method	Hollow-stem Auger	
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	
Drilling Equipment	Diedrich D50 Turbo	
Surface Elevation (ft) Vertical Datum	69 NAVD88	
Top of Casing Elevation (ft)	68.60	
Easting (X) Northing (Y)	1305863 281359	
Horizontal Datum	WA State Plane North NAD83	

DOE Well I.D.: BKU 953
A 2-in well was installed on 8/12/2019 to a depth of 40 ft.

Groundwater

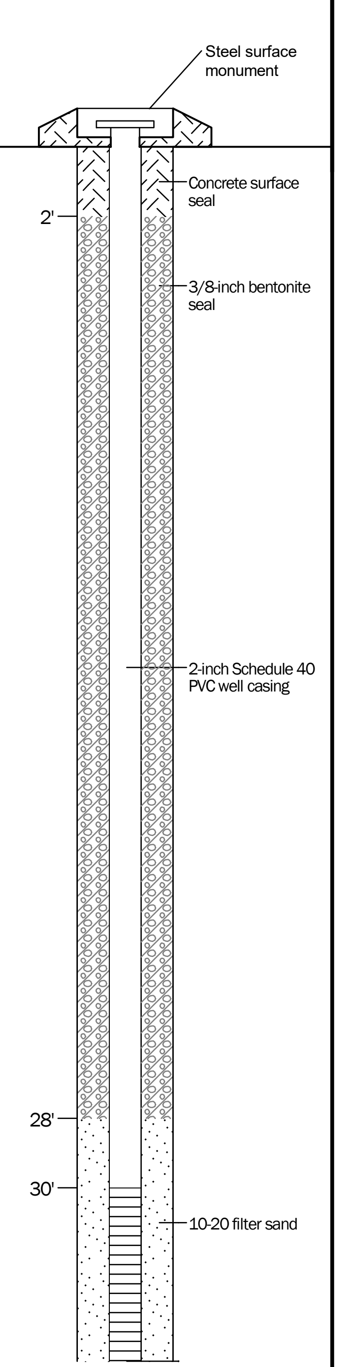
Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	27.70	40.90

Notes: *Blow counts high due to gravel and cobbles
Well casing pressurized on 9/9/19

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0							TS	3 inches topsoil/grass		
								SM	Brown silty fine to medium sand with gravel (medium dense, moist) (fill)		
		☒	18	13		1 SA				NS	<1
65											
	5	☒	9	15		2				NS	<1
								GM	Brown silty coarse gravel with sand and cobbles (dense, moist) (rough drilling)		
		☒	4	76/10"*		3				NS	<1
60											
								SM	Brown silty fine to coarse sand with gravel (very dense, moist) (glacial till)		
	10	☒	8	56		4 MC				NS	<1
								SM	Gray silty fine to medium sand with gravel (very dense, moist)		
55											
	15	☒	9	58		5 %F					
50											
	20	☒	14	61		6 MC			Decreased gravel content		
								CL	Gray lean clay (very stiff, moist) (glaciolacustrine deposits)		
45											
	25	☒	3	30		7					
							▼				
40									Becomes hard		
	30	☒	15	37		8 AL			AL (LL = 47; PI = 26)		
								CH	Gray fat clay; slickensided (very stiff, moist)		
35											
	35										

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Date:10/17/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\0\0183141\GINT\018314100.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_WELL

Log of Boring B-1

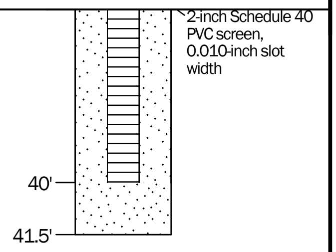
GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-2
Sheet 1 of 2

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	35	☒	18	22		9				1-inch sand seams		
30												
	40	☒	15	26		10 MC						

WELL LOG



Log of Boring B-1 (continued)

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-2
Sheet 2 of 2

Drilled	Start 8/12/2019	End 8/12/2019	Total Depth (ft)	26.5
Logged By	CWM	Checked By	AP	
Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger	
Surface Elevation (ft) Vertical Datum	73 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	
Drilling Equipment	Diedrich D50 Turbo			
Easting (X) Northing (Y)	1305742 281365	System Datum	WA State Plane North NAD83	
Groundwater not observed at time of exploration				

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						AC	2 inches asphalt concrete pavement			
							CR	2 inches base course			
							SM	Brown silty fine to medium sand with gravel; fine roots, debris (medium dense, moist) (fill)			
70		☒	14	17		1 CA			NS	<1	
	5	☒	9	21		2 SA			NS	<1	
							SM	Brown silty fine to medium sand with gravel (very dense, moist to wet) (glacial till)			
65		☒	3	50/4"		3 %F			NS	<1	
	10	☒	18	79		4		Occasional gravel			
60							CL	Gray lean clay; slickensided (hard, moist) (glaciolacustrine deposits)			
	15	☒	18	44		5 AL					AL (LL = 49; PI = 27)
55							SM	Gray silty fine to medium sand with gravel (very dense, moist)			
	20	☒	12	50/6"		6 MC					
50							CL	Gray lean clay with sand (very stiff, moist)			
	25	☒	15	25		7					

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-2

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-3
Sheet 1 of 1

Date:10/17/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\0\0183141\GINT\018314100.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Drilled	Start 8/14/2019	End 8/14/2019	Total Depth (ft) 51.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger

Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Surface Elevation (ft) Vertical Datum	61 NAVD88	Top of Casing Elevation (ft)	60.70
Easting (X) Northing (Y)	1305858 281187	Horizontal Datum	WA State Plane North NAD83

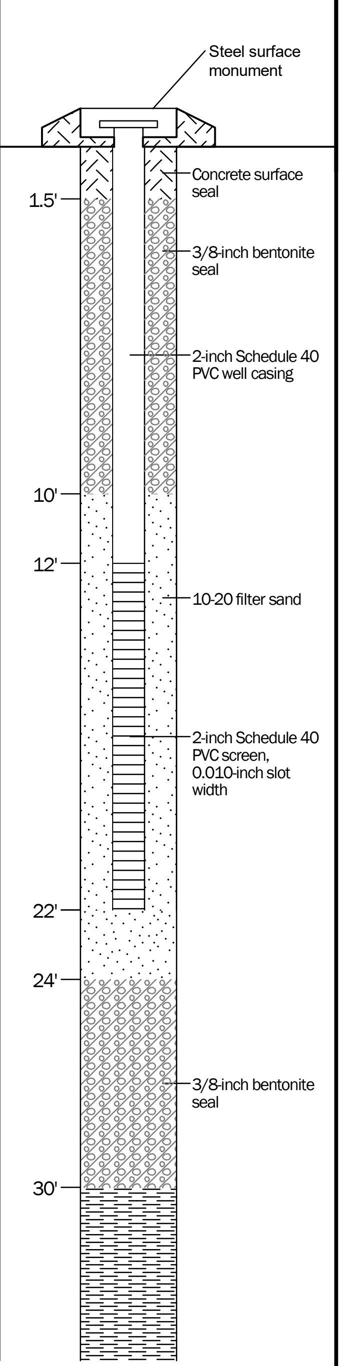
DOE Well I.D.: BKU 956
A 2-in well was installed on 8/14/2019 to a depth of 22 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	18.30	42.40

Notes: *Blow counts high due to gravel and cobbles

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0						SOD	3 to 4 inches sod/topsoil		
60							SM	Geomembrane liner Brown silty fine to medium sand with gravel; small roots (loose to medium dense, moist) (fill)		
		18	11	☒	1 SA; CA				NS	52
	5	9	4	☒	2 CA				NS	38
55										
		10	8	☒	3 CA		ML	Brown sandy silt with gravel; small roots (medium stiff, moist)	NS	<1
	10	5	9	☒	4 %F		SM	Brown silty fine to medium sand with occasional gravel; small roots (loose, moist)	NS	15
50										
							ML	Gray silt with sand; horizontal bedding (soft, moist to wet) (alluvium)		
	15	10	3	☒	5 %F; CA				NS	2
45										
						▼				
	20	9	14	☒	6 SA		SM	Gray silty fine to medium sand with gravel; interbedded silt layers (medium dense, wet)	NS	2
40										
							CL	Gray lean clay with occasional sand and gravel (very stiff to hard, moist) (glaciolacustrine deposits)		
	25	12	33	☒	7 AL			AL (LL = 38; PI = 19)		1
35										
	30	13	22	☒	8					3
30										
	35									

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-3

GEOENGINEERS

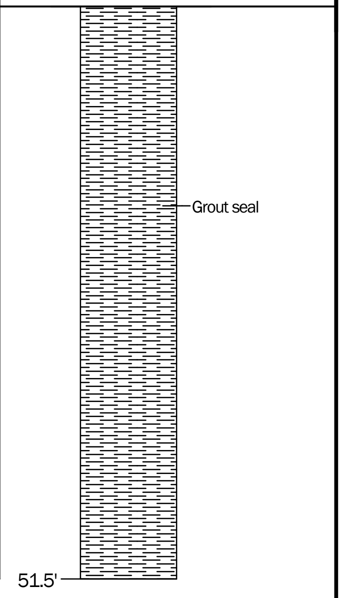
Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-4
Sheet 1 of 2

Date:10/17/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\0\0183141\GINT\018314100.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_WELL

		FIELD DATA											
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	35	☒	12	59*		9 MC						
25												
										(Rough drilling)		
	40	☒	18	30		10						
20												
									CH	Gray fat clay; interbedded sand seams (stiff, moist)		
	45	☒	18	12		11 MC						
15												
	50	☒	18	13		12						
10												

WELL LOG



Log of Boring B-3 (continued)

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-4
Sheet 2 of 2

Drilled	Start 8/12/2019	End 8/12/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 81 Vertical Datum NAVD88			Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo	
Easting (X) 1305585 Northing (Y) 281191			System Datum WA State Plane North NAD83		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						AC	2 inches asphalt concrete pavement			
80							CR	3 inches base course			
							GM	Brown silty coarse gravel with sand (very dense, moist) (fill)			
		☒	5	79/11"*		1			NS	<1	*Blow counts high due to gravel
	5	☒	11	50/5"		2 SA			NS	<1	Very rough drilling, through cobble
75							SM	Gray silty fine to coarse sand with gravel and cobbles; moderate oxidation staining (very dense, moist) (glacial till)	NS	<1	
		☒	13	64		3					
							ML	Gray sandy silt with occasional gravel (very stiff, moist)			
	10	☒	15	50		4 SA					
70							CH	Gray fat clay; interbedded sand seams and slickensided (very stiff, moist) (glaciolacustrine deposits)			
	15	☒	18	20		5					
65											
	20	☒	18	19		6 AL		Occasional sand			AL (LL = 50; PI = 28)
60											
	25	☒	15	28		7		Sand and occasional gravel			
55											

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-4

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-5
Sheet 1 of 1

Drilled	Start 8/14/2019	End 8/14/2019	Total Depth (ft) 31.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger

Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Surface Elevation (ft) Vertical Datum	72 NAVD88	Top of Casing Elevation (ft)	71.50
Easting (X) Northing (Y)	1305707 281133	Horizontal Datum	WA State Plane North NAD83

DOE Well I.D.: BKU 957
A 2-in well was installed on 8/14/2019 to a depth of 30 ft.

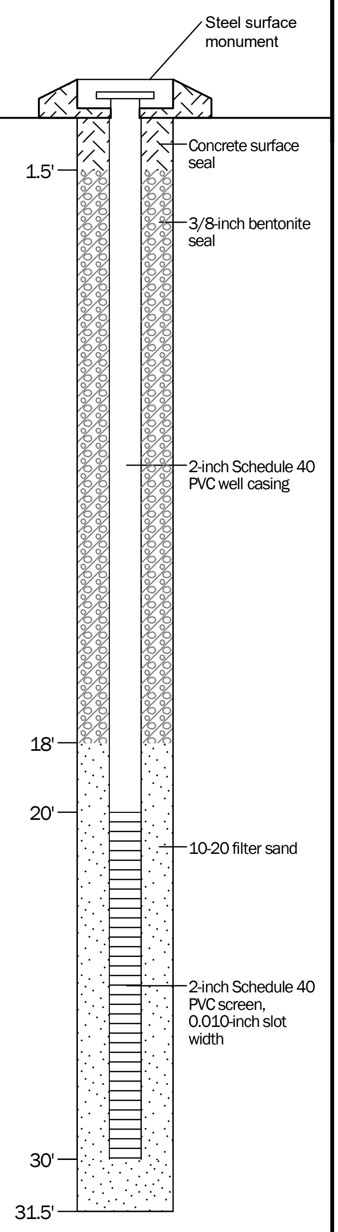
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	5.30	66.20

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								SM	Brown silty fine to medium sand with gravel; small roots (loose to medium dense, moist) (fill)		
70												
		☒	15	7		1 SA					NS	8
	5	☒	10	11		2	▼			Becomes medium dense	NS	3
65									ML	Brown sandy silt with occasional gravel; wood fragments (stiff, moist)		
		☒	12	13		3 MC					NS	<1
	10	☒	14	13		4A 4B %F			SM	Gray silty fine to medium sand (medium dense, wet)	NS NS	3 <1
									ML	Brown sandy silt with occasional gravel; slight oxidation staining (stiff, moist) (glaciolacustrine deposits)		
60												
									CH	Brown fat clay with occasional sand (stiff, moist)		
	15	☒	12	13		5 AL				AL (LL = 61; PI = 38)		
55												
	20	☒	15	14		6				1-inch interbedded sand seams		
50												
	25	☒	18	11		7 MC						
45												
	30	☒	18	10		8						

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-5

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-6
Sheet 1 of 1

Date:10/17/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\0\0183141\GINT\018314100.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_WELL

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 26.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	83 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Easting (X) Northing (Y)	1305571 281055	System Datum	WA State Plane North NAD83	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	2 inches asphalt concrete pavement			
								CR	2 inches base course			
								SM	Brown silty fine to medium sand with gravel (dense, moist) (weathered glacial till)			
80		☒	12	37		1 / CA				NS	<1	
	5	☒	8	24		2 / SA			Slight oxidation staining	NS	<1	
75		☒	10	53		3		SM	Gray silty fine to medium sand with occasional gravel (very dense, moist) (glacial till)	NS	<1	
	10	☒	14	73		4 / %F				NS	<1	
70												
	15	☒	13	40		5				NS	<1	
65								CL	Gray lean clay with 1-inch clean sand seam (very stiff, moist) (glaciolacustrine deposits)			
	20	☒	17	22		6 / AL						AL (LL = 44; PI = 23)
60												
	25	☒	18	28		7						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Date:10/17/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\0\0183141\GINT\018314100.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Log of Boring B-6

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-7
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)		Logged By	CWM	Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger
	8/13/2019	8/13/2019		26.5	Checked By	AP				

Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop

Drilling Equipment: Diedrich D50 Turbo

Surface Elevation (ft): 87
Vertical Datum: NAVD88

Top of Casing Elevation (ft): 86.70

Easting (X): 1305406
Northing (Y): 280994

Horizontal Datum: WA State Plane North NAD83

DOE Well I.D.: BKU 954
A 2-in well was installed on 8/13/2019 to a depth of 25 ft.

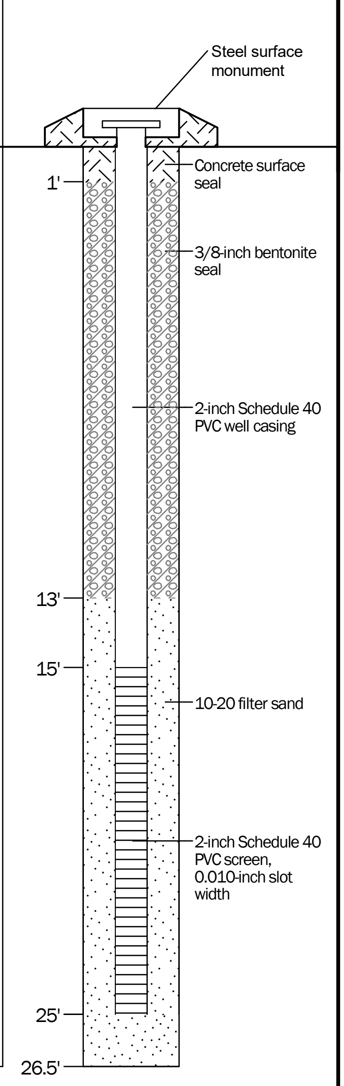
Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	7.60	79.10

Notes:

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								SOD	2 inches sod/topsoil		
									ML	Gray silt with occasional sand (very stiff, moist) (glaciolacustrine deposits)		
85												
		☒	18	20		1 MC					NS	<1
									CL	Gray lean clay with occasional sand (stiff to very stiff, moist) AL (LL = 44; PI = 22)		
	5	☒	15	15		2 AL					NS	<1
80												
		☒	14	24		3	▼				NS	<1
	10	☒	15	14		4 MC				Interbedded sand seams, slickensided		
75												
	15	☒	18	23		5 MC						
70												
	20	☒	18	16		6						
65												
									ML	Gray silt with sand (very stiff, moist)		
	25	☒	18	31		7 MC						

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-7

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-8
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	8/13/2019	8/13/2019	26.5	CWM	AP	Advance Drill Technologies, Inc.	Hollow-stem Auger

Surface Elevation (ft) Vertical Datum	85 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo
Easting (X) Northing (Y)	1305589 280967	System Datum	WA State Plane North NAD83	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						AC	2 inches asphalt concrete pavement			
							CR	3 inches base course			
		☒	12	56		1	SM	Brown silty fine to medium sand with gravel; slight oxidation staining (dense to very dense, moist) (glacial till)	NS	<1	
80	5	☒	15	45		2			NS	<1	
											Rough drilling
		☒	13	75		3 SA					
75	10	☒	15	28		4 MC	CL	Gray lean clay with sand; 2-inch interbedded sand seam (very stiff, moist) (glaciolacustrine deposits)			
							CH	Gray fat clay with sand seams (hard, moist)			
70	15	☒	15	34		5 AL					AL (LL = 50; PI = 31)
65	20	☒	18	35		6					
60	25	☒	18	23		7 MC					

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-8

GeoEngineers

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-9
Sheet 1 of 1

Drilled	Start 8/13/2019	End 8/13/2019	Total Depth (ft) 31.5	Logged By CWM Checked By AP	Driller Advance Drill Technologies, Inc.
Drilling Method	Hollow-stem Auger				
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo		
Surface Elevation (ft) Vertical Datum	75 NAVD88	Top of Casing Elevation (ft)	74.70		
Easting (X) Northing (Y)	1305790 280984	Horizontal Datum	WA State Plane North NAD83		

DOE Well I.D.: BKU 955
A 2-in well was installed on 8/13/2019 to a depth of 30 ft.

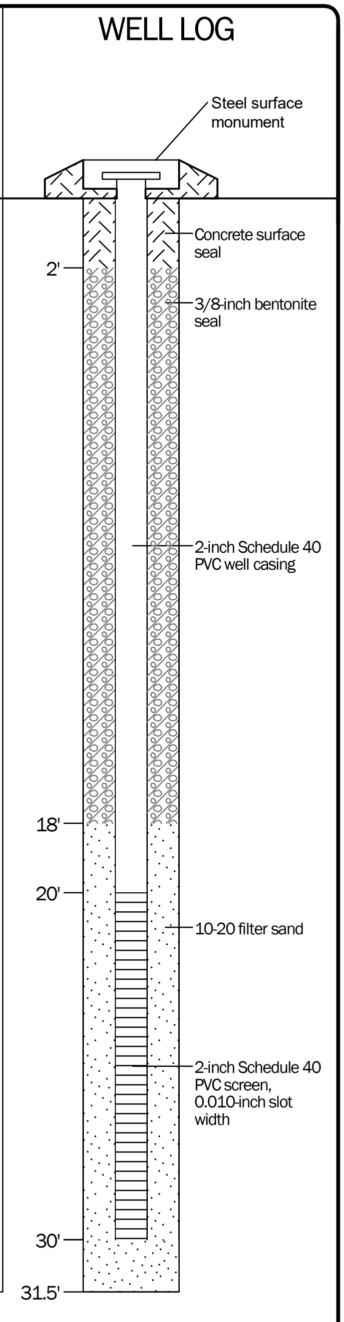
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
9/9/2019	8.75	65.95

Notes: *Blow counts high due to gravel and cobbles
Well casing pressurized on 9/9/19

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0							AC	2½ inches asphalt concrete pavement		
								CR	3 inches base course		
								GM	Brown silty fine to coarse gravel with sand (medium dense, moist to wet) (fill)		
		☒	18	13		1 SA				NS	<1
70	5	☒	9	33*		2				NS	<1
		☒	0	42*		3	▼			NS	<1
65	10	☒	18	21		4 %F		ML	Brown silt with sand and occasional gravel (very stiff, moist) (glaciolacustrine deposits)		
								CL	Gray clay with interbedded sand seams of variable gravel content (very stiff, moist)		
60	15	☒	15	19		5 AL			AL (LL = 43; PI = 22)		
55	20	☒	5	19		6 MC					
50	25	☒	18	10		7			Becomes stiff		
45	30	☒	18	13		8 MC					

WELL LOG



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on LiDAR.

Log of Boring B-9

GEOENGINEERS

Project: UW Bothell Husky Village
Project Location: Bothell, Washington
Project Number: 0183-141-00

Figure A-10
Sheet 1 of 1

Drilled	Start 8/28/2020	End 8/28/2020	Total Depth (ft)	21.5
Logged By	CRG	Checked By	KMS	
Driller	Advance Drill Technologies, Inc.	Drilling Method	Hollow-stem Auger	

Surface Elevation (ft) Vertical Datum	77.5 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Turbo
Easting (X) Northing (Y)	1305728 280987	System Datum	WA State Plane NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
								SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)			
75		☒	5	20		1						
	5	☒	18	27		2		ML	Brown sandy silt with occasional gravel (very stiff, moist)			
70		☒	18	48		3		ML	Brown sandy silt with gravel (hard, moist) (glacial till)			
	10	☒	4	36		4		ML	Gray sandy silt with gravel (hard, moist)			
65								CL	Gray lean clay with occasional fine sand, blocky, varved (very stiff, moist) (glaciolacustrine deposits)			
	15	☒	18	18		5						
60								ML	Gray silt with sand (hard, moist)			
	20	☒	6	33		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-10

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-11
Sheet 1 of 1

Drilled	Start 8/27/2020	End 8/27/2020	Total Depth (ft) 31.5
Logged By CRG	Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 67	Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Diedrich D-50 Turbo
Easting (X) 1305807	Northing (Y) 281129	System Datum WA State Plane NAD83 (feet)	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0					TS	Approximately 2 to 3 inches of topsoil/sod			
						SM	Gray silty fine to coarse sand with gravel, occasional wood fragments (loose, wet) (fill)			
65										
		6	9		1 CA			NS	<1	
	5	12	8		2	SM	Gray silty fine to medium sand with gravel (loose, moist to wet)	NS	<1	
60										
		12	5		3 CA		Wood fragments	NS	<1	
	10	3	7		4			NS	<1	
55							Becomes moist			
						SM	Gray silty fine to coarse sand with gravel (loose to medium dense, wet) (alluvium)			
	15	8	45*		5					*Blow count not representative due to sample driving in coarse gravel Rough drilling 15 to 18 feet Groundwater observed at approximately 15 feet below ground surface during drilling
50										
						CH	Gray fat clay with occasional fine sand, horizontal bedding (medium stiff to very stiff, moist) (glaciolacustrine deposits)			
	20	18	15		6					
45										
	25	5	8		7					
40										
	30	6	10		8					

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-11

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-12
Sheet 1 of 1

Drilled	Start 8/27/2020 End 8/27/2020	Total Depth (ft) 21	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 70 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D-50 Turbo	
Easting (X) 1305807 Northing (Y) 281282		System Datum WA State Plane NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							TS	Approximately 2 to 3 inches of topsoil/sod			
								SM	Brown silty fine to medium sand with gravel (dense to very dense, dry) (fill/weathered glacial till?)			
		☒	18	54		1 CA				NS	<1	
65	5	☒	18	43		2		SM	Brown silty fine to coarse sand with gravel (medium dense, moist)	NS	<1	
		☒	18	20		3 CA		SM	Gray silty fine sand with occasional gravel (medium dense, moist) (glaciolacustrine deposits)	NS	<1	
60	10	☒	12	17		4				NS	<1	
55	15	☒	4	27		5				NS	<1	
								SM	Gray silty fine to medium sand with gravel (very dense, moist)			
50	20	☒	6	50/5"		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-12

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-13
Sheet 1 of 1

Drilled	Start 8/28/2020	End 8/28/2020	Total Depth (ft) 21.5	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 83 Vertical Datum NAVD88			Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D-50 Turbo
Easting (X) 1305562 Northing (Y) 281118			System Datum WA State Plane NAD83 (feet)		Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
								CL	Gray lean clay with fine sand (medium stiff, moist) (fill)			
80		☒	6	3		1						
	5	☒	8	2		2		CL	Brown lean clay with sand (soft, moist)			
75		☒	11	50/5"		3		SM	Brown silty fine to medium sand with occasional gravel (very dense, moist) (glacial till)			
	10	☒	15	94/10"		4			With gravel			
70								CL	Gray lean clay with sand and occasional gravel (hard, moist) (glaciolacustrine deposits)			
	15	☒	5	50/5"		5						
65												
	20	☒	4	54		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-13

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-14
Sheet 1 of 1

Drilled Start 8/28/2020 End 8/28/2020	Total Depth (ft) 21.5	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 87 Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D-50 Turbo	
Easting (X) 1305486 Northing (Y) 281019	System Datum WA State Plane NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	Approximately 2¼ inches of asphalt pavement			
85								SM	Gray silty fine sand with gravel (dense, moist) (glacial till)			
		☒	18	49		1						
	5	☒	4	50/4"		2						
80								ML	Gray sandy silt with occasional gravel (hard, moist)			
		☒	12	43		3						
	10	☒	16	45		4						
75								CL	Gray lean clay with sand and occasional gravel (hard, moist) (glaciolacustrine deposits)			
	15	☒	12	36		5						
70								CL	Gray lean clay with occasional slickensided surfaces (hard, moist)			
	20	☒	10	34		6						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-14

GeoEngineers

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-15
Sheet 1 of 1

Date:9/28/20 Path:W:\PROJECTS\0\0183141\GINT\018314101.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Drilled	Start 8/27/2020	End 8/27/2020	Total Depth (ft) 21.5	Logged By CRG Checked By KMS	Driller Advance Drill Technologies, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) Vertical Datum	70 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Turbo
Easting (X) Northing (Y)	1305761 281238	System Datum	WA State Plane NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							TS	Approximately 2 to 3 inches of topsoil/sod			
								SM	Brown silty fine to medium sand with gravel (medium dense to dense, moist) (fill)			
		☒	6	24		1						
65	5	☒	10	37		2						
								ML	Gray sandy silt with sand and occasional gravel, roots, piece of ¾-inch-diameter root or branch (stiff, moist)			
		☒	10	13		3						
								SM	Gray silty sand with occasional gravel, roots, piece of ¾-inch-diameter root or branch (medium dense, moist)			
60	10	☒	12	27		4						
								ML	Brown sandy silt (stiff, wet) (colluvium/alluvium)			
55	15	☒	12	9		5						Groundwater observed at approximately 15 feet below ground surface during drilling
50	20	☒	18	41		6		ML	Gray sandy silt with gravel (hard, moist) (glacial till)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Google Earth.

Log of Boring B-15

GEOENGINEERS

Project: Husky Village Residence Life and Housing Site
Project Location: Bothell, Washington
Project Number: 0183-141-01

Figure A-16
Sheet 1 of 1

APPENDIX B

Chemical Analytical Data

APPENDIX B
CHEMICAL ANALYTICAL DATA

Analytical Methods

Chain-of-custody procedures were followed during the transport of the soil and groundwater samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory quality control (QC) records are included in this appendix. The analytical results are also summarized in the text and tables of this report.

Analytical Data Review

The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. Data quality exceptions documented by the accredited laboratory were reviewed by GeoEngineers and are addressed in the data quality exception section of this appendix.

Analytical Data Review Summary

No significant data quality exceptions were noted in the laboratory report during our review. Based on our data quality review, it is our opinion that the analytical data are of acceptable quality for their intended use in this report.

OnSite
Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

September 2, 2020

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 183-141-01
Laboratory Reference No. 2008-271

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 27, 2020.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: September 2, 2020
Samples Submitted: August 27, 2020
Laboratory Reference: 2008-271
Project: 183-141-01

Case Narrative

Samples were collected on August 27, 2020 and received by the laboratory on August 27, 2020. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: September 2, 2020
Samples Submitted: August 27, 2020
Laboratory Reference: 2008-271
Project: 183-141-01

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
B-11, 2.5 feet	08-271-01	Soil	8-27-20	8-27-20	
B-11, 7.5 feet	08-271-02	Soil	8-27-20	8-27-20	
B-12 2.5 feet	08-271-03	Soil	8-27-20	8-27-20	
B-12 7.5 feet	08-271-04	Soil	8-27-20	8-27-20	

Date of Report: September 2, 2020
Samples Submitted: August 27, 2020
Laboratory Reference: 2008-271
Project: 183-141-01

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-11, 2.5 feet**					
Laboratory ID:	08-271-01					
Diesel Range Organics	**ND**	27	NWTPH-Dx	8-28-20	8-28-20	
Lube Oil	**64**	53	NWTPH-Dx	8-28-20	8-28-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*104*	*50-150*				
Client ID:	**B-11, 7.5 feet**					
Laboratory ID:	08-271-02					
Diesel Range Organics	**ND**	30	NWTPH-Dx	8-28-20	8-28-20	
Lube Oil	**95**	60	NWTPH-Dx	8-28-20	8-28-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				
Client ID:	**B-12 2.5 feet**					
Laboratory ID:	08-271-03					
Diesel Range Organics	**ND**	26	NWTPH-Dx	8-28-20	8-28-20	
Lube Oil	**98**	52	NWTPH-Dx	8-28-20	8-28-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*93*	*50-150*				
Client ID:	**B-12 7.5 feet**					
Laboratory ID:	08-271-04					
Diesel Range Organics	**ND**	29	NWTPH-Dx	8-28-20	8-28-20	
Lube Oil	**72**	57	NWTPH-Dx	8-28-20	8-28-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*85*	*50-150*				

Date of Report: September 2, 2020
Samples Submitted: August 27, 2020
Laboratory Reference: 2008-271
Project: 183-141-01

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0828S1					
Diesel Range Organics	**ND**	25	NWTPH-Dx	8-28-20	8-28-20	
Lube Oil Range Organics	**ND**	50	NWTPH-Dx	8-28-20	8-28-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*99*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-217-07										
	ORIG	DUP									
Diesel Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	U1
Lube Oil	**303**	**111**	NA	NA		NA		NA	93	NA	
Surrogate:											
o-Terphenyl						*96*	*93*	*50-150*			

Date of Report: September 2, 2020
Samples Submitted: August 27, 2020
Laboratory Reference: 2008-271
Project: 183-141-01

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
B-11, 2.5 feet	08-271-01	**6**	8-28-20
B-11, 7.5 feet	08-271-02	**16**	8-28-20
B-12 2.5 feet	08-271-03	**5**	8-28-20
B-12 7.5 feet	08-271-04	**13**	8-28-20

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 1

Laboratory Number: 08-271

Company: GeoEngineers
Project Number: 183-141-01
Project Name: UW/Husky Village Residence
Project Manager: Ian Young
Sampled by: Cody Gibson

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days)
☐ ______ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A					% Moisture
1	B-11, 2.5 feet	8/27/20	845	S	1				X																		X
2	B-11, 7.5 feet	8/27/20	855	S	1				X																		X
3	B-12 2.5 feet	8/27/20	1235	S	1				X																		X
4	B-12 7.5 feet	8/27/20	1245	S	1				X																		X

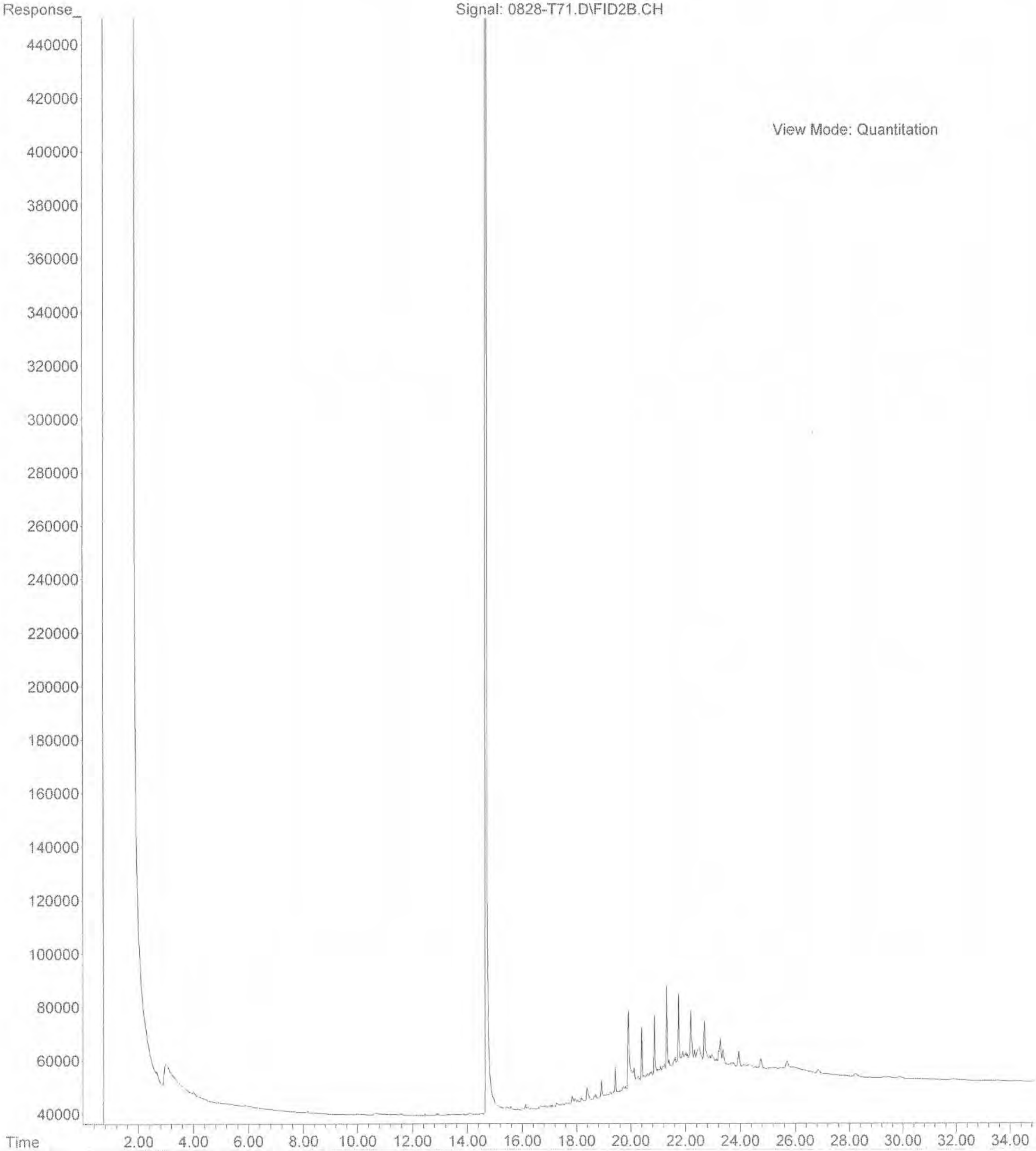
	Signature	Company	Date	Time
Relinquished		GeoEngineers	8/27/20	1346
Received		OSE	8/27/20	1346
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions
Ian Young (206) 920-8635
~~Please contact for testing to be done~~
D,3

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

```
File        :X:\DIESELS\TERI\DATA\T200828.SEC\0828-T71.D
Operator    : JT
Acquired    : 28 Aug 2020  20:56     using AcqMethod T200106F.M
Instrument  :   Teri
Sample Name: 08-271-01
Misc Info   :
Vial Number: 71
```



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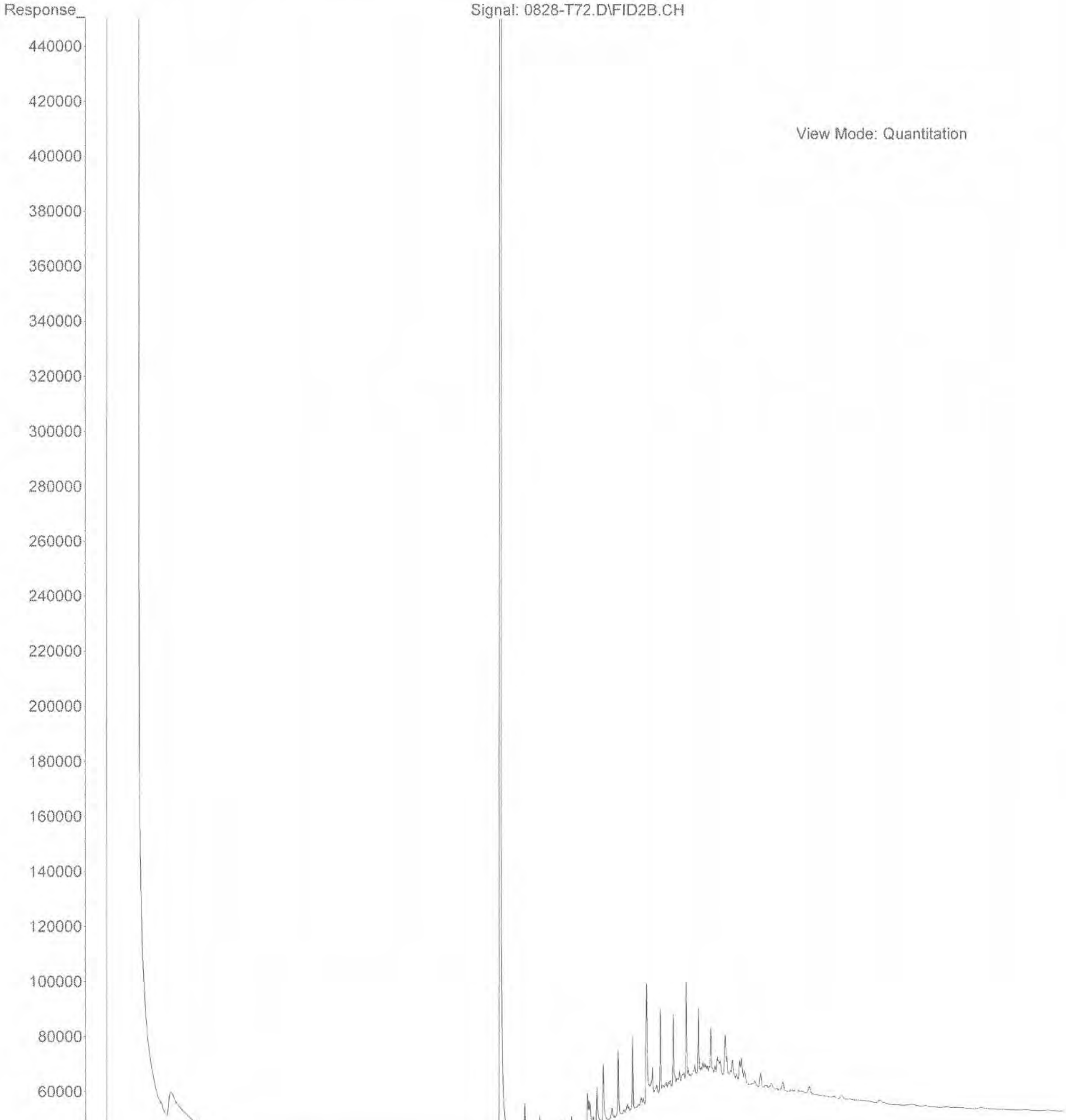
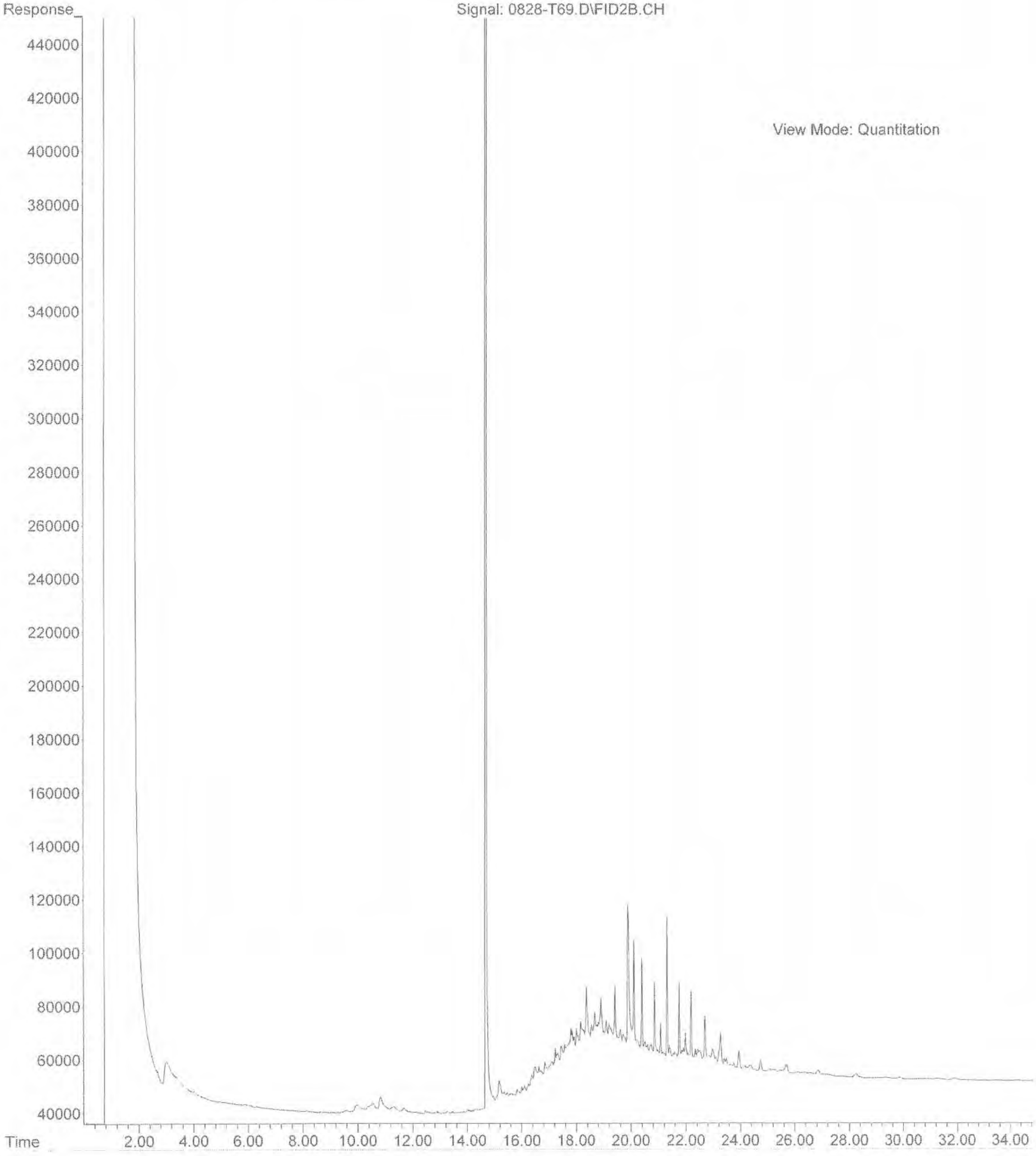
File        :X:\DIESELS\TERI\DATA\T200828.SEC\0828-T72.D
Operator    : JT
Acquired    : 28 Aug 2020  21:39     using AcqMethod T200106F.M
Instrument :    Teri
Sample Name: 08-271-02
Misc Info  :
Vial Number: 72
```



```
File        :X:\DIESELS\TERI\DATA\T200828.SEC\0828-T69.D
Operator    : JT
Acquired    : 28 Aug 2020  19:30     using AcqMethod T200106F.M
Instrument  :   Teri
Sample Name: 08-271-03
Misc Info   :
Vial Number: 69
```



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File        :X:\DIESELS\TERI\DATA\T200828.SEC\0828-T70.D
Operator    : JT
Acquired    : 28 Aug 2020  20:13     using AcqMethod T200106F.M
Instrument :   Teri
Sample Name: 08-271-04
Misc Info  :
Vial Number: 70
```

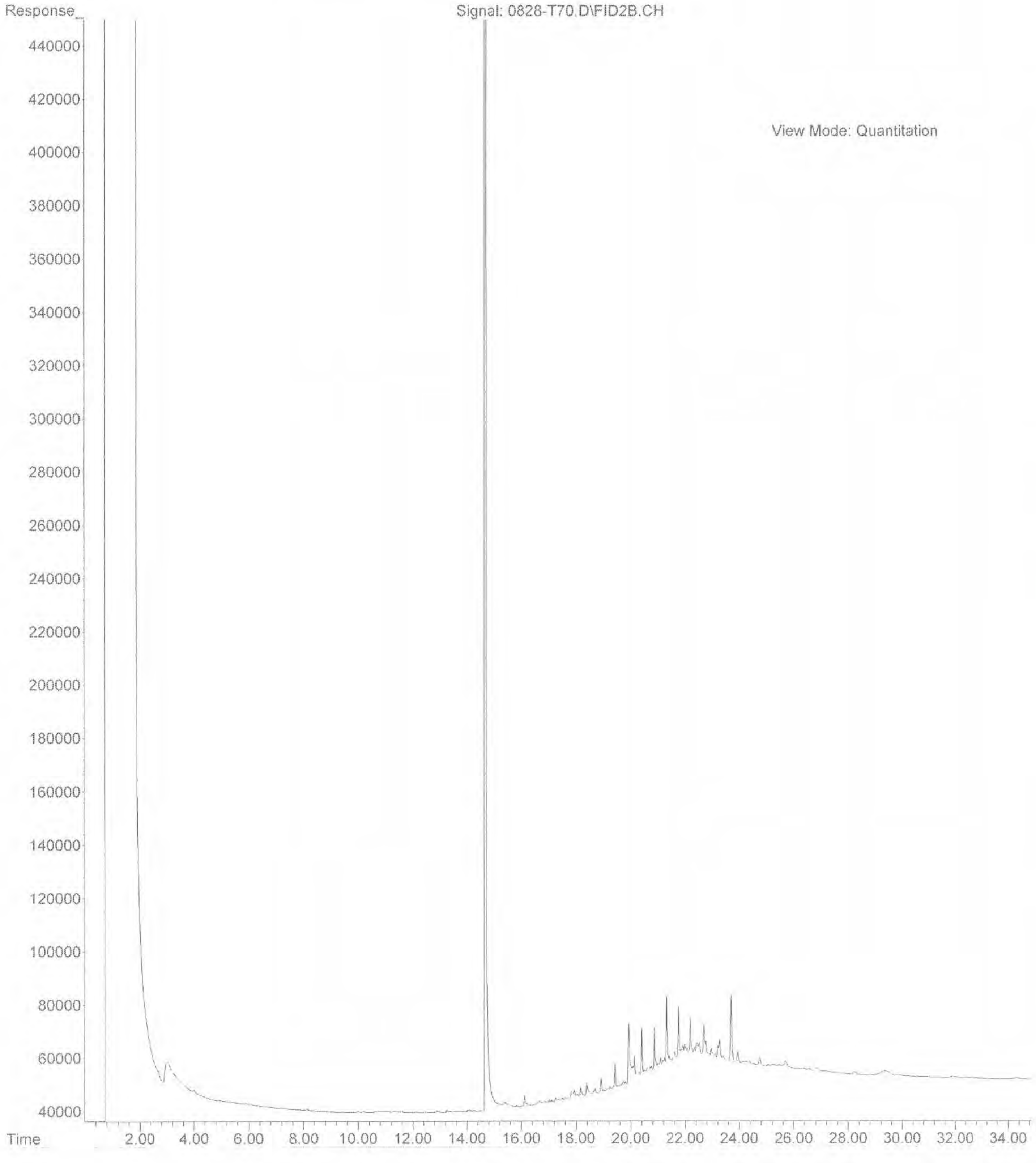

OnSite
Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 21, 2019

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 0183-141-00
Laboratory Reference No. 1908-152

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 12, 2019.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

Case Narrative

Samples were collected on August 12, 2019 and received by the laboratory on August 12, 2019. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
B-2-2.5	08-152-01	Soil	8-12-19	8-12-19	

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-2-2.5**					
Laboratory ID:	08-152-01					
Gasoline Range Organics	**ND**	23	NWTPH-HCID	8-13-19	8-13-19	
Diesel Range Organics	**ND**	57	NWTPH-HCID	8-13-19	8-13-19	
Lube Oil Range Organics	**ND**	110	NWTPH-HCID	8-13-19	8-13-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***71***	***50-150***				

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-2-2.5**					
Laboratory ID:	08-152-01					
Arsenic	**ND**	11	EPA 6010D	8-13-19	8-13-19	
Cadmium	**ND**	0.57	EPA 6010D	8-13-19	8-13-19	
Chromium	**45**	0.57	EPA 6010D	8-13-19	8-13-19	
Lead	**ND**	5.7	EPA 6010D	8-13-19	8-13-19	
Mercury	**ND**	0.28	EPA 7471B	8-13-19	8-13-19	

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0813S1					
Gasoline Range Organics	**ND**	20	NWTPH-HCID	8-13-19	8-13-19	
Diesel Range Organics	**ND**	50	NWTPH-HCID	8-13-19	8-13-19	
Lube Oil Range Organics	**ND**	100	NWTPH-HCID	8-13-19	8-13-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***75***	***50-150***				

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0813SM2					
Arsenic	**ND**	10	EPA 6010D	8-13-19	8-13-19	
Cadmium	**ND**	0.50	EPA 6010D	8-13-19	8-13-19	
Chromium	**ND**	0.50	EPA 6010D	8-13-19	8-13-19	
Lead	**ND**	5.0	EPA 6010D	8-13-19	8-13-19	
Laboratory ID:	MB0813S1					
Mercury	**ND**	0.25	EPA 7471B	8-13-19	8-13-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-152-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Cadmium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Chromium	**39.5**	**35.9**	NA	NA		NA		NA	10	20	
Lead	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Laboratory ID:	08-152-01										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-152-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**86.2**	**85.7**	100	100	ND	**86**	**86**	75-125	1	20	
Cadmium	**42.2**	**42.1**	50.0	50.0	ND	**84**	**84**	75-125	0	20	
Chromium	**119**	**121**	100	100	39.5	**80**	**82**	75-125	2	20	
Lead	**212**	**213**	250	250	ND	**85**	**85**	75-125	0	20	
Laboratory ID:	08-152-01										
Mercury	**0.560**	**0.552**	0.500	0.500	0.0576	**100**	**99**	80-120	1	20	

Date of Report: August 21, 2019
Samples Submitted: August 12, 2019
Laboratory Reference: 1908-152
Project: 0183-141-00

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
B-2-2.5	08-152-01	**12**	8-13-19

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Chain of Custody

Page 1 of 1

Laboratory Number: 08-152

Company: GeoEngineers, Inc.
Project Number: 0183-141-00
Project Name: UW Bothell Husky Village
Project Manager: Ian Young
Sampled by: Colton McInelly

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☑ Standard (7 Days)
☐ ________ (other)

Lab ID	Sample Identification DB	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Hold				% Moisture
1	~~B-2 S-1~~ B-2-2.5	8/12/19	15:30	sand	1	X														X							X
2	~~B-2 S-2~~ B-2-5.0	8/12/19	15:40	soil	1																		X				

	Signature	Company	Date	Time
Relinquished	Colt McInelly	GeoEngineers	8/12/19	16:42
Received		OSE	8/12/18	1642
Relinquished				
Received				
Relinquished				
Received				

Reviewed/Date

Reviewed/Date

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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August 21, 2019

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 0183-141-00
Laboratory Reference No. 1908-167

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 13, 2019.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

Case Narrative

Samples were collected on August 13, 2019 and received by the laboratory on August 13, 2019. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
B-6-2.5	08-167-01	Soil	8-13-19	8-13-19	

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-6-2.5**					
Laboratory ID:	08-167-01					
Gasoline Range Organics	**ND**	23	NWTPH-HCID	8-14-19	8-14-19	
Diesel Range Organics	**ND**	57	NWTPH-HCID	8-14-19	8-14-19	
Lube Oil Range Organics	**ND**	120	NWTPH-HCID	8-14-19	8-14-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***79***	***50-150***				

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-6-2.5**					
Laboratory ID:	08-167-01					
Arsenic	**ND**	11	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.57	EPA 6010D	8-16-19	8-16-19	
Chromium	**28**	0.57	EPA 6010D	8-16-19	8-16-19	
Lead	**ND**	5.7	EPA 6010D	8-16-19	8-16-19	
Mercury	**ND**	0.29	EPA 7471B	8-15-19	8-15-19	

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0814S1					
Gasoline Range Organics	**ND**	20	NWTPH-HCID	8-14-19	8-14-19	
Diesel Range Organics	**ND**	50	NWTPH-HCID	8-14-19	8-14-19	
Lube Oil Range Organics	**ND**	100	NWTPH-HCID	8-14-19	8-14-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***78***	***50-150***				

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0816SM1					
Arsenic	**ND**	10	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.50	EPA 6010D	8-16-19	8-16-19	
Chromium	**ND**	0.50	EPA 6010D	8-16-19	8-16-19	
Lead	**ND**	5.0	EPA 6010D	8-16-19	8-16-19	
Laboratory ID:	MB0815S1					
Mercury	**ND**	0.25	EPA 7471B	8-15-19	8-15-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-171-02										
	ORIG	DUP									
Arsenic	**11.0**	**ND**	NA	NA		NA		NA	NA	20	
Cadmium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Chromium	**12.6**	**10.5**	NA	NA		NA		NA	18	20	
Lead	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Laboratory ID:	08-171-02										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-171-02										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**98.3**	**96.3**	100	100	11.0	**87**	**85**	75-125	2	20	
Cadmium	**45.8**	**45.8**	50.0	50.0	ND	**92**	**92**	75-125	0	20	
Chromium	**108**	**107**	100	100	12.6	**95**	**94**	75-125	1	20	
Lead	**228**	**229**	250	250	ND	**91**	**92**	75-125	0	20	
Laboratory ID:	08-171-02										
Mercury	**0.505**	**0.511**	0.500	0.500	0.0308	**95**	**96**	80-120	1	20	

Date of Report: August 21, 2019
Samples Submitted: August 13, 2019
Laboratory Reference: 1908-167
Project: 0183-141-00

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
B-6-2.5	08-167-01	**13**	8-14-19

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Chain of Custody

Page 1 of 1

Company: GeoEngineers, Inc.
Project Number: 0183-141-00
Project Name: UW Bothell Husky Village
Project Manager: Ian Young
Sampled by: Colton McInelly

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☑ Standard (7 Days)
☐ ________ (other)

Laboratory Number: 08-167

Lab ID	Sample Identification DB	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Hold				% Moisture
1	~~B-6 5-1~~ B-6-2.5	8/13/19	10:50	soil	1	X														X							X
2	~~B-6 5-2~~ B-6-5.0	8/13/19	10:35	soil	1																		X				

	Signature	Company	Date	Time
Relinquished		GeoEngineers	8/13/19	14:50
Received		OSE	8/13/19	1450
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

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August 27, 2019

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 0183-141-00
Laboratory Reference No. 1908-229

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 19, 2019.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

Case Narrative

Samples were collected on August 19, 2019 and received by the laboratory on August 19, 2019. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Total Metals EPA 6010D/7471B Analysis:

The duplicate RPD for Lead is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

Due to the high concentration of Lead in the QC sample, the amount spiked was insufficient for meaningful MS/MSD recovery data. The Spike Blank recovery was 93%.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
POND SED-1	08-229-01	Soil	8-19-19	8-19-19	
POND SED-2	08-229-02	Soil	8-19-19	8-19-19	
POND WATER-08192019	08-229-03	Water	8-19-19	8-19-19	
GEI-3-08192019	08-229-04	Water	8-19-19	8-19-19	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

GASOLINE RANGE ORGANICS
NWTPH-Gx

Matrix: Soil
Units: mg/kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND SED-1**					
Laboratory ID:	08-229-01					
Gasoline	**ND**	5.6	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***91***	***58-129***				
Client ID:	**POND SED-2**					
Laboratory ID:	08-229-02					
Gasoline	**ND**	7.7	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***78***	***58-129***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

GASOLINE RANGE ORGANICS
NWTPH-Gx

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND WATER-08192019**					
Laboratory ID:	08-229-03					
Gasoline	**ND**	100	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***98***	***59-122***				
Client ID:	**GEI-3-08192019**					
Laboratory ID:	08-229-04					
Gasoline	**ND**	100	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***97***	***59-122***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND SED-1**					
Laboratory ID:	08-229-01					
Diesel Range Organics	**ND**	31	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil Range Organics	**ND**	62	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***65***	***50-150***				
Client ID:	**POND SED-2**					
Laboratory ID:	08-229-02					
Diesel Range Organics	**ND**	37	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil Range Organics	**ND**	75	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***77***	***50-150***				

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND WATER-08192019**					
Laboratory ID:	08-229-03					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	8-20-19	8-21-19	
Lube Oil Range Organics	**ND**	0.41	NWTPH-Dx	8-20-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***65***	***50-150***				
Client ID:	**GEI-3-08192019**					
Laboratory ID:	08-229-04					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	8-20-19	8-21-19	
Lube Oil Range Organics	**ND**	0.41	NWTPH-Dx	8-20-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***74***	***50-150***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

PAHs EPA 8270D/SIM

Matrix: Soil
Units: mg/Kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND SED-1**					
Laboratory ID:	08-229-01					
Benzo[a]anthracene	**0.033**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Chrysene	**0.048**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[b]fluoranthene	**0.034**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo(j,k)fluoranthene	**0.0094**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[a]pyrene	**0.020**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Indeno(1,2,3-c,d)pyrene	**ND**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Dibenz[a,h]anthracene	**ND**	0.0083	EPA 8270E/SIM	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
2-Fluorobiphenyl	***67***	***40 - 111***				
Pyrene-d10	***72***	***40 - 110***				
Terphenyl-d14	***80***	***45 - 122***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

PAHs EPA 8270D/SIM

Matrix: Soil
Units: mg/Kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND SED-2**					
Laboratory ID:	08-229-02					
Benzo[a]anthracene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Chrysene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[b]fluoranthene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo(j,k)fluoranthene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[a]pyrene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Indeno(1,2,3-c,d)pyrene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Dibenz[a,h]anthracene	**ND**	0.0099	EPA 8270E/SIM	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
2-Fluorobiphenyl	***65***	***40 - 111***				
Pyrene-d10	***69***	***40 - 110***				
Terphenyl-d14	***78***	***45 - 122***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

PAHs EPA 8270D/SIM

Matrix: Water
Units: ug/L

Analyte	**Result**	**PQL**	**Method**	**Date Prepared**	**Date Analyzed**	**Flags**
Client ID:	**POND WATER-08192019**					
Laboratory ID:	08-229-03					
Benzo[a]anthracene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Chrysene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo[b]fluoranthene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo(j,k)fluoranthene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo[a]pyrene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Indeno(1,2,3-c,d)pyrene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Dibenz[a,h]anthracene	**ND**	0.011	EPA 8270D/SIM	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
2-Fluorobiphenyl	***66***	***27 - 106***				
Pyrene-d10	***70***	***35 - 98***				
Terphenyl-d14	***93***	***41 - 129***				

TOTAL METALS
EPA 6010D/7471B

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND SED-1**					
Laboratory ID:	08-229-01					
Arsenic	**ND**	12	EPA 6010D	8-20-19	8-20-19	
Cadmium	**ND**	0.62	EPA 6010D	8-20-19	8-20-19	
Chromium	**28**	0.62	EPA 6010D	8-20-19	8-20-19	
Lead	**12**	6.2	EPA 6010D	8-20-19	8-20-19	
Mercury	**ND**	0.31	EPA 7471B	8-20-19	8-20-19	
Client ID:	**POND SED-2**					
Laboratory ID:	08-229-02					
Arsenic	**ND**	15	EPA 6010D	8-20-19	8-20-19	
Cadmium	**ND**	0.75	EPA 6010D	8-20-19	8-20-19	
Chromium	**29**	0.75	EPA 6010D	8-20-19	8-20-19	
Lead	**16**	7.5	EPA 6010D	8-20-19	8-20-19	
Mercury	**ND**	0.37	EPA 7471B	8-20-19	8-20-19	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

TOTAL METALS
EPA 200.8/7470A

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND WATER-08192019**					
Laboratory ID:	08-229-03					
Arsenic	**ND**	3.3	EPA 200.8	8-20-19	8-20-19	
Cadmium	**ND**	4.4	EPA 200.8	8-20-19	8-20-19	
Chromium	**ND**	11	EPA 200.8	8-20-19	8-20-19	
Lead	**ND**	1.1	EPA 200.8	8-20-19	8-20-19	
Mercury	**ND**	0.50	EPA 7470A	8-22-19	8-22-19	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

DISSOLVED METALS
EPA 200.8/7470A

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**POND WATER-08192019**					
Laboratory ID:	08-229-03					
Arsenic	**ND**	3.0	EPA 200.8		8-20-19	
Cadmium	**ND**	4.0	EPA 200.8		8-20-19	
Chromium	**ND**	10	EPA 200.8		8-20-19	
Lead	**ND**	1.0	EPA 200.8		8-20-19	
Mercury	**ND**	0.50	EPA 7470A		8-22-19	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

GASOLINE RANGE ORGANICS
NWTPH-Gx
QUALITY CONTROL

Matrix: Soil
Units: mg/kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820S1					
Gasoline	**ND**	5.0	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***80***	***58-129***				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-229-01										
	ORIG	DUP									
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						***91***	***86***	***58-129***			

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

GASOLINE RANGE ORGANICS
NWTPH-Gx
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820W1					
Gasoline	**ND**	100	NWTPH-Gx	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
Fluorobenzene	***100***	***59-122***				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-229-03										
	ORIG	DUP									
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						***98***	***98***	***59-122***			

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	**Result**	**PQL**	**Method**	**Date Prepared**	**Date Analyzed**	**Flags**
METHOD BLANK						
Laboratory ID:	MB0821S1					
Diesel Range Organics	**ND**	25	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil Range Organics	**ND**	50	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***79***	***50-150***				

Analyte	**Result**		**Spike Level**		**Source Result**	**Percent Recovery**		**Recovery Limits**	**RPD**	**RPD Limit**	**Flags**
DUPLICATE											
Laboratory ID:	08-239-10										
	ORIG	DUP									
Diesel Range Organics	**36.0**	**32.2**	NA	NA		NA		NA	11	NA	N
Lube Oil	**163**	**145**	NA	NA		NA		NA	12	NA	
Surrogate:											
o-Terphenyl						***86***	***88***	***50-150***			

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820W1					
Diesel Range Organics	**ND**	0.25	NWTPH-Dx	8-20-19	8-21-19	
Lube Oil Range Organics	**ND**	0.40	NWTPH-Dx	8-20-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***65***	***50-150***				

Analyte	Result		Spike Level		Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE										
Laboratory ID:	SB0820W1									
	ORIG	DUP								
Diesel Fuel #2	**0.936**	**0.812**	NA	NA		NA	NA	14	NA	
Lube Oil Range	**ND**	**ND**	NA	NA		NA	NA	NA	NA	
Surrogate:										
o-Terphenyl						***77 73***	***50-150***			

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

PAHs EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL

Matrix: Soil
Units: mg/Kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0821S1					
Benzo[a]anthracene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Chrysene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[b]fluoranthene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo(j,k)fluoranthene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Benzo[a]pyrene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Indeno(1,2,3-c,d)pyrene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Dibenz[a,h]anthracene	**ND**	0.0067	EPA 8270E/SIM	8-21-19	8-21-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
2-Fluorobiphenyl	***69***	***40 - 111***				
Pyrene-d10	***72***	***40 - 110***				
Terphenyl-d14	***77***	***45 - 122***				

PAHs EPA 8270D/SIM
MS/MSD QUALITY CONTROL

Matrix: Soil
Units: mg/Kg

Analyte	**Result**		**Spike Level**		**Source Result**	**Percent Recovery**		**Recovery Limits**	**RPD**	**RPD Limit**	**Flags**
MATRIX SPIKES											
Laboratory ID:	08-205-36										
	MS	MSD	MS	MSD		MS	MSD				
Benzo[a]anthracene	**0.136**	**0.141**	0.167	0.167	ND	81	84	53 - 131	4	23	
Chrysene	**0.133**	**0.149**	0.167	0.167	ND	80	89	46 - 126	11	24	
Benzo[b]fluoranthene	**0.149**	**0.146**	0.167	0.167	ND	89	87	45 - 127	2	25	
Benzo(j,k)fluoranthene	**0.113**	**0.136**	0.167	0.167	ND	68	81	52 - 122	18	21	
Benzo[a]pyrene	**0.137**	**0.152**	0.167	0.167	ND	82	91	51 - 126	10	24	
Indeno(1,2,3-c,d)pyrene	**0.147**	**0.153**	0.167	0.167	ND	88	92	48 - 127	4	23	
Dibenz[a,h]anthracene	**0.137**	**0.148**	0.167	0.167	ND	82	89	51 - 124	8	22	
Surrogate:											
2-Fluorobiphenyl						***66***	***73***	***40 - 111***			
Pyrene-d10						***68***	***78***	***40 - 110***			
Terphenyl-d14						***78***	***82***	***45 - 122***			

PAHs EPA 8270D/SIM
METHOD BLANK QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	**Result**	**PQL**	**Method**	**Date Prepared**	**Date Analyzed**	**Flags**
Laboratory ID:	MB0820W2					
Benzo[a]anthracene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Chrysene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo[b]fluoranthene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo(j,k)fluoranthene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Benzo[a]pyrene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Indeno(1,2,3-c,d)pyrene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Dibenz[a,h]anthracene	**ND**	0.010	EPA 8270D/SIM	8-20-19	8-20-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
2-Fluorobiphenyl	***46***	***27 - 106***				
Pyrene-d10	***72***	***35 - 98***				
Terphenyl-d14	***88***	***41 - 129***				

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

PAHs EPA 8270D/SIM
SB/SBD QUALITY CONTROL

Matrix: Water
Units: ug/L

Analyte	**Result**		**Spike Level**		**Percent Recovery**		**Recovery Limits**	**RPD**	**RPD Limit**	**Flags**
SPIKE BLANKS										
Laboratory ID:	SB0820W2									
	SB	SBD	SB	SBD	SB	SBD				
Benzo[a]anthracene	**0.469**	**0.445**	0.500	0.500	94	89	59 - 127	5	24	
Chrysene	**0.450**	**0.420**	0.500	0.500	90	84	57 - 122	7	24	
Benzo[b]fluoranthene	**0.565**	**0.448**	0.500	0.500	113	90	58 - 123	23	26	
Benzo(j,k)fluoranthene	**0.497**	**0.423**	0.500	0.500	99	85	60 - 123	16	22	
Benzo[a]pyrene	**0.463**	**0.432**	0.500	0.500	93	86	54 - 121	7	24	
Indeno(1,2,3-c,d)pyrene	**0.582**	**0.503**	0.500	0.500	116	101	55 - 125	15	26	
Dibenz[a,h]anthracene	**0.559**	**0.495**	0.500	0.500	112	99	57 - 127	12	25	
Surrogate:										
2-Fluorobiphenyl					***50***	***44***	***27 - 106***			
Pyrene-d10					***74***	***74***	***35 - 98***			
Terphenyl-d14					***90***	***81***	***41 - 129***			

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820SM1					
Arsenic	**ND**	10	EPA 6010D	8-20-19	8-20-19	
Cadmium	**ND**	0.50	EPA 6010D	8-20-19	8-20-19	
Chromium	**ND**	0.50	EPA 6010D	8-20-19	8-20-19	
Lead	**ND**	5.0	EPA 6010D	8-20-19	8-20-19	
Laboratory ID:	MB0820S1					
Mercury	**ND**	0.25	EPA 7471B	8-20-19	8-20-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-232-02										
	ORIG	DUP									
Arsenic	**38.4**	**35.7**	NA	NA		NA		NA	7	20	
Cadmium	**5.30**	**5.05**	NA	NA		NA		NA	5	20	
Chromium	**42.5**	**38.3**	NA	NA		NA		NA	10	20	
Lead	**3470**	**2520**	NA	NA		NA		NA	32	20	K
Laboratory ID:	08-232-02										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-232-02										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**127**	**130**	100	100	38.4	**88**	**91**	75-125	2	20	
Cadmium	**50.8**	**52.0**	50.0	50.0	5.30	**91**	**93**	75-125	2	20	
Chromium	**134**	**146**	100	100	42.5	**92**	**103**	75-125	8	20	
Lead	**2590**	**2910**	250	250	3470	**-350**	**-224**	75-125	11	20	A
Laboratory ID:	08-232-02										
Mercury	**0.486**	**0.520**	0.500	0.500	0.0638	**84**	**91**	80-120	7	20	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

TOTAL METALS
EPA 200.8/7470A
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820WM1					
Arsenic	**ND**	3.3	EPA 200.8	8-20-19	8-20-19	
Cadmium	**ND**	4.4	EPA 200.8	8-20-19	8-20-19	
Chromium	**ND**	11	EPA 200.8	8-20-19	8-20-19	
Lead	**ND**	1.1	EPA 200.8	8-20-19	8-20-19	
Laboratory ID:	MB0822W1					
Mercury	**ND**	0.50	EPA 7470A	8-22-19	8-22-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-086-03										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Cadmium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Chromium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Lead	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Laboratory ID:	08-229-03										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-086-03										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**116**	**116**	111	111	ND	**105**	**105**	75-125	0	20	
Cadmium	**111**	**111**	111	111	ND	**100**	**100**	75-125	0	20	
Chromium	**110**	**109**	111	111	ND	**99**	**98**	75-125	1	20	
Lead	**116**	**115**	111	111	ND	**104**	**104**	75-125	1	20	
Laboratory ID:	08-229-03										
Mercury	**11.9**	**12.0**	12.5	12.5	ND	**95**	**96**	75-125	1	20	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

DISSOLVED METALS
EPA 200.8/7470A
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0820D1					
Arsenic	**ND**	3.0	EPA 200.8		8-20-19	
Cadmium	**ND**	4.0	EPA 200.8		8-20-19	
Chromium	**ND**	10	EPA 200.8		8-20-19	
Lead	**ND**	1.0	EPA 200.8		8-20-19	
Laboratory ID:	MB0822D1					
Mercury	**ND**	0.50	EPA 7470A		8-22-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-223-01										
	ORIG	DUP									
Arsenic	**11.0**	**11.7**	NA	NA		NA		NA	6	20	
Cadmium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Chromium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Lead	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Laboratory ID:	08-223-01										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-223-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**91.8**	**95.2**	80.0	80.0	11.0	**101**	**105**	75-125	4	20	
Cadmium	**76.8**	**77.8**	80.0	80.0	ND	**96**	**97**	75-125	1	20	
Chromium	**74.4**	**76.8**	80.0	80.0	ND	**93**	**96**	75-125	3	20	
Lead	**73.0**	**75.6**	80.0	80.0	ND	**91**	**95**	75-125	3	20	
Laboratory ID:	08-223-01										
Mercury	**12.0**	**12.2**	12.5	12.5	ND	**96**	**98**	75-125	1	20	

Date of Report: August 27, 2019
Samples Submitted: August 19, 2019
Laboratory Reference: 1908-229
Project: 0183-141-00

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
POND SED-1	08-229-01	**19**	8-20-19
POND SED-2	08-229-02	**33**	8-20-19

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 1

Company: GEOENGINEERS
Project Number: 0183-K1-00
Project Name: UW-HUSKY VILLAGE
Project Manager: IAN YOUNG
Sampled by: BRIAN ANDERSON

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days)
☐ ________ (other)

Laboratory Number: 08-229

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level) cPAHs	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	DISSOLVED MTCA METALS				% Moisture
1	POND SED-1	8-19-19	0930	S	2			X	X					X						X							X
2	POND SED-2	8-19-19	1000	S	2			X	X					X						X							X
3	POND WATER-08192019	8-19-19	1040	W	9			X	X					X						X			X				
4	GEI-3-08192019	8-19-19	1125	W	5			X	X																		
5	TRIP BLANK	—	—	↓	3																						

	Signature	Company	Date	Time
Relinquished	Brian Anderson	GEOENGINEERS	8-19-19	1340
Received		OSE	8/19/19	1340
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions
DISSOLVED MTCA METAL SAMPLE WAS FIELD FILTERED.

Data Package: Standard ☐ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

OnSite
Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 29, 2019

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 0183-141-00
Laboratory Reference No. 1908-182B

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 14, 2019.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 29, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182B
Project: 0183-141-00

Case Narrative

Samples were collected on August 14, 2019 and received by the laboratory on August 14, 2019. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: August 29, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182B
Project: 0183-141-00

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
B-3-7.5	08-182-03	Soil	8-14-19	8-14-19	

Date of Report: August 29, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182B
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-3-7.5**					
Laboratory ID:	08-182-03					
Diesel Range Organics	**ND**	30	NWTPH-Dx	8-27-19	8-27-19	
Lube Oil Range Organics	**76**	60	NWTPH-Dx	8-27-19	8-27-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***84***	***50-150***				

Date of Report: August 29, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182B
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	**Result**	**PQL**	**Method**	**Date Prepared**	**Date Analyzed**	**Flags**
METHOD BLANK						
Laboratory ID:	MB0827S2					
Diesel Range Organics	**ND**	25	NWTPH-Dx	8-27-19	8-27-19	
Lube Oil Range Organics	**ND**	50	NWTPH-Dx	8-27-19	8-27-19	
Surrogate:	***Percent Recovery***	***Control Limits***				
o-Terphenyl	***83***	***50-150***				

Analyte	**Result**		**Spike Level**		**Source Result**	**Percent Recovery**		**Recovery Limits**	**RPD**	**RPD Limit**	**Flags**
DUPLICATE											
Laboratory ID:	SB0827S2										
	ORIG	DUP									
Diesel Fuel #2	**90.8**	**84.6**	NA	NA		NA		NA	7	NA	
Lube Oil Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						***83***	***93***	***50-150***			

Date of Report: August 29, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182B
Project: 0183-141-00

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
B-3-7.5	08-182-03	**16**	8-16-19

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

OnSite
Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 26, 2019

Ian Young
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 0183-141-00
Laboratory Reference No. 1908-182

Dear Ian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 14, 2019.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

Case Narrative

Samples were collected on August 14, 2019 and received by the laboratory on August 14, 2019. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
B-3-2.5	08-182-01	Soil	8-14-19	8-14-19	
B-3-5.0	08-182-02	Soil	8-14-19	8-14-19	
B-3-7.5	08-182-03	Soil	8-14-19	8-14-19	
B-3-15.0	08-182-04	Soil	8-14-19	8-14-19	

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-3-2.5**					
Laboratory ID:	08-182-01					
Gasoline Range Organics	**ND**	22	NWTPH-HCID	8-16-19	8-16-19	
Diesel Range Organics	**ND**	56	NWTPH-HCID	8-16-19	8-16-19	
Lube Oil Range Organics	**ND**	110	NWTPH-HCID	8-16-19	8-16-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*74*	*50-150*				
Client ID:	**B-3-5.0**					
Laboratory ID:	08-182-02					
Gasoline Range Organics	**ND**	23	NWTPH-HCID	8-16-19	8-16-19	
Diesel Range Organics	**ND**	56	NWTPH-HCID	8-16-19	8-16-19	
Lube Oil	**Detected**	110	NWTPH-HCID	8-16-19	8-16-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				
Client ID:	**B-3-7.5**					
Laboratory ID:	08-182-03					
Gasoline Range Organics	**ND**	24	NWTPH-HCID	8-16-19	8-16-19	
Diesel Range Organics	**ND**	60	NWTPH-HCID	8-16-19	8-16-19	
Lube Oil Range Organics	**ND**	120	NWTPH-HCID	8-16-19	8-16-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*75*	*50-150*				
Client ID:	**B-3-15.0**					
Laboratory ID:	08-182-04					
Gasoline Range Organics	**ND**	25	NWTPH-HCID	8-16-19	8-16-19	
Diesel Range Organics	**ND**	63	NWTPH-HCID	8-16-19	8-16-19	
Lube Oil Range Organics	**ND**	130	NWTPH-HCID	8-16-19	8-16-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*75*	*50-150*				

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-3-2.5**					
Laboratory ID:	08-182-01					
Arsenic	**ND**	11	EPA 6010D	8-16-19	8-16-19	
Barium	**84**	2.8	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.56	EPA 6010D	8-16-19	8-16-19	
Chromium	**30**	0.56	EPA 6010D	8-16-19	8-16-19	
Lead	**17**	5.6	EPA 6010D	8-16-19	8-16-19	
Mercury	**ND**	0.28	EPA 7471B	8-19-19	8-19-19	
Selenium	**ND**	11	EPA 6010D	8-16-19	8-16-19	
Silver	**ND**	1.1	EPA 6010D	8-16-19	8-16-19	

Client ID:	**B-3-5.0**					
Laboratory ID:	08-182-02					
Arsenic	**ND**	11	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.56	EPA 6010D	8-16-19	8-16-19	
Chromium	**27**	0.56	EPA 6010D	8-16-19	8-16-19	
Lead	**14**	5.6	EPA 6010D	8-16-19	8-16-19	
Mercury	**ND**	0.28	EPA 7471B	8-19-19	8-19-19	

Client ID:	**B-3-7.5**					
Laboratory ID:	08-182-03					
Arsenic	**ND**	12	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.60	EPA 6010D	8-16-19	8-16-19	
Chromium	**30**	0.60	EPA 6010D	8-16-19	8-16-19	
Lead	**11**	6.0	EPA 6010D	8-16-19	8-16-19	
Mercury	**ND**	0.30	EPA 7471B	8-19-19	8-19-19	

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**B-3-2.5**					
Laboratory ID:	08-182-01					
Diesel Range Organics	**ND**	28	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil	**150**	56	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*94*	*50-150*				
Client ID:	**B-3-5.0**					
Laboratory ID:	08-182-02					
Diesel Range Organics	**ND**	28	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil	**210**	56	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*83*	*50-150*				

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

HYDROCARBON IDENTIFICATION
NWTPH-HCID
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0816S1					
Gasoline Range Organics	**ND**	20	NWTPH-HCID	8-16-19	8-16-19	
Diesel Range Organics	**ND**	50	NWTPH-HCID	8-16-19	8-16-19	
Lube Oil Range Organics	**ND**	100	NWTPH-HCID	8-16-19	8-16-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*76*	*50-150*				

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

TOTAL METALS
EPA 6010D/7471B
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0816SM1					
Arsenic	**ND**	10	EPA 6010D	8-16-19	8-16-19	
Barium	**ND**	2.5	EPA 6010D	8-16-19	8-16-19	
Cadmium	**ND**	0.50	EPA 6010D	8-16-19	8-16-19	
Chromium	**ND**	0.50	EPA 6010D	8-16-19	8-16-19	
Lead	**ND**	5.0	EPA 6010D	8-16-19	8-16-19	
Selenium	**ND**	10	EPA 6010D	8-16-19	8-16-19	
Silver	**ND**	1.0	EPA 6010D	8-16-19	8-16-19	
Laboratory ID:	MB0819S1					
Mercury	**ND**	0.25	EPA 7471B	8-19-19	8-19-19	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-171-02										
	ORIG	DUP									
Arsenic	**11.0**	**ND**	NA	NA		NA		NA	NA	20	
Barium	**20.9**	**25.5**	NA	NA		NA		NA	20	20	
Cadmium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Chromium	**12.6**	**10.5**	NA	NA		NA		NA	18	20	
Lead	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Selenium	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Silver	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Laboratory ID:	08-182-01										
Mercury	**ND**	**ND**	NA	NA		NA		NA	NA	20	
MATRIX SPIKES											
Laboratory ID:	08-171-02										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**98.3**	**96.3**	100	100	11.0	**87**	**85**	75-125	2	20	
Barium	**121**	**119**	100	100	20.9	**100**	**98**	75-125	1	20	
Cadmium	**45.8**	**45.8**	50.0	50.0	ND	**92**	**92**	75-125	0	20	
Chromium	**108**	**107**	100	100	12.6	**95**	**94**	75-125	1	20	
Lead	**228**	**229**	250	250	ND	**91**	**92**	75-125	0	20	
Selenium	**92.1**	**90.3**	100	100	ND	**92**	**90**	75-125	2	20	
Silver	**21.2**	**21.3**	25.0	25.0	ND	**85**	**85**	75-125	0	20	
Laboratory ID:	08-182-01										
Mercury	**0.523**	**0.521**	0.500	0.500	0.0416	**96**	**96**	80-120	0	20	

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0821S1					
Diesel Range Organics	**ND**	25	NWTPH-Dx	8-21-19	8-21-19	
Lube Oil Range Organics	**ND**	50	NWTPH-Dx	8-21-19	8-21-19	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				

Analyte	Result		Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE									
Laboratory ID:	08-239-04								
	ORIG	DUP							
Diesel Range Organics	**180**	**179**	NA	NA	NA	NA	1	NA	N
Lube Oil	**1380**	**1320**	NA	NA	NA	NA	4	NA	
Surrogate:									
o-Terphenyl					*73* *82*	*50-150*			

Date of Report: August 26, 2019
Samples Submitted: August 14, 2019
Laboratory Reference: 1908-182
Project: 0183-141-00

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
B-3-2.5	08-182-01	**10**	8-16-19
B-3-5.0	08-182-02	**11**	8-16-19
B-3-7.5	08-182-03	**16**	8-16-19
B-3-15.0	08-182-04	**20**	8-16-19

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 1

Company: GeoEngineers
Project Number: 0183-141-00
Project Name: UW Bothell Husky Village
Project Manager: Ian Young
Sampled by: Colton McInelly

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☑ Standard (7 Days)
☐ ______ (other)

Laboratory Number: 08-182

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	~~Hold~~ DB				% Moisture
1	~~B-3 S-1~~ DB B-3-2.5	8/14/19	8:20	soil	5	X			O										X				~~X~~				X
2	~~B-3 S-2~~ B-3-5.0	8/14/19	8:23	soil	5	X			O											X			~~X~~				X
3	~~B-3 S-3~~ B-3-7.5	8/14/19	8:26	soil	5	X														X			~~X~~				X
4	~~B-3 S-5~~ B-3-15.0	8/14/19	8:30	soil	1	X																	~~X~~				X

	Signature	Company	Date	Time
Relinquished	Coltn McInlly	GeoEngineers	8/14/19	1446
Received		OSE	8/14/19	1446
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

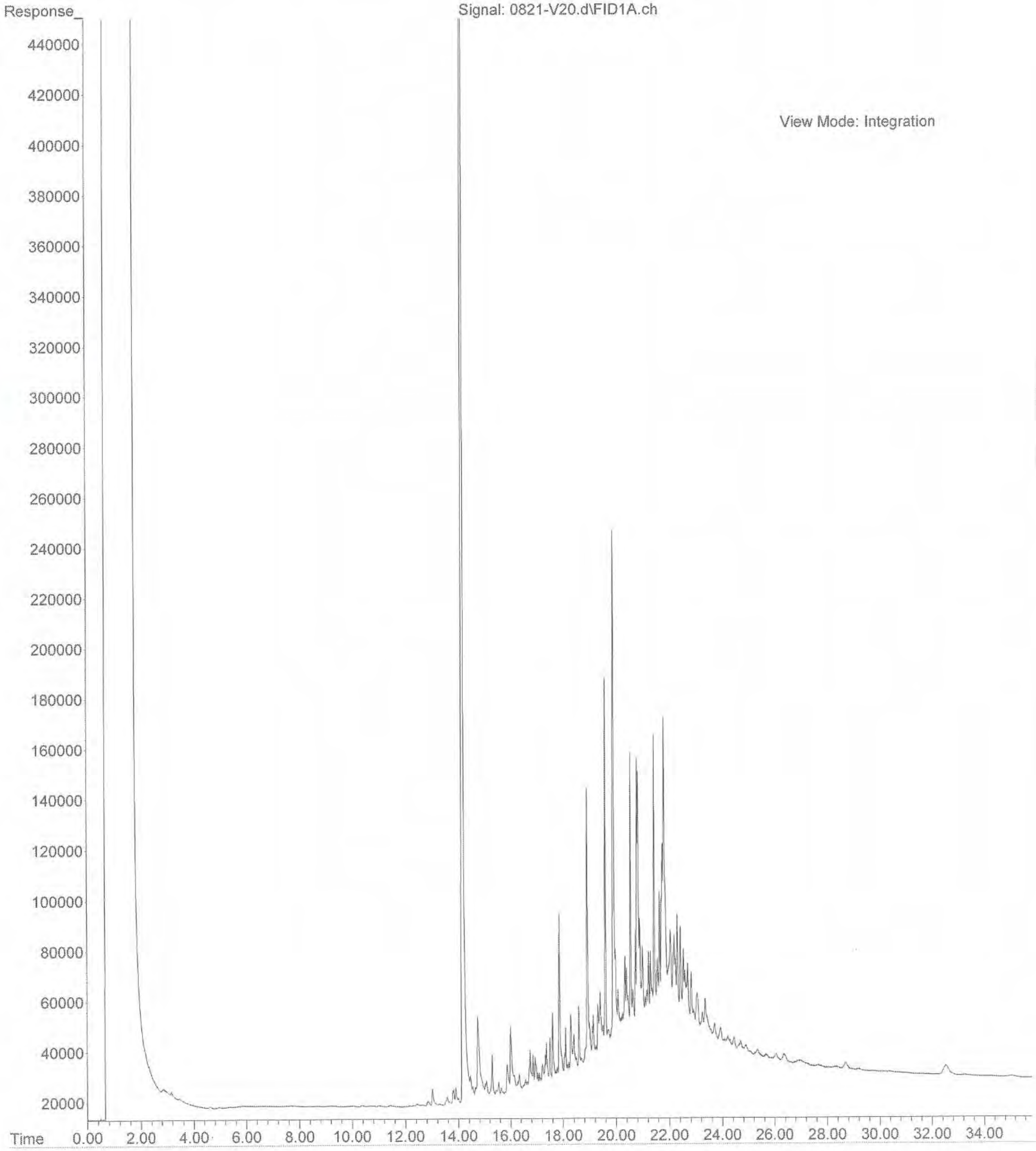
Comments/Special Instructions

X Added 8/15/19. DB (3 day TAT)
O Added 8/20/19. DB (4 day TAT)

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

```
File        :X:\DIESELS\VIGO\DATA\V190821\0821-V20.d
Operator    : JT
Acquired    : 21 Aug 2019  18:59     using AcqMethod V180601F.M
Instrument :   Vigo
Sample Name: 08-182-01
Misc Info  :
Vial Number: 20
```



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File        :X:\DIESELS\VIGO\DATA\V190821\0821-V22.d
Operator    : JT
Acquired    : 21 Aug 2019  20:21     using AcqMethod V180601F.M
Instrument :    Vigo
Sample Name: 08-182-02
Misc Info   :
Vial Number: 22
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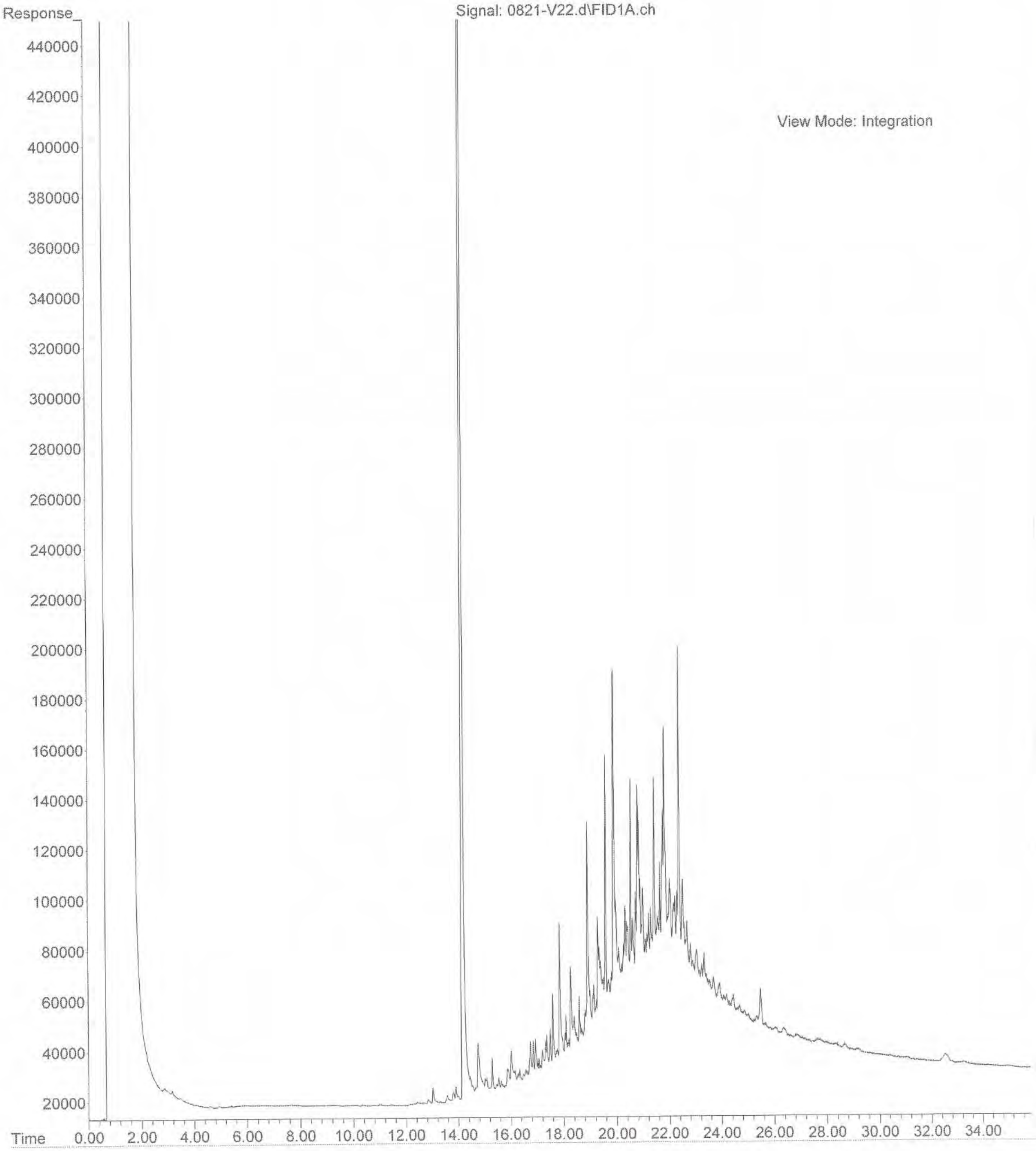

APPENDIX C

Report Limitations and Guidelines for Use

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

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

Read These Provisions Closely

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

Environmental Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of Capstone Development Partners and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment or remedial action study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project site. No one except Capstone Development Partners should rely on this report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

This Environmental Report Is Based on a Unique Set of Project-Specific Factors

This report applies to the proposed Husky Village Student Housing Site on the UW Bothell campus in Bothell, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

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

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

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[1] Developed based on material provided by ASFE, The GeoProfessional Association; www.asfe.org.

Reliance Conditions for Third Parties

No third party may rely on the product of our services unless GeoEngineers agrees in advance, and in writing to such reliance. 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.

Environmental Regulations Are Always Evolving

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

Subsurface Conditions Can Change

This report is based on conditions that existed at the time our site studies were 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, by new releases of hazardous substances, or by natural events such as floods, earthquakes and slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report to determine if it is still applicable.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

Do Not Redraw the Exploration Logs

Environmental scientists 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 an environmental report should never be redrawn for inclusion in other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

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.

Soil and Groundwater End Use

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other sites or for other on-Site uses of the affected media (soil and/or groundwater). Note that hazardous substances may be present in some of the Site soil, surface water and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or water from the subject Site or reuse of the affected media on Site to evaluate the potential for associated environmental liabilities. We cannot be responsible for potential environmental liability arising out of the transfer of soil and/or water from the subject Site to another location or its reuse on Site in instances that we were not aware of or could not control.

Most Environmental Findings Are Professional Opinions

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

GeoEngineers

Husky Village Redevelopment

SEPA Consistency Memo Appendices

Appendix D

MEMORANDUM

Date:	January 4, 2021	**TG:**	1.20203.00
To:	Wasim Khan – City of Bothell		
From:	Mike Swenson PE, PTOE – Transpo Group		
cc:	Jason Jones & Chad Izmirian, Capstone Development Partners, LLC Julie Blakeslee, University of Washington		
Subject:	UW Bothell Husky Village Redevelopment Transportation Impact Analysis (TIA)		

The following memorandum summarizes the transportation impact analysis (TIA) prepared for the new student housing development proposed on the UW Bothell Campus (the Campus). The Campus is located just west of I-405 and north of SR 522. The following sections provide a project description and summary of project impacts including trip generation, site access operations, and parking. The proposed project would redevelop the current Husky Village housing development.

The adopted 2017 Campus Master Plan identifies student housing as a major element of the Transportation Management Plan. Increasing the capacity for on-campus housing reduces the commuter trips to/from the campus as it provides student housing options within walking distance of the campus. The following trip generation and parking demand analysis considers the shift in travel patterns/modes as a result of the student housing project.

Project Description

The proposed project is located on the south side of Beardslee Boulevard, extending between 110th Avenue NE and 108th Avenue NE. This area is also considered the northern portion of the UW Bothell Campus District. The project includes the demolition of the existing Husky Village buildings. The project includes 4 buildings accommodating 1,049 student beds via traditional, apartment-style, and suite-style student housing configurations, three two-bedroom apartments for full-time residential director staff, 20,000 gsf of office space for university use, and a dining hall building. The residential uses are distributed to the site according to the following:

Site improvements will remove 163 existing parking spaces, of which 36 are currently designated for commuter parking, and add parking along Beardslee Avenue and 185th Street to accommodate ADA parking and short-term parking needs. The proposed driveway on Beardslee Boulevard will provide access to the loading area including 3 stalls intended for short-term maintenance vehicle activity. Parking demand for the residential uses will be accommodated on-site. The project is anticipated to be completed with occupancy in 2024.

Frontage improvements will be constructed along Beardslee Boulevard. Frontage improvements will vary along Beardslee Boulevard, but generally include short-term on-street parking, additional widening to accommodate a second eastbound/northbound travel lane, transit stops and platforms, and a sidewalk/multi-use bicycle pathway inboard of the transit platforms. A site plan is shown on Figure 1.

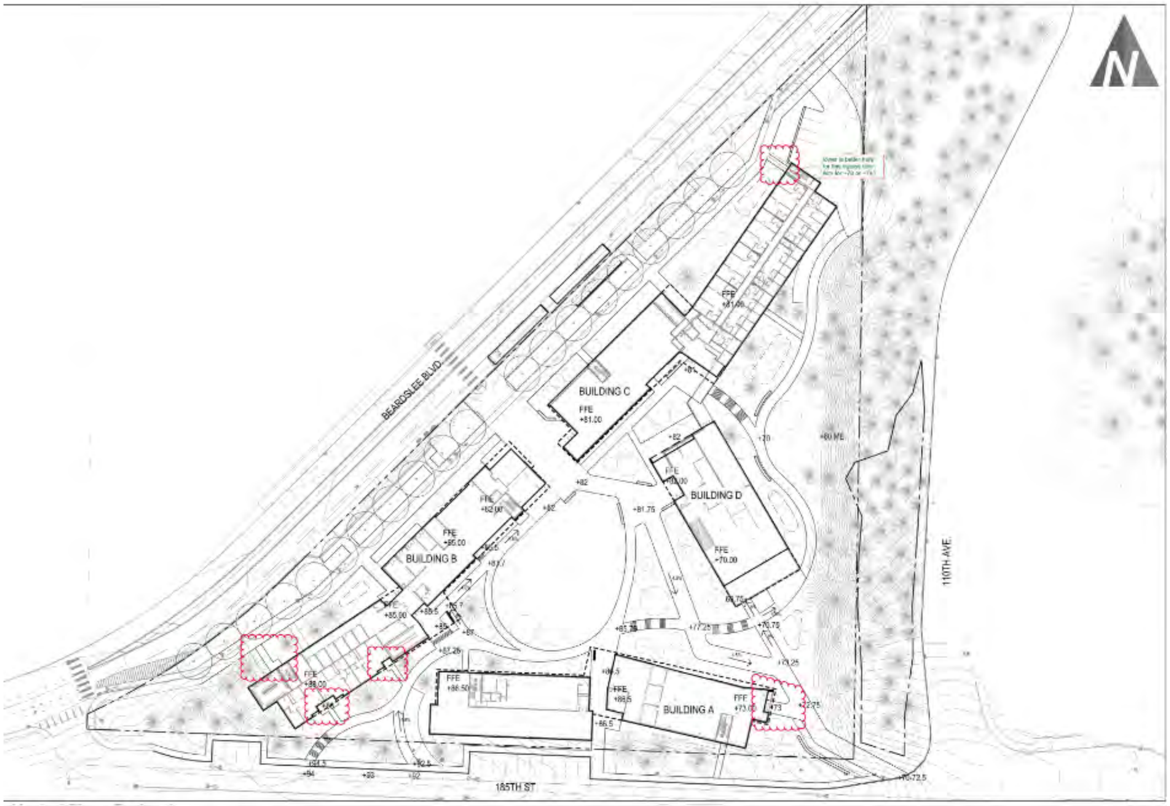

Figure 1. Site Plan

Existing Roadway Network

The primary roadways within the vicinity of the site are described in Table 1.

Table 1. Roadway Network Existing Conditions Summary

Roadway	Classification	Speed Limit	# Lanes	Bicycle Facilities	Pedestrian Facilities
Bothell Way NE (SR-522)	Principal Arterial	35 mph	4	None	Intermittent sidewalks
Main Street	Minor Arterial	25 mph	2	None	Sidewalks
98th Avenue NE	Collector	25 mph	3	None	Sidewalks
Kaysner Avenue NE	Local Access Street	25 mph	2	None	Sidewalks on south side
96th Avenue NE	Local Access Street	25 mph	2	None	Sidewalks
NE 185th Street	Collector	25 mph	2	None	Sidewalks
Beardslee Boulevard	Minor Arterial	30 mph	2-4	Bike lanes	Sidewalks
NE 183rd Street	Local Access Street	25 mph	2	None	Intermittent sidewalks
NE 180th Street	Collector	25 mph	2	Bike lanes	Sidewalks
Bothell-Everett Highway (SR-527)	Principal Arterial	30-40 mph	3-7	Bike Lanes	Intermittent sidewalks
110th Avenue NE	Local Access Street	20 mph	2	None	Sidewalks on east side

1. Roadway functional classifications are based on the *City of Bothell's Imagine Bothell…Comprehensive Plan 2015 Periodic Plan and Code Update.*

As shown in Table 1, pedestrian facilities are provided on one or both sides of all study area roadways.

Planned Improvements

The City of Bothell's 2021-2026 Six Year TIP was reviewed for future transportation improvements that may impact the study area's street network. The following projects were identified:

- **TIP #3 SR-522, Stage 3:** A continuation of the SR-522 improvements, this project will widen general purpose lanes, add BAT lanes in each direction, improve sidewalks, add a center median, connect signals, and improve illumination, landscaping and water infrastructure between 96th Avenue NE and 83rd Place NE. The project is anticipated to be completed by 2021.
- **TIP #5 Adaptive Signal Control System, Phase 2:** This project includes installing adaptive signal control systems in 13 intersections along Bothell Way (NE 191st St to SR 522) and SR 522 (96th Ave NE to Campus Way S) to accommodate for changing traffic patterns and ease traffic congestion. This project is anticipated to be completed in 2022.
- **TIP #6 Beardslee Boulevard Widening (Campus to I-405):** This project includes an additional eastbound lane on Beardslee Boulevard from 110th Avenue NE to I-405, as well as corresponding bike lane, signal modifications, illumination, and roadway improvements. This project is anticipated to be completed between 2024-2026.
- **TIP #8 NE 185th Street Transit Oriented Street:** This project includes streetscaping improvements on NE 185th Street between Beardslee Boulevard and Bothell Way and 98th Avenue NE between SR-522 and Bothell Way NE in preparation for use as a transit-oriented-street (TOS). It will also include intersection improvements at the 98th Avenue NE/NE 193rd Street intersection, as well as improvements at the NE 185th Street intersections with 101st Avenue NE, 104th Avenue NE, and Beardslee Boulevard. A transit station will be located at the NE 185th Street and 101st Avenue NE intersection. This project is anticipated to be completed between 2024-2026.
- **TIP #9 SR 522, Stage 2b Improvements:** Similar to TIP project #3 above, this project with provide improvements to access, transit, sidewalks, curb, gutter, landscaping,

between illumination 98th Avenue NE and 96th Avenue NE. The project is expected to be completed between 2024-2026.

- **TIP #10 Bothell Way Widening (Reder Way to 240th Street SE):** This project will widen Bothell Way NE from 2 to 4-5 lanes between Reder Way and 240th Street SE. Intersection improvements, protected bike lanes, landscaping strips, lighting, sidewalks and environment improvements will be made. The project is anticipated to be completed sometime between 2024-2026.
- **TIP #22 Bothell Downtown Center Access Improvements to SR 522 BRT and Transit Corridor:** This project includes replacing existing damaged sidewalks in the north-south direction on 102nd Avenue NE between NE 185th Street and the 102nd Avenue NE Bridge in order to connect transit users with the downtown businesses and to provide safe and accessible routes that meet ADA requirements to and from multimodal corridors. This project is anticipated to be completed after the 2024 horizon year.

As noted previously in the project description, the project will provide frontage improvements on Beardslee Boulevard. The frontage improvements accommodate transit and non-motorized travel with a bus lane, bike lane, sidewalk, and mixed-use path, in addition to on-street parking. The frontage improvements along Beardslee Boulevard will include transit platforms serving King County Metro, Sound Transit, and Community Transit.

Transit Service

Community Transit, Sound Transit and King County Metro Transit provides service within the vicinity of the project site. The nearest transit stops are located approximately 500 feet north of the site, just south of the NE 185th Street/110th Avenue intersection. Table 2 provides information about the three routes served.

Table 2. Existing Transit Routes

Routes	Area Served	Approximate Weekday Operating Hours	Approximate Weekend Operating Hours	Weekday PM Peak Headways (min)
105	Bothell to Mariner P&R	4:50 a.m. – 10:10 p.m.	6:30 a.m. – 9:30 p.m.	30
106	Bothell to Mariner P&R	5:40 a.m. – 7:30 p.m.	-	45
230/231	Kirkland TC to Woodinville P&R	6:50 a.m. – 10:45 p.m.	7:05 a.m. – 9:05 p.m.	30
239	UW Bothell/Cascadia College to Totem Lake TC to Kirkland TC	5:20 a.m. – 1:00 a.m.	6:05 a.m. – 12:55 a.m.	30
312/522	UW Bothell/Cascadia College to Downtown Seattle	4:35 a.m. – 8:50 a.m. and 2:40 p.m. – 7:35 p.m.	-	10
372	University District to Lake City to Bothell	5:10 a.m. - 1:35 a.m.	-	8-15
535	Lynwood to Bothell	5:05 a.m. to 10:45 p.m.	8:00 a.m. – 9:00 p.m.[1]	30
931	Bothell to Downtown Seattle via Redmond	6:15 a.m. – 7:55 p.m.	-	30

Source: Community Transit, Sound Transit, and King County Metro (August 2020).

In addition, the Bothell Park & Ride located southwest of the project site on SR-522 is approximately 0.8 miles from the site, or about a 15-20-minute walking distance. The park and ride are served by King County Metro route 342, in addition to a number of routes in the table above. Daily service via these routes extends from Bothell to Seattle, Shoreline, Redmond, and Renton.

Future Sound Transit and WSDOT transit improvements are planned within the study area to be constructed after 2023. The following improvements are identified:

- **Sound Transit SR 522/NE 145th Street Bus Rapid Transit (BRT):** This project will install BRT service between the Shoreline South/NE 145th Street Link Light Rail station and the SR 522/I-405 interchange. BRT service provides fast, frequent, and reliable transit service with off-board fare payment and multiple-door entry and exit. This project includes improvements to Beardslee Boulevard and NE 185th Street within the study area to add bus lanes and transit priority improvements. The Sound Transit BRT improvements are anticipated to be constructed in 2024.
- **WSDOT I-405, SR 522 Vicinity to SR 527 Express Toll Lanes (ETL) Improvement Project:** This project adds one new express toll lane in each direction of I-405 between SR 522 and SR 527. In addition, the project includes transit and roadway improvements along SR 527 in the vicinity of the study area, including channelization improvements to the 220th Street SE intersection at SR 527.

The Sound Transit SR 522/NE 145th Street BRT and WSDOT ETL improvements will increase transit service to the vicinity of the UW Bothell/Cascadia College Campus. Increased service in the vicinity of the campus is anticipated to encourage students, faculty, and staff to utilize alternative modes when traveling to/from UW Bothell/Cascadia College. These improvements are anticipated to affect the population living in the proposed student housing development.

Trip Generation

Weekday AM and PM peak hour trip generation for the residential uses of the project was developed from existing observed rates and using the Institute of Transportation Engineers (ITE) *Trip Generation,* 10th Edition (2017). Trip rates for the proposed student housing component were estimated using October 2015 midweek peak hour observations conducted at Husky Village as part of the UW Bothell/Cascadia College Campus Master Plan Update. Inbound and outbound traffic volumes were collected at the Husky Village entrances/exits during the AM and PM peak periods and peak hour rates were developed based on a two-day average.

Trip rates for the three staff apartments and the office used in the proposed development are based on ITE *Trip Generation* 10th Edition. The residential units trip generation is based on the Multifamily Housing Mid-Rise Land Use #221 and the office trip generation is based on the General Office Building Land Use #710.

In addition, a dining hall component is included in the proposed student housing development. The dining hall will be staffed by Aramark employees, Aramark managers, and student dining hall employees, and student C-Store employees. The following assumptions were incorporated into the dining hall trip generation estimation, based on information provided by Capstone:

- All employees work 8-hour shifts
- All employees arrive 15 minutes prior to shift start time and leave 15 minutes after shift end time
- Aramark Management shifts assumed to start at 6:30 a.m. (2 managers), 11:00 a.m. (1 rotating manager), and 3:00 p.m. (2 managers)
- All employees assumed to use SOV mode
- 23 full-time Aramark employees with staggered start times: 6:30 a.m., 7:30 a.m., 8:00 a.m., 9:00 a.m., 10:30 a.m., 11:30 a.m., 2:00 p.m., 3:00 p.m., 4:00 p.m.
- 6 full time Aramark managers with assumed staggered start times: 6:30 a.m., 11:00 a.m., 3:00 p.m.
- 8 dining hall student employees with staggered start times: 7:00 a.m., 10:30 a.m., and 2:30 p.m.

- 4 C-Store student employees with staggered start times: 7:00 a.m., 10:30 a.m., and 2:30 p.m.
- Student employees assumed to already be on campus and are not included in dining hall staff trips

Detailed dining hall trip generation calculations are included in Attachment A.

As a result of this project, no changes to the campus student capacity is expected. With the increase in student housing, the project will result in a shift of students from commuter trips to non-motorized trips. The student housing development is anticipated to accommodate 1,049 students, representing an increase in 808 residential beds. With the construction of the student housing development, these trips are anticipated to transition from the campus-wide commuter trip rate and reflect the rates associated with Husky Village residential uses instead. The shift in trips is taken into account when estimating the net new trip generation associated with the student housing development.

Existing trip rates for the campus (per student FTE) were calculated traffic counts conducted in October 2019 as part of the Fall 2019 Parking Utilization Study. Traffic counts were conducted at the both the north and south access points for the campus over a three-day period. A trip rate was then derived based on the on-campus FTE enrollment for that time period.

Weekday AM and PM peak hour trip generation estimates are summarized in Table 3. Detailed trip generation calculations are included in Attachment A.

Table 3. Weekday Peak Hour Vehicle Trip Generation

		AM Peak Hour Trips				**PM Peak Hour Trips**			
Land Use	**Size**	**Rate**	**In**	**Out**	**Total**	**Rate**	**In**	**Out**	**Total**
Proposed Use									
Student Housing[1]	1,049 beds	0.10	60	45	105	0.17	77	101	178
Staff Apartments	3 DU	0.36	0	1	1	0.44	1	0	1
Office	20,000 sf	1.16	20	3	23	1.15	4	19	23
Dining Hall[2]	NA	NA	5	0	5	NA	0	3	3
Total			*85*	*49*	*134*		*82*	*123*	*205*
Existing to be Removed									
Traditional Student Housing[1]	241 beds	0.10	14	10	24	0.17	18	23	41
Shift in FTE Commuter Trips									
Traditional and Apartment-Style Student Housing[3]	808 FTE	0.18	122	23	145	0.20	65	97	162
Net New Vehicle Trips			***-51***	***16***	***-35***		***-1***	***3***	***2***

Notes: DU = dwelling units; sf = square feet; FTE = Full Time Equivalent Students

1. Average trip rate based on Husky Village Trip Generation Study and observations conducted over two midweek days in October 2015.
2. Based on estimated employee staffing schedules for the dining hall component of the development.
3. Rates based on campus-wide trip rate established for UW Bothell/Cascadia College based on trips generated per full time equivalent (FTE) student. Average rate based on midweek data collected over 3 days in October 2019.

As shown in Table 3, the student housing development is estimated to result in a decrease of approximately 35 net new weekday AM peak hour trips (-51 inbound, 16 outbound) and an increase of approximately 2 net new weekday PM peak hour trips (-1 inbound, 3 outbound).

Site Access Analysis

The proposed project includes one driveway on Beardslee Boulevard. The two existing driveways serving Husky Village will be closed with the proposed development. The driveway serves a loading area that includes 3 stalls to be used for maintenance vehicle activity. This area also provides for fire, garbage, and recycling access to the site. The proposed driveway is anticipated to operate as a right-in right-out (RIRO) access. The following section summaries the operations and sight distance at the driveway.

Operations

A level of service (LOS) analysis was conducted for the future site access for the weekday PM peak hour using Synchro 10. This software program provides an analysis based on methodologies presented in the *Highway Capacity Manual* (HCM) (Transportation Research Board, 6th Edition). LOS values range from LOS A, which indicates good operating conditions with little or no delay, to LOS F, which indicates extreme congestion and long vehicle delays. LOS is measured in terms of the average delay for the worst minor street movement for two-way stop-controlled intersections.

Future (2024) with-project through volumes on Beardslee Boulevard were developed from forecasted future volumes at the 110th Avenue NE/Beardslee Boulevard intersection previously developed for the Phase 4 STEM Building TIA. All future forecasted volume methodology is consistent with the Phase 4 STEM Building analysis. In addition, 3 vehicles were estimated at each inbound and outbound movement to/from the site access. This is a conservative estimate for the PM peak hour considering the 3 parking stalls are proposed for maintenance and short-term loading activity. Future (2024) with-project volumes at the site access are shown below in Figure 2.

Figure 2. Future (2024) With-Project PM Peak Hour Site Access Volumes

The driveway is anticipated to operate as a right-in right-out access based on the future channelization along Beardslee Boulevard and the spacing between the driveway and the 110th Avenue NE/Beardslee Boulevard intersection. Based on the methodology described above, the site access is anticipated to operate acceptably at LOS B with approximately 12 seconds of delay at the northbound approach. A detailed LOS report is included in Attachment B.

Sight Distance

Sight distance requirements were referenced from the *City of Bothell Design and Construction Standards* Standard Detail 337. For a residential driveway entering a local access street of 30 mph (Beardslee Boulevard), a sight distance of at least 300 feet is required from 14 feet back from the curb line. Based on a review of available sight distance at the proposed driveway, it was found that the 300-foot minimum requirements would be met. Sight distance triangles at the proposed driveway are included in Attachment C.

Frontage Improvements

Frontage improvements will be constructed along Beardslee Boulevard. Frontage improvements will vary along Beardslee Boulevard, but generally include short term on-street parking, additional widening to accommodate a second eastbound/northbound travel lane, transit stops and platforms, and a sidewalk/multi-use bicycle pathway inboard of the transit platforms.

Frontage improvements will also be completed along 185th Street. These improvements include sidewalks as well as additional parking (90 degree).

Parking

Consistent with the trip generation, peak parking demand was developed based on observations and ITE *Parking Generation* 5th Edition rates., The peak parking demand rate for the campus is 0.24 vehicles per student FTE based on parking data collected in Fall 2019.
This rate is based on the on-campus student FTE totals of 7,745 students, which does not include 315 online FTE associated with Cascadia College. In addition, the rate was developed based on an observed Fall 2019 peak parking demand of 1,870 vehicles within the areas shown in Figure 3.

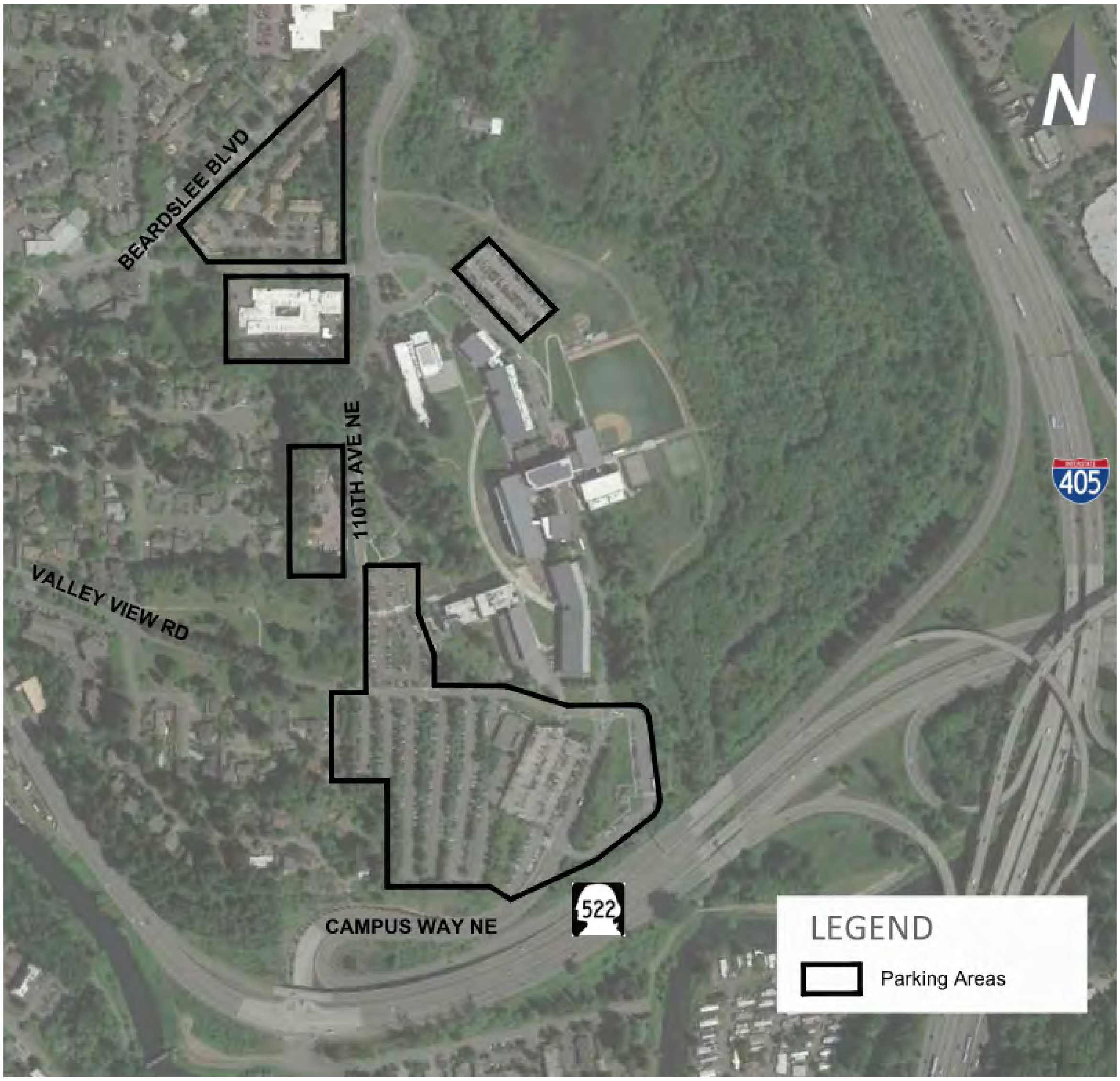

Figure 3. On Campus Parking Areas

As noted above, the residents of the project will utilize existing and future planned parking facilities on campus. As such the analysis of peak parking is based on the mid-day period when the demand on campus is at its peak. The following outlines the basis for the rates utilized in the analysis:

- 699 traditional student housing beds – The rate is based on 2018 observations at a similar student housing development in Seattle.[1]
- 350 apartment-style student housing beds – The rate is based on the existing residential parking demand rate as noted in the UW Bothell/Cascadia College Campus Master Plan (March 2017).
- 3 Staff apartments - The parking rate for the staff apartments is based on ITE *Parking Generation* 5th Edition, Multifamily Mid-Rise LU #221.
- 20,000 sf office – This rate is based on a local rate for the adjacent Beardslee Crossing building, developed from observations and data collected for the Fall 2019 Campus Parking Utilization Study.
- Dining hall component- Dining hall staff demand is based on the assumed staffing schedule provided by Capstone. Detailed assumptions are included in Attachment A.

Consistent with the trip generation methodology, the project includes a shift in FTE students from commuter to non-motorized with the development of the on-campus housing. The calculation of the on-campus peak demand considers the total demand for the project, less the current net new residential demand associated with the 808 additional beds.

A net new peak parking demand of 97 vehicles is anticipated for the development and is summarized in Table 4. Detailed parking demand calculations are included in Attachment D.

Table 4. Projected Project Parking Demand

Land Use	Size	Parking Rate	Peak Demand
Proposed Use			
Traditional Student Housing[1]	699 beds	0.11 per bed	77
Apartment-Style Student Housing[2]	350 beds	0.43 per bed	151
Staff Apartments	3 DU	1.31 per DU	4
Office	20,000 sf	2.05 per 1,000 sf	41
Dining Hall[4]	NA	NA	18
Total			*291*
Shift in FTE Commuter Trips to Residential			
Traditional and Apartment-Style Student Housing[3]	808 FTE	0.24 per bed	-194
Net New Parking Demand			***97***

Notes: DU = dwelling units; sf = square feet; FTE = Full Time Equivalent Students
1. Traditional student housing parking rate based observations at a similar student housing development in Seattle (Hub at Seattle II).
2. Apartment-style housing parking rate based on existing residential parking demand rate developed in the March 2017 Campus Master Plan.
3. Excludes the parking demand for 241 beds currently in Husky Village
4. Based on estimated employee staffing schedules for the dining hall component of the development.

As shown in Table 4, a net new parking demand of 97 vehicles is anticipated for the project. The on-campus parking supply of 2,101 spaces was based on August 2020 information provided by UW Bothell; however, this supply is anticipated to increase to 2,706 spaces with the addition of the planned West Garage. With the addition of the project, the campus parking supply is anticipated to

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[1] *Hub at Seattle II – Trip Generation and Parking Analysis*, Transpo Group, 2019.

be 2,687 spaces. Table 5 summarizes the incremental parking demand and resulting parking utilization for the project.

Table 5. Peak Parking Demand and Utilization Summary

Scenario	Campus Parking Supply	Incremental Project Demand	Campus Peak Parking Demand	Parking Utilization
Existing Conditions (Fall 2019)	2,101	-	1,870[1]	89%
Background Conditions				
With West Garage	2,706	-	1,870	69%
With STEM Building	2,706	156	2,026	75%
With Project[2]	2,687	291	2,317	-
Shift in FTE from Commuter to Residential[3]	2,687	-194	2,123	-
On-street parking demand[4]	2,687	23	2,146	80%

1. Average peak parking demand based on Fall 2019 UW Bothell Parking Utilization study and observed during the 12 p.m. hour.
2. Campus parking supply includes the removal of 36 commuter stalls and addition of 17 stalls associated with Husky Village.
3. Assumes shift away from commuter parking demand of 1,038 FTE including the demand associated with the traditional housing and apartment-style housing.
4. Assumes shift in demand to on-campus parking with the removal of 23 on-street parking spaces along Beardslee Boulevard between NE 185th Street and 110th Avenue NE.

As shown in Table 5, with the addition of the net new 97 vehicles associated with the proposed project, future on-campus parking utilization is anticipated to be approximately 80 percent. Detailed parking demand calculations are included in Attachment D.

Transportation Concurrency

The study area was determined based upon the anticipated peak hour distribution of site-generated traffic volumes as described in the introduction to this report. As specified in the City's guidelines, the study area includes any concurrency corridor impacted by 10 or more weekday PM peak hour trips. Based upon the City's criteria and the project's estimated trip generation, no concurrency corridors are required for study. Thus, this project meets City of Bothell concurrency requirements.

Mitigation

As noted in the traffic study, no improvements at off-site intersections are necessary to mitigate the impacts of the project. The proposed project will be required to pay Transportation Impact Fees to the City of Bothell and Snohomish County. The following section highlights the impact fees to be paid to each jurisdiction. These estimates should be considered preliminary until confirmed.

City of Bothell Transportation Impact Fees

The City of Bothell traffic impact fees for the student housing development are calculated based on the November 2019 City of Bothell Transportation Impact Fee Rate Study. Due to the combination of uses and the shift in trips from a commuter trip to a residential trip, the fees have been estimated based on the City's fee per trip basis rather than standard rates in the table.

The City's methodology for determining the fee rate per use is based on the following:

Impact Fee = Trip Rate (per unit) * New Trip Percentage * Trip Length Factor * $10,156.46

In order to estimate the transportation impact fees associated with this project, the trip length factor for the University/College land use was utilized. The following provides a calculation of the anticipated transportation impact fees to be assessed for the project. The impact fee is as follows:

Impact Fee = 2 PM peak hour trips * 0.81 * $10,156.46 = $16,453.47

Including the required 3 percent administration fee, the total transportation impact fee is estimated to be $16,947.07. This fee is a preliminary calculation and the final impact fee would be calculated by the City of Bothell. Fees are based on current rates at the time of building permit issuance.

Snohomish County Impact Fees

The City of Bothell has entered into an interlocal agreement with Snohomish County where projects within the City of Bothell are required to provide a mitigation offer to Snohomish County. The County has developed a payment system based on the project's city area, current Snohomish County impact fees, and estimated impact to County roads. Based on the estimated trip generation shown in Table 3, we have not identified any locations where trips above the County's 3-trip threshold would impact unincorporated County roadway improvements; therefore, no County impact fee contributions would be required. Snohomish County impact fees will be determined through coordination with County staff.

Summary of Findings

- The proposed project includes the construction of the student housing and dining buildings on the north side of the UW Bothell Campus. The development is anticipated to be constructed and fully occupied by 2024.
- The development is estimated to result in a decrease of approximately 35 net new weekday AM peak hour trips (-51 inbound, 16 outbound) and an increase of approximately 2 net new weekday PM peak hour trips (-1 inbound, 3 outbound).
- Based on City of Bothell criteria, no City concurrency corridors are effected by 10 or more average weekday PM peak hour trips; therefore, no corridors are included in the analysis.
- It is expected that the existing transit service would be able to accommodate the potential increase in demand attributable to the proposed project.
- With the addition of the net new 97 vehicles associated with the student housing project peak parking demand, future on-campus parking utilization is anticipated to be approximately 80 percent. The future peak parking demand is anticipated to be accommodated on campus.
- Transportation impacts fees to the City of Bothell is estimated to be $16,947.07, including an administrative fee of 3 percent. The impact fees to Snohomish County will be determined through coordination with County staff. These fees are considered preliminary estimates and would be finalized with the City and County upon review.

Attachment A: Trip Generation

Trip Generation												
UWB Capstone Student Housing			**Weekday AM Peak Hour**					**Weekday PM Peak Hour**				
Land Use			Rate	% Inbound	Inbound	Outbound	Total	Rate	% Inbound	Inbound	Outbound	Total
Proposed												
Student Housing [1]	1,049	beds	0.10	57%	60	45	105	0.17	43%	77	101	178
Staff Apartments (Multifamily Housing Mid-Rise LU #221)	3	du	0.36	26%	0	1	1	0.44	61%	1	0	1
Office (General Office Building LU #710)	20,000	sf	1.16	86%	20	3	23	1.15	16%	4	19	23
Dining Hall (Trips calculated programmatically by employee shift times)	-	-	NA	100%	5	0	5	NA	0%	0	3	3
Total					*85*	*49*	*134*			*82*	*123*	*205*
Existing to be Removed												
Traditional Student Housing [1]	241	beds	0.10	57%	14	10	24	0.17	43%	18	23	41
Shift in FTE Commuter Trip Gen												
Traditional and Apartment-Style Student Housing [2]	808	FTE	0.18	84%	122	23	145	0.20	40%	65	97	162
Net New Trips					***-51***	***16***	***-35***			***-1***	***3***	***2***

Notes: du = dwelling unit; sf = square feet; FTE = full time equivalent student

1. Average trip rate based on Husky Village Trip Generation Study and observations conducted over two midweek days in October 2015.
2. Rates based on campus-wide trip rate established for UW Bothell/Cascadia College based on trips generated per full time equivalent (FTE) student. Average rate based on midweek data collected over 3 days in October 2019.

Dining Hall Trip Generation and Parking Demand Assumptions	**Inbound**					**Outbound**						
Time	Full Time Aramark Employee	Full Time Aramark Management	Students	C-Store Students	**Total Inbound**	Full Time Aramark Employee	Full Time Aramark Management	Students	C-Store Students	**Total Outbound**	**Total Trips**	**Hourly Staff Parking Demand**
12:00 AM					0	3				3	3	-3
1:00 AM					0					0	0	-3
2:00 AM					0					0	0	-3
3:00 AM					0					0	0	-3
4:00 AM					0					0	0	-3
5:00 AM					0					0	0	-3
6:00 AM	2	2			4					0	4	1
7:00 AM	5				5					0	5	6
8:00 AM	3				3					0	3	9
9:00 AM					0					0	0	9
10:00 AM	2	1			3					0	3	12
11:00 AM	3				3					0	3	15
12:00 PM					0					0	0	15
1:00 PM	1				1					0	1	16
2:00 PM	4	2			6	2	2			4	10	18
3:00 PM	3				3	3				3	6	18
4:00 PM					0	2				2	2	16
5:00 PM					0	3				3	3	13
6:00 PM					0	2				2	2	11
7:00 PM					0	3	1			4	4	7
8:00 PM					0					0	0	7
9:00 PM					0					0	0	7
10:00 PM					0	1				1	1	6
11:00 PM					0	4	2			6	6	0

Assumptions:

-All employees work 8-hour shifts

-All employees arrive 15 minutes prior to shift start time and leave 15 minutes after shift end time

-Aramark Management shifts assumed to start at 6:30 a.m. (2 managers), 11:00 a.m. (1 rotating manager), and 3:00 p.m. (2 managers)

-All employees assumed to use SOV mode

-23 full-time Aramark employees with staggered start times: 6:30 a.m., 7:30 a.m., 8:00 a.m., 9:00 a.m., 10:30 a.m., 11:30 a.m., 2:00 p.m., 3:00 p.m., 4:00 p.m.

-6 full time Aramark managers with assumed staggered start times: 6:30 a.m., 11:00 a.m., 3:00 p.m.

-8 dining hall student employees with staggered start times: 7:00 a.m., 10:30 a.m., and 2:30 p.m.

-4 C-Store student employees with staggered start times: 7:00 a.m., 10:30 a.m., and 2:30 p.m.

-Student employees assumed to already be on campus (not inlcuded in dining hall staff trips)

Attachment B: Site Access LOS

Intersection	
Int Delay, s/veh	0

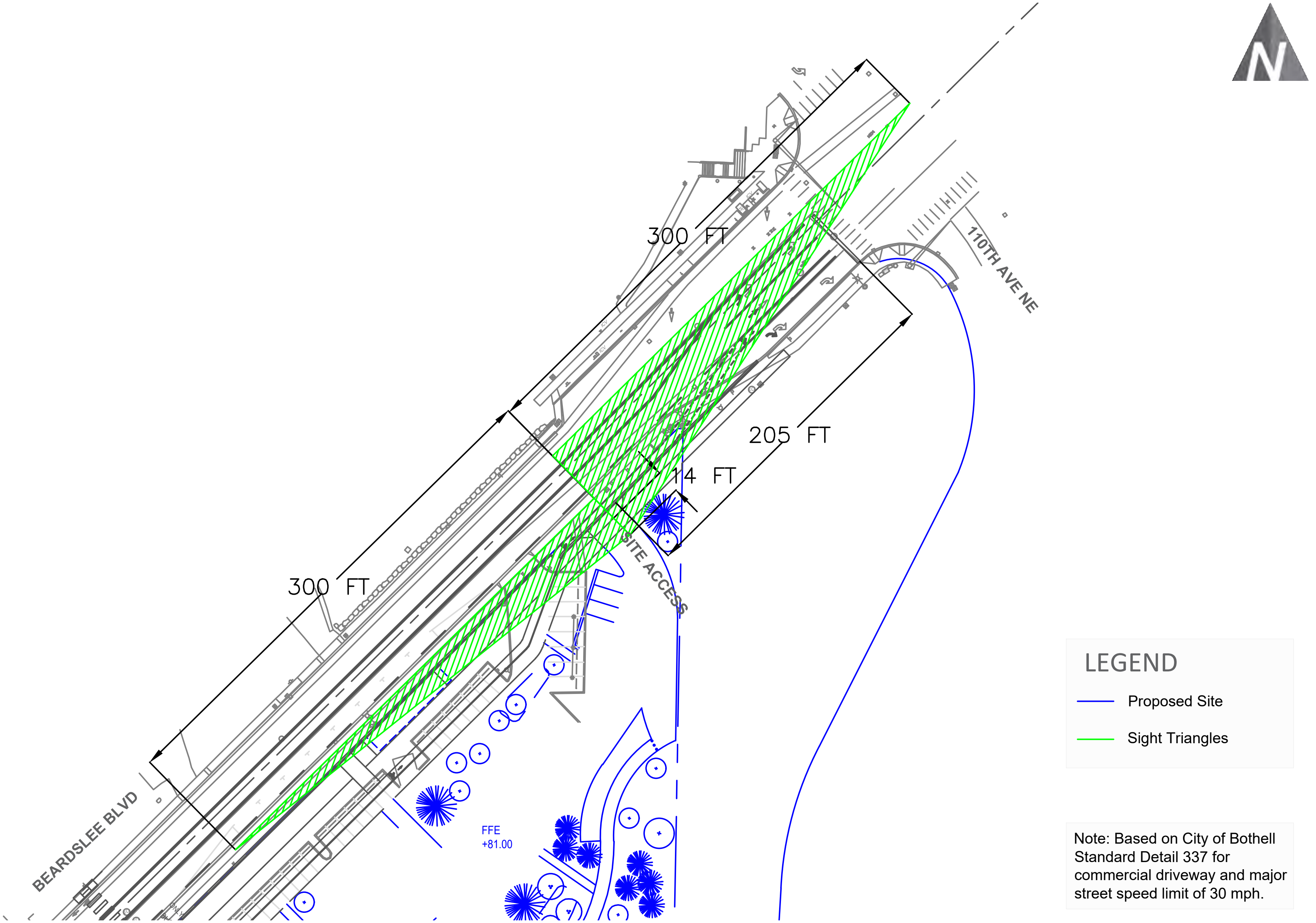
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑		↱
Traffic Vol, veh/h	485	3	0	650	0	3
Future Vol, veh/h	485	3	0	650	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	527	3	0	707	0	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	529
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	-	0	550
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	550
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	550	-	-	-
HCM Lane V/C Ratio	0.006	-	-	-
HCM Control Delay (s)	11.6	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

Attachment C: Sight Distance Triangles



LEGEND

—	Proposed Site
—	Sight Triangles

Note: Based on City of Bothell Standard Detail 337 for commercial driveway and major street speed limit of 30 mph.

Sight Distance Triangles

Capstone Student Housing

ATTACHMENT

C

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Dec 21, 2020 - 1:47pm francescal M:\20\1.20203.00 - UW Student Housing - Capstone\Graphics\DWG\Graphics_20203.dwg Layout: Sight Triangles

Attachment D: Parking Demand

UW Bothell Student Housing - Capstone

Parking Utilization Summary	**Campus Parking Supply**	**Incremental Project Demand**	**Campus Peak Parking Demand**	**Parking Utilization**	**Notes**
Existing Conditions (Fall 2019)	2,101		1,870	89%	Supply based on August 2020 information provided by UW Bothell and includes PUD (on-campus) subtotal, Husky Village (Commuter), and Husky Hall. Average peak demand based on Fall 2019 UW Bothell Parking Utilization study and observed during 12 p.m. hour (PUD subtotal only)
With West Garage	2,706		1,870	69%	Assumes 605 additional stalls within the Cascadia Garage
With STEM Building	2,706	156	2,026	75%	Assumes 650 FTE associated with the STEM Building
With Capstone Student Housing	2,687	97	2,123	79%	
With Capstone Student Housing	*2,687*	*291*	*2,317*		Assumes 716 student dorm-style beds, 322 student apartment-style beds, and 20,000 sf office. Includes removal of 36 commuter stalls associated with Husky Village and addition of 17 stalls.
With Capstone Student Housing and Shift in FTE from Commuter to Residential	*2,687*	*-194*	*2,123*		Assumes removal of 1,029 FTE including 100% of the demand associated with the traditional housing and the apartment-style student housing. Does not include staff apartments.
With Capstone Student Housing (includes on-street parking demand based on Fall 2019 Utilization Report)	*2,687*	*23*	*2,146*	*80%*	Assumes shift in demand to on-campus parking with the removal of 23 on-street parking spaces along Beardslee Boulevard between NE 185th Street and 110th Avenue NE.

Student Housing Demand

Land Use	Size	Parking Rate	Peak Demand	Notes
Traditional Student Housing	699 beds	0.11 per bed	77	Traditional student housing parking rate based on 2018 observations at a student housing development in seattle (Hub at Seattle TIA).
Apartment-Style Student Housing	350 beds	0.43 per bed	151	Apartment-style housing parking rate based on existing residential parking demand rate as noted in the UW Bothell/Cascadia College Campus Master Plan (March 2017)
Staff Apartments (ITE LU #221 - Multifamily Mid-Rise)	3 du	1.31 per du	4	DU = dwelling unit. Staff apartment rate based on ITE Parking Generation 5th Edition Multifamily Mid-Rise land use #221
General Office (local rate - Beardslee Crossing)	20,000 sf	2.05 per 1,000 sf	41	Offce rate based on Beardslee Crossing building with data collected for the Fall 2019 Parking Utilization Study.
Dining Hall Staff	NA	NA	18	Dining hall staff demand based on assumed staffing schedule provided by Capstone.

FTE Growth Sensitivity	Peak Parking Demand Rate/FTE	0.24	
Total Campus FTE without Growth Sensitivity	Additional FTE Growth	Total FTE with Growth Sensitivity	Utilization
8,395	0	8,395	79%
8,395	500	8,895	83%
8,395	1,000	9,395	88%
8,395	1,078	9,473	89%
8,395	**1,605**	**10,000**	**93%**