



April 13, 2022
Project No. 20210394E001

Puyallup School District
323 12th Street NW
Puyallup, WA 98371

Attention: Mr. Les Gerstmann

Subject: Subsurface Exploration, Infiltration Testing, and
Design Infiltration Rate Determination
South Hill Site
14th Street Place SW
Puyallup, Washington

Dear Mr. Gerstmann:

Associated Earth Sciences, Inc. (AESI) is pleased to present this letter-report providing the results of subsurface exploration, infiltration testing, and design infiltration rate determination for the above-referenced project. AESI previously completed a *Subsurface Exploration, Geologic Hazard, Infiltration Feasibility, and Preliminary Geotechnical Engineering Report* dated November 29, 2021.

PROJECT AND SITE DESCRIPTION

The site known as Parcel B is located along 14th Street Place SW just north of 39th Avenue NW in Puyallup, Washington. Roughly rectangular in shape, the site encompasses about 4.8 acres. The site is bounded to the north by a stormwater detention pond associated with the Costco store to the east of the site, to the south by commercial property and undeveloped Parcel A, to the west by Puyallup School District property, and to the east by 14th Street Place SW. Topography on the site varies from relatively flat to undulating and features a 29-foot-tall mound of fill associated with construction of the Costco store across the street. Vegetation across the site generally consists of tall grasses and occasional Scotch broom.

We understand that development of Parcel B will involve using the fill mound to level the site and create a new paved parking area for district school buses relocated from the downtown

Maintenance Facility site. The project will result in additional stormwater runoff, and the currently preferred plan is to convey additional runoff water to a shallow infiltration facility. The location of the infiltration facility has not been finalized, but it may be at the north or south end of the site. During our recent previous geotechnical study, the shallow soils were estimated to have relatively low infiltration rates, and pilot infiltration testing was recommended to estimate design infiltration rates.

We understand that infiltration systems will be designed per Washington State Department of Ecology (Ecology) 2014 *Stormwater Management Manual for Western Washington* (Ecology Manual) as required by the City of Puyallup per *Puyallup Municipal Code* (PMC), Chapter 21.10.040.

PURPOSE AND SCOPE

The purpose of this study was to evaluate shallow subsurface soil and groundwater conditions, conduct infiltration testing, perform grain-size analysis, and to estimate design infiltration rates for planned shallow infiltration facilities. Our study included reviewing previous AESI explorations, observing the excavation of exploration pits, conducting infiltration tests, performing grain-size analyses, and preparing this letter-report per the requirements of the Ecology Manual. The location of the site, the approximate locations of the explorations accomplished for this study, are presented on the “Existing Site and Exploration Plan,” Figure 2.

AUTHORIZATION

Our study was accomplished in general accordance with our proposal for additional work, dated March 15, 2022. This letter-report has been prepared for the exclusive use of the Puyallup School District and their agents, for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted hydrogeology practices in effect in this area at the time our letter-report was prepared. No other warranty, express or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

PREVIOUS STUDIES SUMMARY

We reviewed subsurface information from our geotechnical evaluation and observations during construction of the adjacent LSC Warehouse Infiltration trench, the Kessler Center site and our previous work at the South Hill site. Native site soils consist of a variable thickness layer of silt and silty fine sand (Vashon recessional lacustrine sediments), an intermittent perching layer of glacial till and hard silt, overlying coarse-grained sand and gravel (Vashon advance outwash sediments).

SUBSURFACE EXPLORATION

Subsurface exploration for the infiltration study consisted of four exploration pits (EP-1 through EP-4) and four infiltration tests (IT-1 through IT-4) located on the subject site. Previous explorations for the overall site include the completion of eight exploration borings, one of which was completed as a 90-foot-deep monitoring well.

We explored subsurface conditions at the site in October 2021 and March 2022. The drilling and infiltration test locations were selected based on conceptual plans and discussions with the project civil engineer. The conclusions and recommendations presented in this letter-report are based on AESI's explorations completed for the subject site. The number, locations, and depths of the explorations were completed within site and budgetary constraints. It should be noted that subsurface conditions differing from those encountered in our explorations may be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this letter-report and make appropriate changes.

Exploration and Infiltration Test Pits

The exploration and infiltration test pits were excavated by Northwest Excavating and Trucking, an independent firm working under subcontract to AESI. Our proposed scope of work was to complete two infiltration tests, however, we were able to complete four infiltration tests during the time allocated for two tests. The pits (EP-1 through EP-4 and IT-1 through IT-4) permitted direct, visual observation of subsurface conditions. Materials encountered in the pits were studied and classified in the field by a geologist from AESI. After logging the exposed soils, the pits were backfilled with the excavated soil and lightly tamped with the excavator bucket. Disturbed soil samples were selected from the pits, placed in moisture-tight containers, and transported to AESI's laboratory for further visual classification and testing, as necessary. The exploration logs in Appendix A are based on the field observations and inspection of the samples.

Infiltration Testing

The infiltration testing locations were selected in order to obtain preliminary design infiltration rates for possible infiltration facility locations. At the time the study was completed exact facility locations had not been chosen. The four locations selected were generally north and south of the onsite fill mound. Infiltration testing methods are discussed in more detail later in this letter-report.

SUBSURFACE CONDITIONS

The following text sections describe current site conditions, including vegetation, regional and local topography, regional geology, local soils, and local groundwater. Our sources of information include topographic and geologic maps published by the U.S. Geological Survey (USGS), and aerial photographs published by Google Earth. Subsurface conditions at the project site were inferred from previous and recent field explorations, visual reconnaissance of the site, and review of selected applicable geologic literature.

Published Geologic Map

The 2006 draft USGS Geologic Map for the Puyallup 7.5 minute Quadrangle (Troost, 2006), and the Geologic Map of the Tacoma 1:100,000-scale (Schuster, et al, 2015) indicate that the project site is underlain by Vashon-age Steilacoom gravel outburst deposits. These sediments normally comprise loose to medium dense, well-sorted gravels with sands, and variable amounts of silts and cobbles. The total thickness typically ranges from several feet to several tens of feet. Steilacoom gravel is often underlain by dense to very dense, glacial lodgement till, and the geologic map shows lodgement till covering a large portion of the upland to the west of the site. Our subsurface explorations encountered Vashon-age deposits at the site, however, the Steilacoom gravel unit shown on the regional geology map was not encountered. Instead, we observed a variety of other Vashon-age sediments along with fill soils. In our experience, this deviation from mapped geology is not unusual, because the geology in the project vicinity varies over short distances; other explorations near the project site did encounter Vashon-age finer-grained recessional deposits (silt and sand), lodgement till, and advance outwash.

Published Soils Map

Review of regional soils mapping available via the Natural Resources Conservation Service (NRCS) Web Soil Survey web application indicates that the subject site is underlain by Indianola loamy sand, Alderwood gravelly sandy loam, and Kitsap silt loam, which originated from sandy outwash, glacial drift or outwash, and lacustrine deposits, respectively. Our interpretation of the soils encountered in our explorations is in general agreement with the regional soils mapping.

Stratigraphy

As shown on the exploration logs included in Appendix A, sediments encountered at the site consisted primarily of a surficial layer of topsoil/fill. Vashon lacustrine deposits were encountered directly below the topsoil/fill. Where fully penetrated, the Vashon lacustrine deposits were generally underlain by Vashon advance outwash sediments. In some areas, an interval of transitional melt-out till and Vashon advance outwash sediments were encountered.

The following section presents more detailed subsurface information organized from the youngest to the oldest sediment types.

Topsoil

Organic-rich brown topsoil was observed at the ground surface in all explorations completed where native sediments were present at ground surface elevation (EP-2, IT-2, EB-2, EB-6, EB-7, and EB-8). The observed thicknesses of topsoil ranged between 4 and 6 inches at the exploration locations and are shown on the exploration logs.

Fill

Fill soils (those not naturally placed), were observed in explorations EP-1, EP-3, EP-4, IT-1, IT-3, IT-4, EB-1W, EB-3, EB-4, EB-5, and EB-6. The observed fill thicknesses ranged between 1 foot and 29 feet. Figure 2 includes the observed fill depths at each of the exploration locations. The fill generally consisted of loose to medium dense, moist, light brown to brown, fine to medium sand with variable silt content and variable gravel content. Organics (wood pieces) and faint organic odors were observed in the fill at the locations of borings EP-1, IT-1, EB-3 and EB-4.

Vashon Recessional Lacustrine Deposits

Immediately below the surficial topsoil and/or fill, in all explorations except EB-3, we observed a thick deposit of massive to stratified, silty, fine sands and fine, sandy silts. We interpret this deposit to be Vashon recessional lacustrine sediments that were deposited in a lake or other low-energy setting during the retreat of the Vashon ice sheet. These sediments have a low permeability and can be challenging for stormwater infiltration due to a high percentage of fines. The recessional lacustrine deposit extended to depths of 22.5 feet (EB-1W), 9 feet (EB-2), 39 feet (EB-4), 7.5 feet (EB-5), 12.5 (EB-7), 18.5 (EB-8), 11.5 (EP-1/IT-1), 9 (EP-2/IT-2) and 11.5 (EP-3/IT-3). We did not observe the bottom of the lacustrine deposit in EB-6 or EP-4/IT-4.

Vashon Melt-out Till

In explorations EP-1, EP-2, EP-3, IT-1, IT-2, IT-3, EB-2, EB-4, EB-5, EB-7, and EB-8 we observed a thin layer of sediments interpreted as Vashon melt-out till below the Vashon recessional lacustrine sediments and above the Vashon advance outwash. The sediments were generally an unsorted mixture of silty fine sand to sandy silt with variable amounts of coarser sands and gravel and ranged from medium dense to dense/hard. The Vashon melt-out till was deposited in conjunction with debris-laden, glacial ice during the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. This material is not recommended for use as an infiltration receptor due to its variable density and generally high silt content.

Vashon Advance Outwash

In exploration borings EB-1W, EB-2, EB-3, EB-5, and EB-7 we observed dense sand and gravel with variable silt content that we interpret to be Vashon advance outwash. Advance outwash deposits were encountered at depths of 22.5 feet (EB-1W), 12.5 feet (EB-2), 29 feet (EB-3), 13 feet (EB-5), and 17.5 feet (EB-7). The advance outwash likely continued beyond the termination of each boring where it was observed. The Vashon advance outwash consists of sediments that were deposited by meltwater streams that emanated from the advancing Vashon glacier, and were subsequently consolidated by the massive weight of the glacial ice. Where permeable and unsaturated, these sediments are suitable for stormwater infiltration.

Laboratory Grain-Size Analysis

Grain-size (sieve) analysis were performed by AESI's in-house laboratory on nine representative, selected samples collected during AESI's subsurface exploration. Six sieves were conducted on the Vashon recessional lacustrine deposits, and three on the Vashon advance outwash. The sieve results are summarized in Table 1 below. Based on the ASTM D-2487 Unified Soil Classification System (USCS), the grain-size analyses (included in Appendix B) indicate that the samples of the near surface recessional lacustrine deposits correlate to silty to very silty sand or sandy to very sandy silt. As shown below the fines content in the lacustrine deposits ranged from about 24 percent to 80 percent.

Table 1
Laboratory Grain-Size Analysis Summary

Exploration No.	Depth (feet)	Geologic Unit	Sieve Results - Calculated Percent			USCS
			Gravel (%)	Sand (%)	Fines (%)	
EB-1W	30	Qva	48.8	43.3	7.9	GP-GM
EB-2	20	Qva	48.7	40.1	11.2	GW-GM
EB-5	15	Qva	48.5	43.6	7.9	GP-GM
EB-7	5	Qvrl	0.1	41.2	58.7	ML
IT-3	5	Qvrl	1.2	55	43.8	SM
IT-4	5	Qvrl	0.8	69.9	29.3	SM
IT-4	7	Qvrl	0.0	76.4	23.6	SM
IT-1	5	Qvrl	0.0	20.2	79.8	ML
IT-2	5	Qvrl	1.8	48	50.2	ML

USCS = Unified Soil Classification System

Qvrl = Vashon recessional lacustrine deposits

Qva = Vashon advance outwash

CEC and Organic Content Analysis

AESI submitted a representative portion of the tested recessional lacustrine sediments from IT-1, IT-2, IT-3 and IT-4 Northwest Agricultural Consultants in Kennewick, Washington, for cation exchange capacity (CEC) testing per U.S. Environmental Protection Agency (EPA) Method 9081 and organic matter content by weight per ASTM D-2974. The samples had a CEC ranging from 9.7 to 13.1 milliequivalents per 100 grams of soil (meq/100g) and an organic content ranging from 1.46 to 2.27 percent. All laboratory testing results are included in Appendix B.

Hydrogeology and Groundwater Monitoring

Regional Hydrogeology

Descriptions of regional hydrogeology are contained in reports prepared by the USGS, including Water-Supply Bulletin No. 22 (Walters and Kimmel, 1968) and *Hydrogeologic Framework, Groundwater Movement, and Water Budget in the Puyallup River Watershed and Vicinity, Pierce and King Counties, Washington*, Scientific Investigations Report 2015-5068 (Welch et al., 2015). The aquifer in the site vicinity is contained within the lower portion of the advance outwash sediments (Qva) and some pre-Fraser non-glacial deposits above older pre-Fraser deposits. The aquifer is referred to as the Qva aquifer in this letter-report. Groundwater flow within the Qva aquifer is in part controlled by the underlying low-permeability pre-Fraser-age deposits. The elevation of the regional Qva aquifer in the site vicinity is not well constrained. South of site, the elevation varies from about 250 feet to 320 feet. A monitoring well at the adjacent Kessler Center site encountered groundwater interpreted as the regional Qva aquifer at about elevation 288 to 289 feet. We also observed the Qva aquifer in EB-1W at the site at an elevation of about 278-279. The base of the aquifer and discharge springs are mapped at about elevation 160 feet about a mile north of the site. The aquifer thickness is likely greater than 50 feet (Welch et al., 2015). Groundwater flow direction is generally to the north toward the Puyallup River valley. Recharge to the unconfined Qva aquifer in the site vicinity is primarily through rainfall.

Site Groundwater

Site groundwater consists of two general water-bearing zones: (1) perched water in the recessional lacustrine deposits, and (2) deeper groundwater in the regional Qva aquifer. The recessional lacustrine sediments are intermittently wet at the base of the geologic unit if the till layer is present. We interpret that the perched groundwater likely flows along the base of the unit, controlled by the form of the underlying glacial till, if present. Groundwater seepage was not observed at the time of excavation during the infiltration testing field work.

Monitoring well EB-1W was completed within the Qva sediments. Water level monitoring is ongoing within the monitoring well. The monitoring program is intended to document the

water table aquifer contained at depth in the Qva deposits. To date, the groundwater has been observed to be at approximately 85 feet deep, corresponding to an elevation of 278 feet AMSL.

It should be noted that the depth of occurrence of groundwater seepage may vary in response to changes in season, amount of precipitation, and on- and off-site land use. Explorations for the current study were conducted in the fall of 2021 and spring of 2022.

INFILTRATION TESTING

Four infiltration tests were completed at the locations shown on Figure 2 as IT-1, IT-2, IT-3 and IT-4. The locations for infiltration tests IT-1 and IT-3 were selected by the project civil engineer, north and south of the onsite fill stockpile. Two additional infiltration test locations designated as IT-2 and IT-4 were selected by AESI to obtain more infiltration data for shallow subsurface soils across the site.

Methodology

Each test was conducted using the small-scale Pilot Infiltration Test (PIT) procedure outlined in the Ecology Manual. All tests were conducted in open pits at an average depth of 5 feet below existing ground surface, based on input from the project civil engineer. All of the infiltration tests were conducted within the fine sandy, silty lacustrine deposits. A staff gauge with 0.01 foot divisions was placed in the base of each infiltration test pit to allow for water level stage monitoring during testing. Water was introduced into the test area using fire hoses attached to a digital propeller flow meter assembly and was sourced from a 4,000-gallon water truck, supplied by Northwest Excavating and Trucking. The discharge hose was equipped with a diffuser to minimize turbulence and scouring of the pit bottom. The flow meter has both an instant read flow rate and a total flow volume readout. Readings of the depth to water, instantaneous flow rate, and total flow volume were recorded at approximately 5- to 15-minute intervals. No groundwater was present prior to testing.

Each test included a constant-head phase and a falling-head phase. During the first (constant-head) phase of each test, the test pit was filled with water to a height of about 12 inches, then maintained for approximately 7 hours. At the end of the constant-head phase, the water flow was shut off and a falling-head phase was started. During this second phase, the water level drop in the test pit was measured at approximately 5- to 15-minute intervals on a staff gauge. After completing each test, we observed the test pit subgrade being overexcavated to the limits of the excavating equipment. This allowed for direct observation of the types of sediments that received the infiltration testing water, and to identify any restrictive layers.

Field infiltration rates of IT-1 and IT-2 (north and northeast of the fill mound) in the Vashon recessional lacustrine deposits ranged from -0.6 to -0.7 inches per hour. The field infiltration

rate of IT-3 (south of the fill mound) in the Vashon recessional lacustrine deposits was 3.4 inches per hour. The field infiltration rate of IT-4 (southwest of the fill mound) in the Vashon recessional lacustrine deposits was 8.1 inches per hour. The infiltration test data was recorded by hand in the field and subsequently transferred to an electronic spreadsheet. The test depth, geologic unit tested, test base area, discharge time, and the uncorrected field infiltration rates of each infiltration test is summarized in Table 2.

Table 2
Infiltration Test Summary

Test Number	Test Depth (feet)	Geologic Unit	Test Base Area (square feet)	Water Discharge Time (minutes)	Uncorrected Field Infiltration Rate (inches/hour)
IT-1	5	Recessional Lacustrine	29	420	0.7
IT-2	5	Recessional Lacustrine	35	380	0.6
IT-3	5	Recessional Lacustrine	40	420	3.4
IT-4	5	Recessional Lacustrine	41	420	8.1

DESIGN INFILTRATION RATE DETERMINATION

The aforementioned short-term infiltration rates are considered to be uncorrected and, therefore, non-conservative for design purposes. As such, the Ecology Manual requires that a series of partial correction factors be applied to these short-term values. The design infiltration rate was derived using the correction factors for site variability (CF_v), testing (CF_t), and maintenance (CF_m), per the following formulas:

$$\text{Total Correction Factor} = CF_T = CF_v \times CF_t \times CF_m$$

and

$$K_{\text{sat design}} = K_{\text{sat initial}} \times CF$$

where $K_{\text{sat design}}$ and $K_{\text{sat initial}}$ are the design and measured infiltration rates, respectively.

The specific factors derived for individual test results are summarized in Table 3. The corrected infiltration rates shown in the last column of Table 3 represent the maximum allowable long-term design rate after the total correction factor (CF_T) has been applied.

Table 3
Summary of Infiltration Rates and Correction Factors

Data Source	Uncorrected Infiltration Rate (in/hr)	Correction Factors				Corrected Infiltration Rate (in/hr)
		CF _v	CF _t	CF _m	CF _T	
IT-1	0.7	0.7 ¹	0.5 ²	0.9 ³	0.315	0.22
IT-2	0.6	0.7 ¹	0.5 ²	0.9 ³	0.315	0.19
IT-3	3.4	0.7 ¹	0.5 ²	0.9 ³	0.315	1.1
IT-4	8.1	0.7 ¹	0.5 ²	0.9 ³	0.315	2.5

in/hr = inches per hour

CF_v = correction factors for site variability

CF_t = correction factors for testing

CF_m = correction factors for maintenance

CF_T = total correction factor

1 This value reflects the variable conditions within the Vashon recessional lacustrine deposits.

2 This value reflects the prescribed correction factor of 0.5 for a small-scale Pilot Infiltration Test.

3 This value is suggested by the Ecology 2019 *Stormwater Management Manual for Western Washington*.

CONCLUSIONS AND RECOMMENDATIONS

Our explorations and testing indicate that, from a geotechnical and hydrogeologic standpoint, the subject site is suitable for limited stormwater infiltration in shallow facilities. Corrected shallow infiltration rates in the lacustrine deposits are relatively slow, ranging between 0.2 and 2.5 inches per hour. If shallow infiltration is pursued, we recommend that the infiltration facility be placed southwest of the onsite fill stockpile (where faster rates were observed), the design be consistent with the Ecology Manual and be based on a design rate of 1.1 in/hr. The design value assumes that actual subgrade soils are consistent with those encountered at our testing locations.

Stripping and Subgrade Overexcavation

We recommend that the infiltration base be stripped of topsoil and excavated and be embedded a minimum of 2 feet of the underlying Vashon lacustrine sediments. Subgrade preparations should be observed by AESI. If this depth is greater than the currently proposed design infiltration subgrade, the excavation can be partially backfilled with washed free-draining aggregate up to the facility design subgrade.

Stripping and overexcavation should be performed in a manner that does not disturb the underlying receptor horizon. In addition, the subsequent placement of washed import free-draining aggregate, if applicable, on the areas proposed for infiltration should be completed in a manner that minimizes impacts to the framework and density of the native soil.

Use of heavy equipment in the areas proposed for infiltration has the potential to compact the subgrade and reduce infiltration potential. As such, we recommend using an excavator with a toothed bucket to strip and scarify the subgrade without tracking over it. An excavator should also be used to initially place the aggregate material over the stripped subgrade to reduce the potential for disturbance. Construction activity on the surface that results in compaction of the native soil will have a detrimental effect on the infiltration rate.

Protection of Infiltration Facilities During Construction

Once the facilities are excavated and constructed, the contractor must provide temporary protection of the facility subgrade to keep the subgrade free of water and fine-grained sediments. Uncontrolled runoff into the infiltration facilities constitutes failure of the subgrade, requiring removal of all backfill materials and contaminated subgrade, and replacement with clean backfill materials.

The infiltration facilities must be kept isolated from influent flows until after the site has been stabilized, so that only clean water is introduced into the infiltration facility.

Plan Review and Construction Monitoring

We understand that the proposed facility layouts may be updated as design plans progress. We recommend that AESI should review the plans when they become available. We are available to provide additional geotechnical/hydrogeologic consultation as the project design develops and possibly changes from that upon which this letter-report is based. We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, our infiltration recommendations may be properly interpreted and implemented in the design.

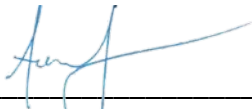
We are also available to provide geotechnical engineering and hydrogeologic monitoring services during construction of the infiltration facility. The infiltration performance depends on verification of anticipated subsurface conditions, proper site preparation, backfill quality, and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of the current scope of work. If these services are desired, please let us know and we will prepare a cost proposal.

CLOSURE

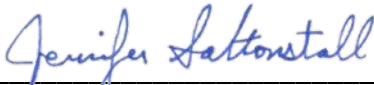
We have enjoyed working with you on this study and are confident these recommendations will aid in the successful completion of your project. If you should have any questions, or require further assistance, please do not hesitate to call.

Sincerely,

ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



Aaron Turnley
Senior Staff Geologist



Jennifer H. Saltonstall, L.G., L.Hg.
Principal Geologist/Hydrogeologist



Stephen A. Siebert, P.E.
Associate Geotechnical Engineer

Attachments: Figure 1: Vicinity Map
 Figure 2: Existing Site and Exploration Plan
 Appendix A: Exploration Logs
 Appendix B: Laboratory Testing Results

APPENDIX A

Exploration Logs



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Exploration Pit

EP-1

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/23/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; slight organic odor (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND, to fine sandy, SILT (SM-ML).
5	Becomes more stratified. Less stratified.
7.5	Loose/soft, moist, grayish brown, silty, fine SAND, to fine sandy, SILT (SM-ML).
10	Loose/soft, very moist, brownish gray with orange mottling, silty, fine SAND, to fine sandy, SILT, some gravel (SM-ML).
12.5	Vashon Melt Out Till Dense, very moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles; diamict / till-like; excavates in clasts (SM).
15	No seepage. No caving.
17.5	
20	

4/13/2022

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Exploration Pit

EP-2

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/23/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Topsoil - 6 inches
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT (SM-ML).
5	Soft, moist, light brown, fine sandy, SILT, trace gravel (ML). Loose, moist, light brown, silty, fine SAND, trace gravel, trace cobbles (SM).
7.5	Becomes slightly stratified
10	Vashon Melt Out Till Dense, moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles (SM). Excavates in clasts of diamict (till-like).
12.5	No seepage. No caving.
15	
17.5	
20	

4/13/2022

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Exploration Pit

EP-3

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/23/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; rootlets (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT, trace gravel; occasional rootlets (SM-ML). Becomes slightly stratified.
5	Loose, moist, light brown with faint orange iron oxide mottling, silty, fine SAND, some gravel, trace rootlets (SM). Gravel content decreases with depth.
7.5	Loose, moist, brownish gray with faint iron oxide staining, gravelly, silty, fine SAND (SM).
10	Loose, moist, brownish gray with faint orange oxide staining, silty, fine SAND, trace gravel (SM).
12.5	Vashon Melt Out Till Medium dense, moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles; diamict / till like clasts (SM). No seepage. No caving.
15	
17.5	
20	

4/13/2022

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Exploration Pit

EP-4

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/24/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; organic odor; rootlets observed (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT (SM-ML). Becomes slightly less silty.
5	Loose, moist, grayish brown with faint iron oxide staining, silty, fine SAND, trace gravel (SM).
7.5	Loose, moist, brownish gray, silty, fine SAND (SM).
10	
12.5	No seepage. No caving.
15	
17.5	
20	

4/13/2022

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Exploration Pit

IT-1

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/23/22

Logged By: ART

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Total Depth (ft): 12

Approved By: JH

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; slight organic odor; asphalt fragments observed (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, wet, light brown with orange mottling, silty, fine SAND, to fine sandy, SILT (SM-ML).
5	Soft, light brown with faint orange mottling, fine sandy, SILT (ML). Less stratified. Becomes more moist. Loose/soft, very moist, grayish brown, silty, fine SAND, to fine sandy, SILT (SM-ML).
7.5	Loose/soft, very moist, brownish gray with orange mottling, silty, fine SAND to fine sandy, SILT, some gravel (SM-ML).
10	
12.5	Vashon Melt Out Till Dense, very moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles; diamict / till-like; excavates in clasts (SM). No seepage. No caving. Infiltration test performed at 5 feet.
15	
17.5	
20	

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Exploration Pit

IT-2

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/23/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Topsoil - 6 inches
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT (SM-ML).
5	Soft, very moist, light brown, fine sandy, SILT, trace gravel (ML). Loose, very moist, light brown, silty, fine SAND, trace gravel, trace cobbles (SM).
7.5	Becomes slightly stratified.
10	Vashon Melt Out Till Dense, moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles (SM). Excavates in clasts of diamict (till-like).
12.5	No seepage. No caving. Infiltration test performed at 5 feet.
15	
17.5	
20	

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Exploration Pit

IT-3

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date:

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JHS

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; rootlets (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT, trace gravel; occasional rootlets (SM-ML). Becomes slightly stratified.
5	Loose, very moist to wet, light brown with faint orange iron oxide mottling, silty, fine SAND, trace gravel; rootlets (SM). Gravel content decreases with depth.
7.5	Loose, very moist, brownish gray with faint orange iron oxide mottling, silty, fine SAND, some gravel (SM).
10	Loose, moist to very moist (post test water), brownish gray with faint iron oxide mottling, silty, fine SAND, trace gravel (SM).
12.5	Vashon Melt Out Till Medium dense, moist, brownish gray, silty, fine to medium SAND, some gravel, trace cobbles; diamict / till-like (SM). No seepage. No caving. Infiltration test performed at 5 feet.
15	
17.5	
20	

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Exploration Pit

IT-4

Puyallup School District - South Hill Site

Sheet: 1 of 1

Puyallup, WA

Date: 3/24/22

Logged By: ART

20210394E001

Total Depth (ft): 12

Approved By: JH

Depth (ft)	Description
0	Fill Loose, moist, brown, silty, fine SAND, some gravel, trace cobbles; organic odor; rootlets observed (SM).
2.5	Vashon Recessional Lacustrine Loose/soft, moist, light brown with orange mottling, silty, fine SAND to fine sandy, SILT (SM). Becomes slightly less silty.
5	Loose, very moist to wet, grayish brown with faint iron oxide staining, silty, fine SAND, trace gravel (SM).
7.5	Loose, moist, very moist, brownish gray, silty, fine SAND (SM).
10	
12.5	No seepage. No caving. Infiltration test performed at 5 feet.
15	
17.5	
20	

4/13/2022

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Geologic & Monitoring Well Construction Log

Project Number
20210394E001

Well Number
EB-1W

Sheet
1 of 4

Project Name **PSD- South Hill Site**

Elevation (Top of Well Casing) **362.31**

Water Level Elevation **45 Dry (10/27/2021)**

Drilling/Equipment **Advance / D-50 Track Mount H.S.A.**

Hammer Weight/Drop **140# / 30**

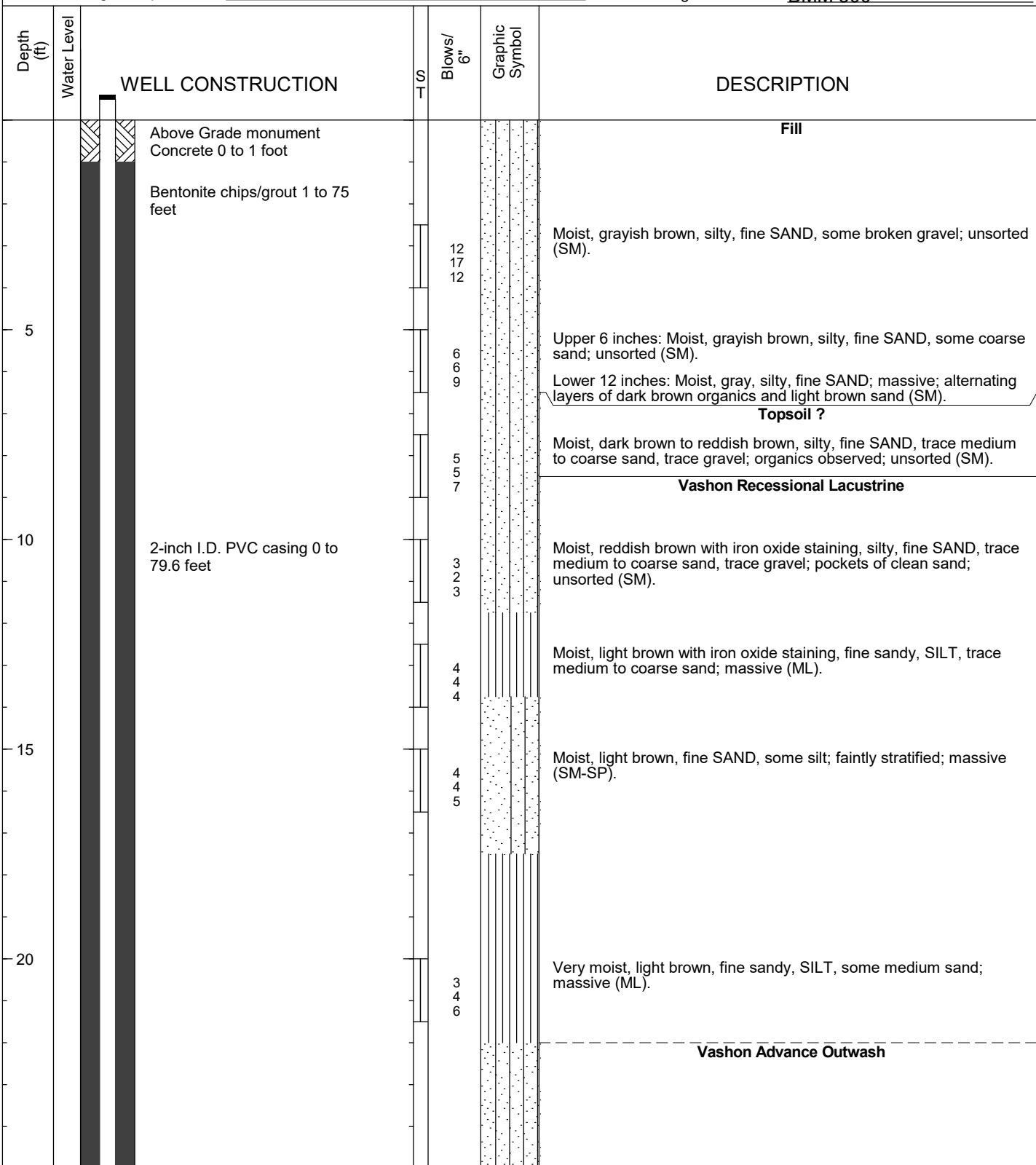
Location **Puyallup, WA**

Surface Elevation (ft) **~360**

Date Start/Finish **10/20/21, 10/21/21**

Hole Diameter (in) **4.25 i.d.**

Well Tag # **BMM 300**



Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture

Logged by: ART



3" OD Split Spoon Sampler (D & M)



Ring Sample



Water Level ()

Approved by: JHS



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

NWELL- B 20210394E001.GPJ BORING.GDT 11/30/21



Geologic & Monitoring Well Construction Log

Project Number
20210394E001

Well Number
EB-1W

Sheet
2 of 4

Project Name **PSD- South Hill Site**
 Elevation (Top of Well Casing) **362.31**
 Water Level Elevation **45 Dry (10/27/2021)**
 Drilling/Equipment **Advance / D-50 Track Mount H.S.A.**
 Hammer Weight/Drop **140# / 30**

Location **Puyallup, WA**
 Surface Elevation (ft) **~360**
 Date Start/Finish **10/20/21, 10/21/21**
 Hole Diameter (in) **4.25 i.d.**
 Well Tag # **BMM 300**

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
				7 17 36		Moist, brownish gray, silty, fine to medium SAND, some coarse sand, some broken gravel; organic; layer (3 inches thick) of dark brown sandy silt with rootlets; unsorted (SM).
30				17 35 36		Moist, brownish gray, fine to medium sandy, GRAVEL, some silt, some coarse sand; broken gravels; unsorted (GP-GM). Driller notes gravel at 32 feet. Drill action changes.
35				27 50/6"		Moist, brownish gray, gravelly, fine to medium SAND, some silt, some broken gravel, trace medium to coarse sand; unsorted (SP-SM). Gravelly drilling.
40				44 50/5"		Moist, brownish gray, fine to medium sandy, GRAVEL, some silt; contains rare red sand grains; unsorted; poor recovery (GP-GM).
45	▼			37 50/5"		Wet, brownish gray, silty, fine to medium SAND, some coarse sand, some gravel; unsorted (SM).

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture

Logged by: ART



3" OD Split Spoon Sampler (D & M)



Ring Sample



Water Level ()

Approved by: JHS



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

NWELL- B 20210394E001.GPJ BORING.GDT 11/30/21



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Geologic & Monitoring Well Construction Log

Project Number
20210394E001

Well Number
EB-1W

Sheet
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Project Name **PSD- South Hill Site**

Elevation (Top of Well Casing) **362.31**

Water Level Elevation **45 Dry (10/27/2021)**

Drilling/Equipment **Advance / D-50 Track Mount H.S.A.**

Hammer Weight/Drop **140# / 30**

Location **Puyallup, WA**

Surface Elevation (ft) **~360**

Date Start/Finish **10/20/21, 10/21/21**

Hole Diameter (in) **4.25 i.d.**

Well Tag # **BMM 300**

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
				43 50/6"		Moist, brownish gray, fine to medium SAND, some silt, some broken gravel; unsorted (SP-SM).
55				50/4"		Moist, brownish gray, fine to medium SAND, trace to some silt contains rare red sand grains; unsorted; poor recovery due to random large gravel (SP).
60				50/2"		No recovery.
65				36 42 50/3"		Very moist, brownish gray, medium to coarse SAND, some fine sand, some silt, trace gravel; unsorted (SP-SM).
70				50/1"		Very moist, brownish gray, silty, fine to medium SAND; poor recovery due to gravel (SM).

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture

Logged by: ART



3" OD Split Spoon Sampler (D & M)



Ring Sample



Water Level ()

Approved by: JHS



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

NWELL- B 20210394E001.GPJ BORING.GDT 11/30/21



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Geologic & Monitoring Well Construction Log

Project Number
20210394E001

Well Number
EB-1W

Sheet
4 of 4

Project Name **PSD- South Hill Site**

Elevation (Top of Well Casing) **362.31**

Water Level Elevation **45 Dry (10/27/2021)**

Drilling/Equipment **Advance / D-50 Track Mount H.S.A.**

Hammer Weight/Drop **140# / 30**

Location **Puyallup, WA**

Surface Elevation (ft) **~360**

Date Start/Finish **10/20/21, 10/21/21**

Hole Diameter (in) **4.25 i.d.**

Well Tag # **BMM 300**

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
				32 50/5"		Very moist, brownish gray, fine to coarse SAND, some silt, trace gravel; unsorted (SP-SM).
		Sand pack 75 to ~90 feet		46 50/4"		As above; more gravel; coarsens with depth.
80				50/4"		Moist, brownish gray, fine to medium SAND, some silt, trace broken gravel; unsorted; poor recovery (SP-SM).
85		2-inch I.D. PVC well screen 0.020-inch slot width 79.6 to 89.6 feet		50/5"		Moist, grayish brown, silty, fine SAND, some broken gravel; unsorted; poor recovery (SM).
90						Boring terminated at 90.5 feet Well completed at 89.6 feet on 10/21/21. Perched water at 45 at the time of drilling. Well was dry at time of insallation and on 10/27/21.
95						

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture

Logged by: ART



3" OD Split Spoon Sampler (D & M)



Ring Sample

Water Level ()

Approved by: JHS



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-2

Sheet
1 of 2

Project Name PSD- South Hill Site

Location Puyallup, WA

Driller/Equipment Advance / D-50 Track Mount H.S.A.

Hammer Weight/Drop 140# / 30

Ground Surface Elevation (ft) ~357

Datum NAVD88

Date Start/Finish 10/21/21, 10/21/21

Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Blows/ft	Blows/Foot				Other Tests
								10	20	30	40	
5		S-1		Topsoil - 6 inches								
				Vashon Recessional Lacustrine								
				Moist, light brown, silty, fine SAND; faint stratification; massive (SM).		4 4 4	▲8					
10		S-2		Vashon Ice Contact / Melt-out Till								
				Gravel at 9 feet. Moist, brownish gray, silty, fine SAND, some medium sand, some broken gravel; layer (0.5 inches thick) of dark organics observed; unsorted; blowcounts overstated (SM).		22 18 20				▲38		
15		S-3		Vashon Advance Outwash								
				Moist, brownish gray, silty, fine SAND, some medium to coarse sand, some broken gravel; coarsens with depth; cleaner sand towards bottom of sampler; unsorted (SM).		16 28 31						▲59
20		S-4		Moist, brownish gray, fine to medium sandy, GRAVEL, some silt, some coarse sand; broken gravel (GP-GM).		18 47 50/5"						▲50/5"
				Gravelly drill action.								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



3" OD Split Spoon Sampler (D & M)



Grab Sample



No Recovery



Ring Sample



Shelby Tube Sample

M - Moisture



Water Level ()



Water Level at time of drilling (ATD)

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Exploration Boring

Project Number
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Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~357
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/21/21, 10/21/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
		S-5		Moist, brownish gray to light gray, fine to medium SAND, some silt, some coarse sand, some gravel; unsorted (SM).			50/6"					▲ 50/6"
30		S-6		Moist, brownish gray, fine to medium SAND, some silt, some coarse sand, trace gravel; unsorted (SP-SM).		28 50/5"						▲ 50/5"
				Bottom of exploration boring at 30.9 feet No groundwater encountered.								
35												
40												
45												

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture



3" OD Split Spoon Sampler (D & M)



Ring Sample

Water Level ()



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

Logged by: ART

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Exploration Boring

Project Number
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Sheet
1 of 2

Project Name PSD- South Hill Site

Location Puyallup, WA

Driller/Equipment Advance / D-50 Track Mount H.S.A.

Hammer Weight/Drop 140# / 30

Ground Surface Elevation (ft) ~376

Datum NAVD88

Date Start/Finish 10/21/21, 10/21/21

Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Blows/ft	Blows/Foot				Other Tests
								10	20	30	40	
				Fill								
				Gravelly drilling.								
5		S-1		Moist, gray, silty, gravelly, fine SAND, some medium to coarse sand, contains broken gravel; faint organic odor; unsorted (SM).		12 9 12				▲31		
				Gravelly drilling.								
10		S-2		Moist, gray, silty, gravelly, fine SAND, some medium to coarse sand; contains broken gravel; small dark brown organic pieces observed; unsorted (SM).		7 9 9			▲18			
15		S-3		Moist, dark brown to brown, silty, gravelly, fine SAND, trace medium to coarse sand; organics throughout; faint organic odor; unsorted (SM).		12 13 10				▲23		
20		S-4		Moist, dark gray to bluish gray, silty, fine SAND; organics throughout; unsorted (SM).		7 9 12				▲21		
				Fill / Weathered Vashon Advance Outwash ?								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



3" OD Split Spoon Sampler (D & M)



Grab Sample



No Recovery



Ring Sample



Shelby Tube Sample

M - Moisture



Water Level ()



Water Level at time of drilling (ATD)

Logged by: ART

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Exploration Boring

Project Number
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Exploration Number
EB-3

Sheet
2 of 2

Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~376
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/21/21, 10/21/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Blows/ft	Blows/Foot				Other Tests
								10	20	30	40	
		S-5		Moist, dark to light brown with slight oxidation, silty, fine SAND, trace gravel; occasional organics (rootlets and larger pieces); unsorted (SM).		5 7 7		▲14				
30		S-6		Vashon Advance Outwash Driller reports gravel at 29 feet. Moist, brown to light brown, silty, fine SAND, some medium sand, some broken gravel; unsorted (SM).		14 23 19						▲42
35		S-7		Moist, grayish brown, fine to medium SAND, some silt, some coarse sand, trace gravel; coarsens with depth; unsorted (SP-SM).		18 20 22						▲42
40		S-8		Moist, grayish brown to brownish gray, silty, fine to medium SAND, trace coarse sand; broken gravel observed; unsorted; poor recovery (SM).		25 28 20						▲48
45				Bottom of exploration boring at 41.5 feet No groundwater encountered.								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



3" OD Split Spoon Sampler (D & M)



Grab Sample



No Recovery



Ring Sample



Shelby Tube Sample

M - Moisture

▽ Water Level ()

▼ Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS

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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-4

Sheet
1 of 2

Project Name PSD- South Hill Site
Location Puyallup, WA
Driller/Equipment Advance / D-50 Track Mount H.S.A.
Hammer Weight/Drop 140# / 30

Ground Surface Elevation (ft) ~382
Datum NAVD88
Date Start/Finish 10/21/21, 10/21/21
Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
Fill												
5		S-1		Moist, dark brownish gray, silty, gravelly, fine SAND, some medium to coarse sand, trace organics; faint organic odor; unsorted (SM).			7 8 12		▲20			
10		S-2		Moist, dark brownish gray to greenish gray, silty, gravelly, fine SAND; occasional organics; unsorted (SM).			3 4 4	▲8				
15		S-3		Moist, bluish gray, silty, fine SAND, trace broken gravel; organics throughout; banding (1 inch thick) of dark brown organics; unsorted (SM).			3 3 4	▲7				
20		S-4		Moist, dark brown to bluish brown, silty, fine SAND; abundant organics; organic odor; unsorted (SM).			3 4 5	▲9				

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



3" OD Split Spoon Sampler (D & M)



Grab Sample



No Recovery



Ring Sample



Shelby Tube Sample

M - Moisture



Water Level ()



Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS



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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-4

Sheet
2 of 2

Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~382
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/21/21, 10/21/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
		S-5		As above.			5 6 9		▲15			
				Driller reports gravel at 27 feet.								
				Vashon Recessional Lacustrine								
30		S-6		Moist, light brown with slight mottling, silty, fine SAND ranges to sandy, SILT, trace coarse sand; faintly stratified otherwise massive (SM).			5 5 5		▲10			
35		S-7		Very moist, light brown with iron oxide staining, silty, fine SAND to fine sandy, SILT, trace gravel; faintly stratified otherwise massive (SM-ML).			3 4 5		▲9			
				Vashon Ice Contact / Melt-out Till								
40		S-8		Moist, grayish brown, silty, fine SAND, trace broken gravel; till-like (SM).			5 10 12		▲22			
				Bottom of exploration boring at 41.5 feet No groundwater encountered.								
45												

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture



3" OD Split Spoon Sampler (D & M)



Ring Sample



Water Level ()



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-5

Sheet
1 of 1

Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~359
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/22/21, 10/22/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
5		S-1		Fill Moist, grayish brown, silty, fine SAND; dark organic banding; unsorted (SM). Vashon Recessional Lacustrine Lower 6 inches: Moist, light brown with iron oxide staining, silty, fine SAND; faintly stratified otherwise massive (SM).		2 5 9		▲14				
		S-2		Moist, brownish gray with iron oxide staining, silty, fine SAND ranging to fine sandy, SILT, trace gravel; occasional organics observed; faintly stratified otherwise massive (SM).		5 4 5		▲9				
				Vashon Ice Contact / Melt-out Till								
		S-3		Moist, brownish gray, silty fine SAND ranges to fine sandy, SILT, some broken gravel, trace medium to coarse sand; till-like (SM-ML).		5 11 11		▲22				
				Vashon Advance Outwash Driller reports gravel.								
15		S-4		Moist, brownish gray, fine to medium sandy, GRAVEL, some silt, some coarse sand; contains broken gravel; unsorted (GP-GM).		12 22 22						▲44
20		S-5		No recovery; due to gravel.		29 44 50/5"						▲50/5"
				Bottom of exploration boring at 21.4 feet No groundwater encountered.								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture



3" OD Split Spoon Sampler (D & M)



Ring Sample

Water Level ()



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS

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Exploration Boring

Project Number
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Exploration Number
EB-6

Sheet
1 of 1

Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~352
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/22/21, 10/22/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
				Fill / Topsoil ?								
5		S-1		Moist, brown to dark brown, silty, fine SAND, trace medium sand; rootlets observed; dark organic banding throughout; unsorted (SM).		2 2 2	▲4					
				Vashon Recessional Lacustrine								
10		S-2		Very moist, light brown iron oxide staining, silty, fine SAND to fine sandy, SILT; faintly stratified otherwise massive (SM-ML).		8 4 6	▲10					
				Gravelly drilling at 12 feet.								
15		S-3		As above; very moist.		2 2 2	▲4					
20		S-4		As above; greater gravel content in tip.		9 7 11	▲18					
				Bottom of exploration boring at 21.5 feet No groundwater encountered.								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture



3" OD Split Spoon Sampler (D & M)



Ring Sample

Water Level ()



Grab Sample



Shelby Tube Sample

Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS

AESIBOR 20210394E001.GPJ November 30, 2021



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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-7

Sheet
1 of 1

Project Name PSD- South Hill Site Ground Surface Elevation (ft) ~358
Location Puyallup, WA Datum NAVD88
Driller/Equipment Advance / D-50 Track Mount H.S.A. Date Start/Finish 10/22/21, 10/22/21
Hammer Weight/Drop 140# / 30 Hole Diameter (in) 3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Blows/ft	Blows/Foot				Other Tests
								10	20	30	40	
5				Topsoil - 6 inches								
				Vashon Recessional Lacustrine								
				Moist, dark brown, silty, fine SAND, trace medium sand; rootlets observed; unsorted; poor recovery (SM).								
				Moist, light brown with iron oxide staining, fine sandy, SILT, trace medium sand, trace gravel, trace rootlets; faintly stratified otherwise massive (ML).								
				Moist, light brown with iron oxide staining, silty, fine SAND; faintly stratified otherwise massive (SM).								
10				Vashon Ice Contact / Melt-out Till								
				Moist, brownish gray, silty, fine SAND ranges to sandy, SILT, some broken gravel, trace coarse sand; unsorted (SM-ML).								
				Vashon Advance Outwash								
				Driller reports gravel 17.5 feet.								
				Moist, brownish gray, fine to medium SAND, some silt, some broken gravel, trace coarse sand, contains gravel (SP-SM).								
15				Bottom of exploration boring at 21.5 feet No groundwater encountered.								
20												

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



3" OD Split Spoon Sampler (D & M)



Grab Sample



No Recovery



Ring Sample



Shelby Tube Sample

M - Moisture

Water Level ()



Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS



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Exploration Boring

Project Number
20210394E001

Exploration Number
EB-8

Sheet
1 of 1

Project Name	PSD- South Hill Site	Ground Surface Elevation (ft)	~359
Location	Puyallup, WA	Datum	NAVD88
Driller/Equipment	Advance / D-50 Track Mount H.S.A.	Date Start/Finish	10/22/21, 10/22/21
Hammer Weight/Drop	140# / 30	Hole Diameter (in)	3.75 i.d.

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6" Water Level	Blows/Foot				Other Tests
								10	20	30	40	
				Topsoil - 6 inches								
				Vashon Lacustrine Recessional Outwash								
		S-1		Moist, light brown with iron oxide staining, silty, fine SAND to fine sandy, SILT; faintly stratified otherwise massive (SM-ML).		3 3 1	▲4					
5		S-2		As above; less iron oxide staining.		3 4 3	▲7					
10		S-3		Moist, light brown, silty, fine SAND; massive (SM).		3 4 3	▲7					
15		S-4		Very moist, light brown with iron oxide banding, silty, fine SAND to fine sandy, SILT; massive (SM-ML).		1 2 3	▲5					
				Vashon Ice Contact / Melt-out Till								
20		S-5		Very moist, brownish gray, silty, fine SAND, some broken gravel; coarsens with depth (SM).		13 21 19					▲40	
				Bottom of exploration boring at 21.5 feet No groundwater encountered.								

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture



3" OD Split Spoon Sampler (D & M)



Ring Sample

Water Level ()



Grab Sample



Shelby Tube Sample



Water Level at time of drilling (ATD)

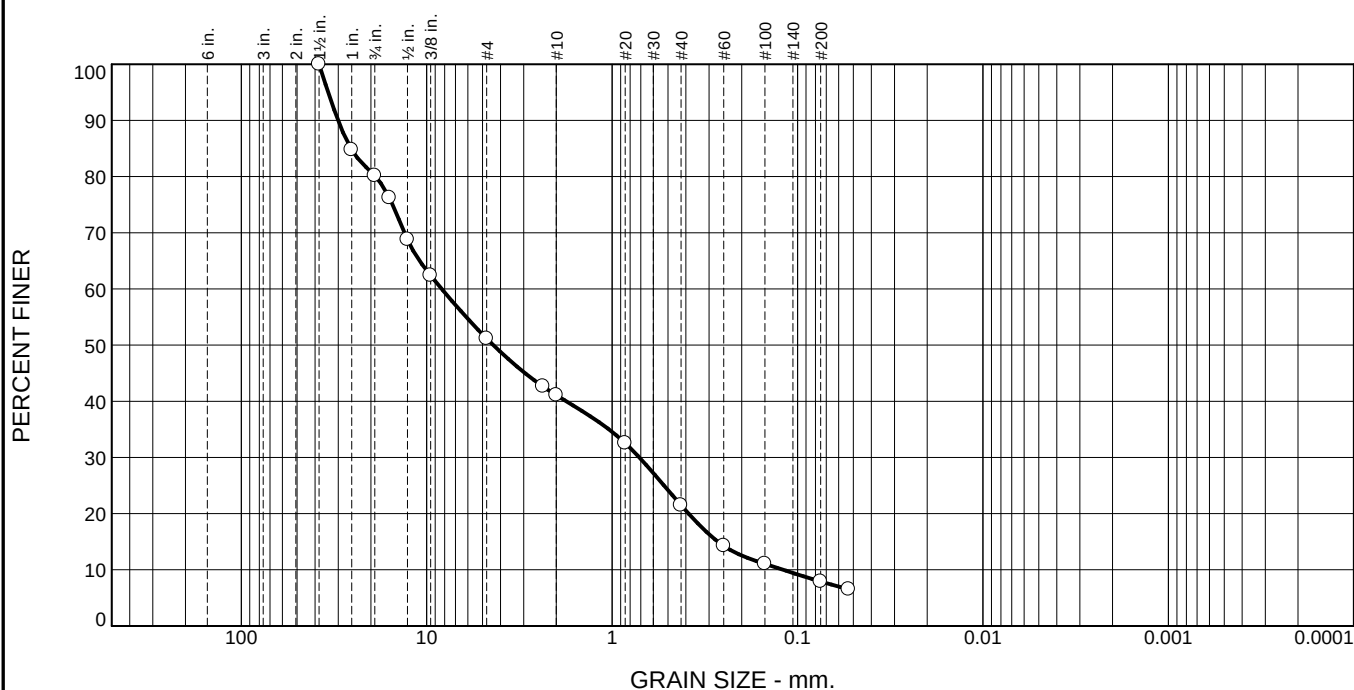
Logged by: ART

Approved by: JHS

APPENDIX B

Laboratory Testing Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.9	28.9	10.1	19.6	13.6	7.9	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	84.8		
3/4"	80.1		
5/8"	76.2		
1/2"	68.8		
3/8"	62.4		
#4	51.2		
#8	42.6		
#10	41.1		
#20	32.5		
#40	21.5		
#60	14.3		
#100	11.1		
#200	7.9		
#270	6.5		

* (no specification provided)

Material Description

very sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI=

Classification

USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 30.0469 D₈₅= 25.6377 D₆₀= 8.3018
D₅₀= 4.3746 D₃₀= 0.7131 D₁₅= 0.2688
D₁₀= 0.1197 C_u= 69.34 C_c= 0.51

Remarks

Date Received: 10/26/2021 Date Tested: 11/2/2021

Tested By: CI

Checked By: ART/SS

Title:

Location: Onsite - Outwash

Sample Number: EB-1W

Depth: 30'

Date Sampled: 10/20/2021



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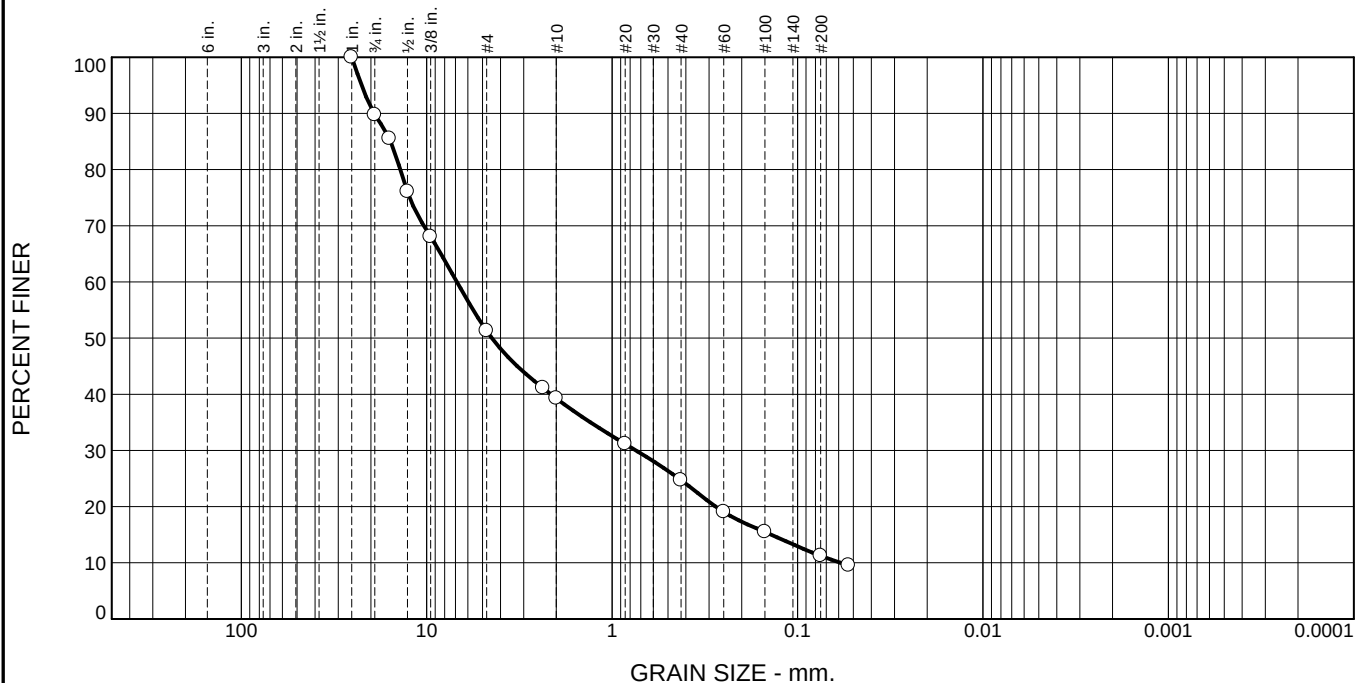
Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	38.4	12.0	14.6	13.5	11.2	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	89.7		
5/8"	85.5		
1/2"	76.0		
3/8"	68.1		
#4	51.3		
#8	41.1		
#10	39.3		
#20	31.1		
#40	24.7		
#60	19.0		
#100	15.5		
#200	11.2		
#270	9.5		

* (no specification provided)

Material Description
very sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)
PL= NP LL= NV PI=

Classification
USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 19.2567 D₈₅= 15.6335 D₆₀= 6.8755
D₅₀= 4.4527 D₃₀= 0.7445 D₁₅= 0.1386
D₁₀= 0.0585 C_u= 117.48 C_c= 1.38

Remarks

Date Received: 10/26/2021 Date Tested: 11/2/2021
Tested By: CI
Checked By: ART/SS
Title: _____

Location: Onsite - Outwash
Sample Number: EB-2

Depth: 20'

Date Sampled: 10/21/2021



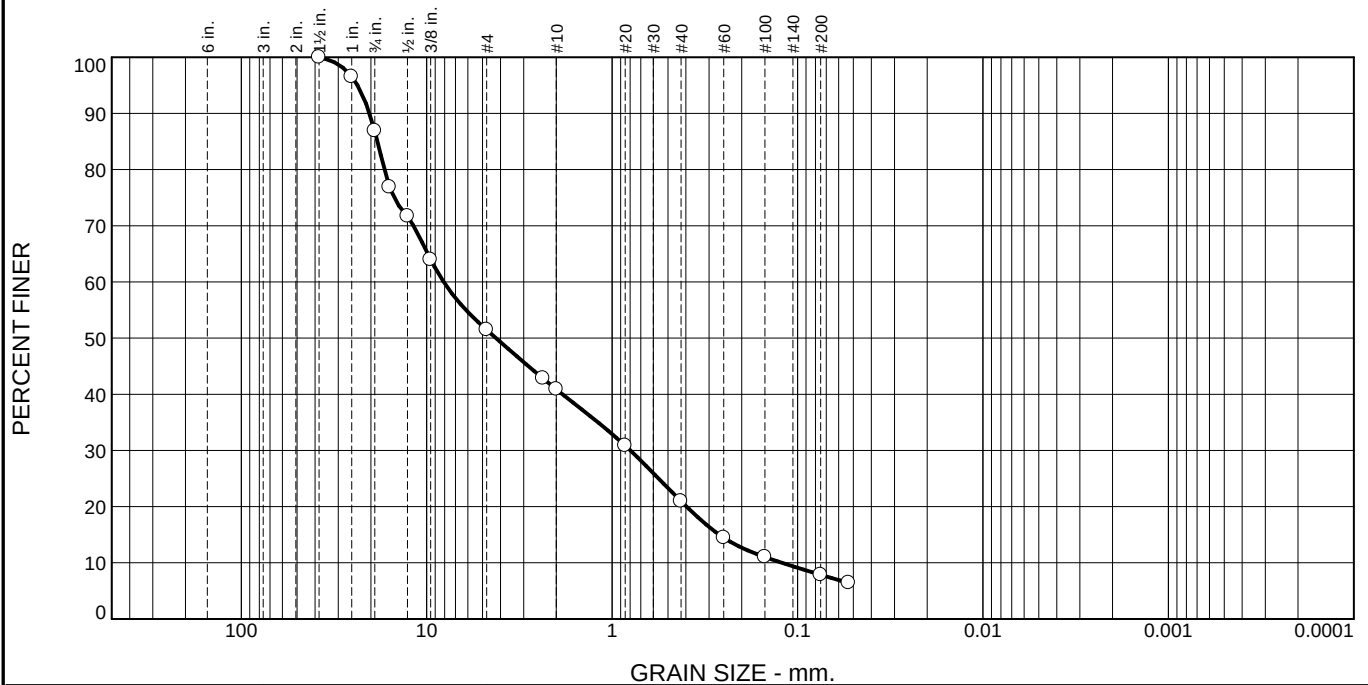
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Client: Puyallup SD
Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.1	35.4	10.6	19.9	13.1	7.9	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	96.5		
3/4"	86.9		
5/8"	76.9		
1/2"	71.7		
3/8"	64.0		
#4	51.5		
#8	42.8		
#10	40.9		
#20	30.9		
#40	21.0		
#60	14.5		
#100	11.0		
#200	7.9		
#270	6.4		

* (no specification provided)

Material Description
very sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)
PL= NP LL= NV PI=

Classification
USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 20.3223 D₈₅= 18.4222 D₆₀= 8.0993
D₅₀= 4.2312 D₃₀= 0.7975 D₁₅= 0.2644
D₁₀= 0.1216 C_u= 66.63 C_c= 0.65

Remarks

Date Received: 10/26/2021 Date Tested: 11/2/2021
Tested By: CI
Checked By: ART/SS
Title: _____

Location: Onsite - Outwash
Sample Number: EB-5

Depth: 15'

Date Sampled: 10/22/2021



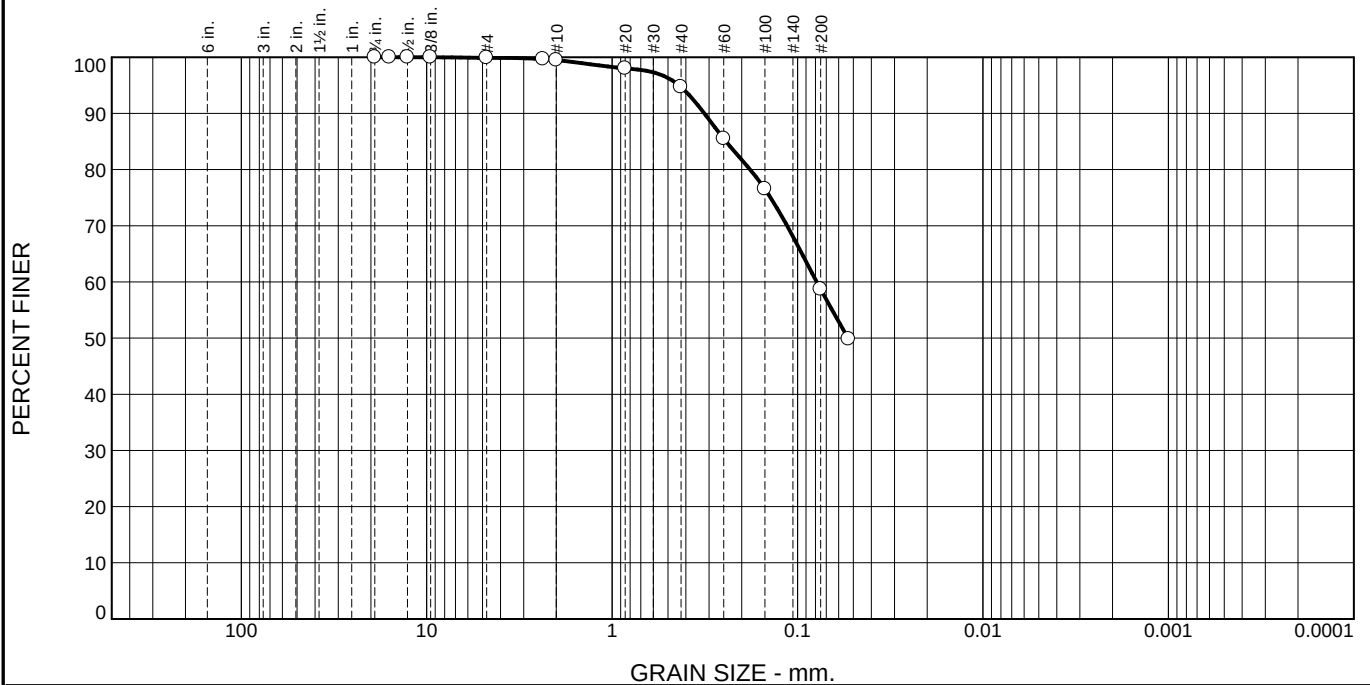
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Client: Puyallup SD
Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.4	4.8	36.0	58.7	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
5/8"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.9		
#8	99.7		
#10	99.5		
#20	98.0		
#40	94.7		
#60	85.5		
#100	76.6		
#200	58.7		
#270	49.8		

* (no specification provided)

Material Description

very sandy SILT, trace gravel

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients

D₉₀= 0.3182 D₈₅= 0.2431 D₆₀= 0.0788
D₅₀= 0.0534 D₃₀= C_u= D₁₅= C_c=

Remarks

Date Received: 10/26/2021 Date Tested: 11/2/2021

Tested By: CI

Checked By: ART/SS

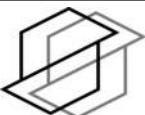
Title:

Location: Onsite - Lacustrine

Sample Number: EB-7

Depth: 5'

Date Sampled: 10/22/2021



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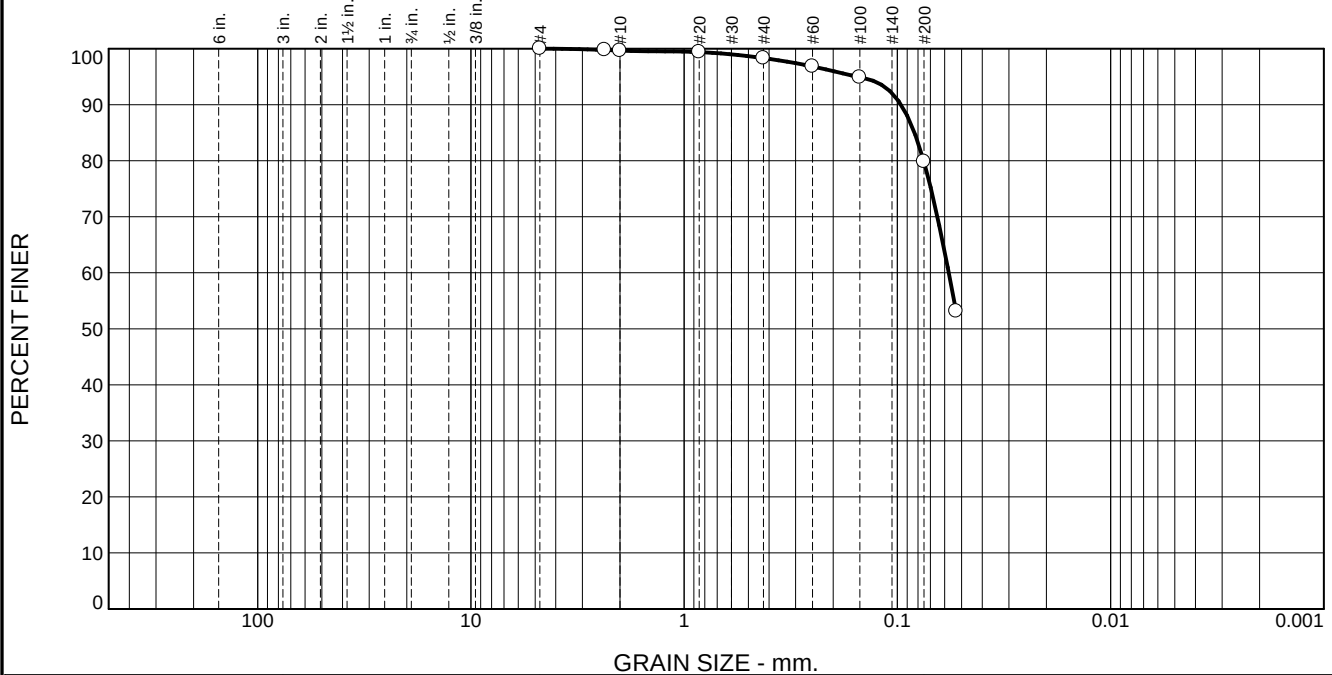
Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.4	18.5	79.8	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.8		
#10	99.7		
#20	99.4		
#40	98.3		
#60	96.8		
#100	94.9		
#200	79.8		
#270	53.1		

* (no specification provided)

Material Description

sandy SILT

Atterberg Limits (ASTM D 4318)

PL= NP

LL= NV

PI=

Classification

USCS (D 2487)= ML

AASHTO (M 145)= A-4(0)

Coefficients

D₉₀= 0.0962

D₈₅= 0.0831

D₆₀= 0.0574

D₅₀=

D₃₀=

D₁₅=

C_u=

C_c=

Remarks

Date Received: 3/25/2022 Date Tested: 4/1/2022

Tested By: CI

Checked By: ART/SS

Title:

Location: Onsite - Qvrl

Sample Number: IT-1

Depth: 5'

Date Sampled: 3/23/2022



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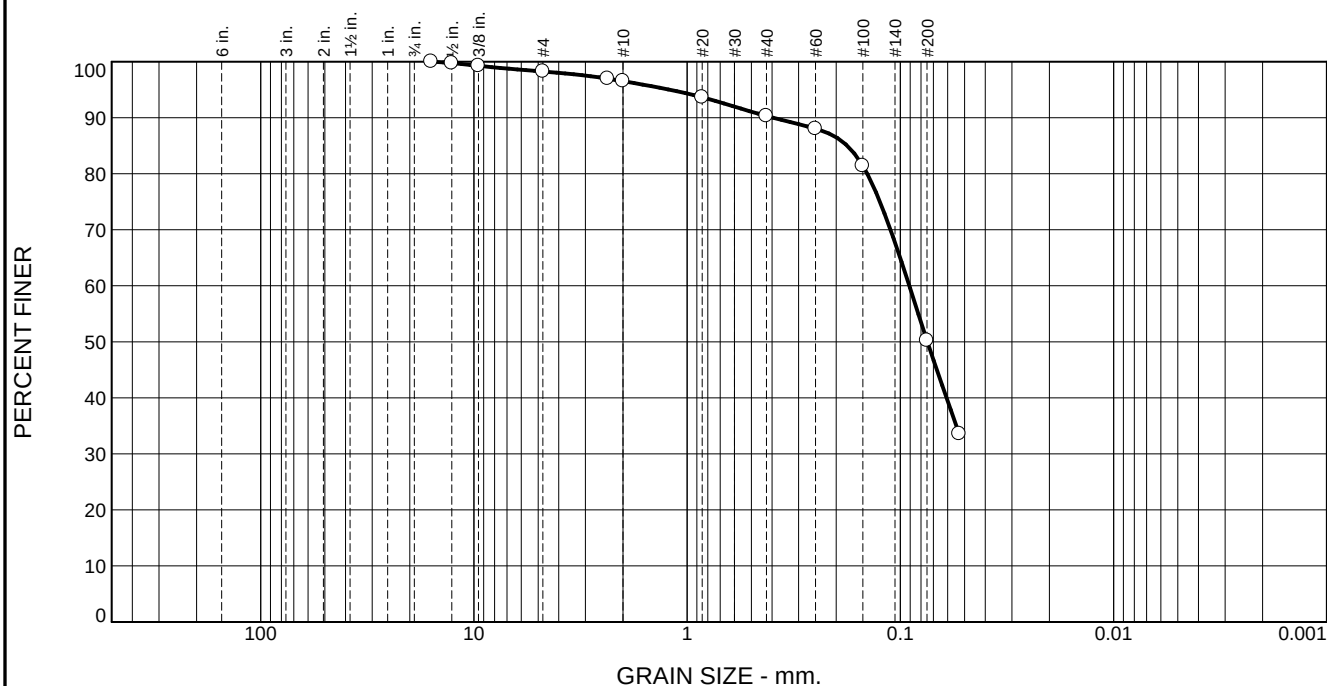
Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	1.7	6.2	40.1	50.2	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
5/8"	100.0		
1/2"	99.7		
3/8"	99.3		
#4	98.2		
#8	97.0		
#10	96.5		
#20	93.6		
#40	90.3		
#60	88.0		
#100	81.4		
#200	50.2		
#270	33.6		

* (no specification provided)

Material Description

very sandy SILT, trace gravel

Atterberg Limits (ASTM D 4318)

PL= NP

LL= NV

PI=

Classification

USCS (D 2487)= ML

AASHTO (M 145)= A-4(0)

Coefficients

D₉₀= 0.3961

D₈₅= 0.1775

D₆₀= 0.0908

D₅₀= 0.0747

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Remarks

Date Received: 3/25/2022

Date Tested: 4/1/2022

Tested By: CI

Checked By: ART/SS

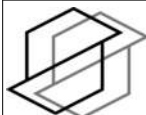
Title:

Location: Onsite - Qvrl

Sample Number: IT-2

Depth: 5'

Date Sampled: 3/23/2022



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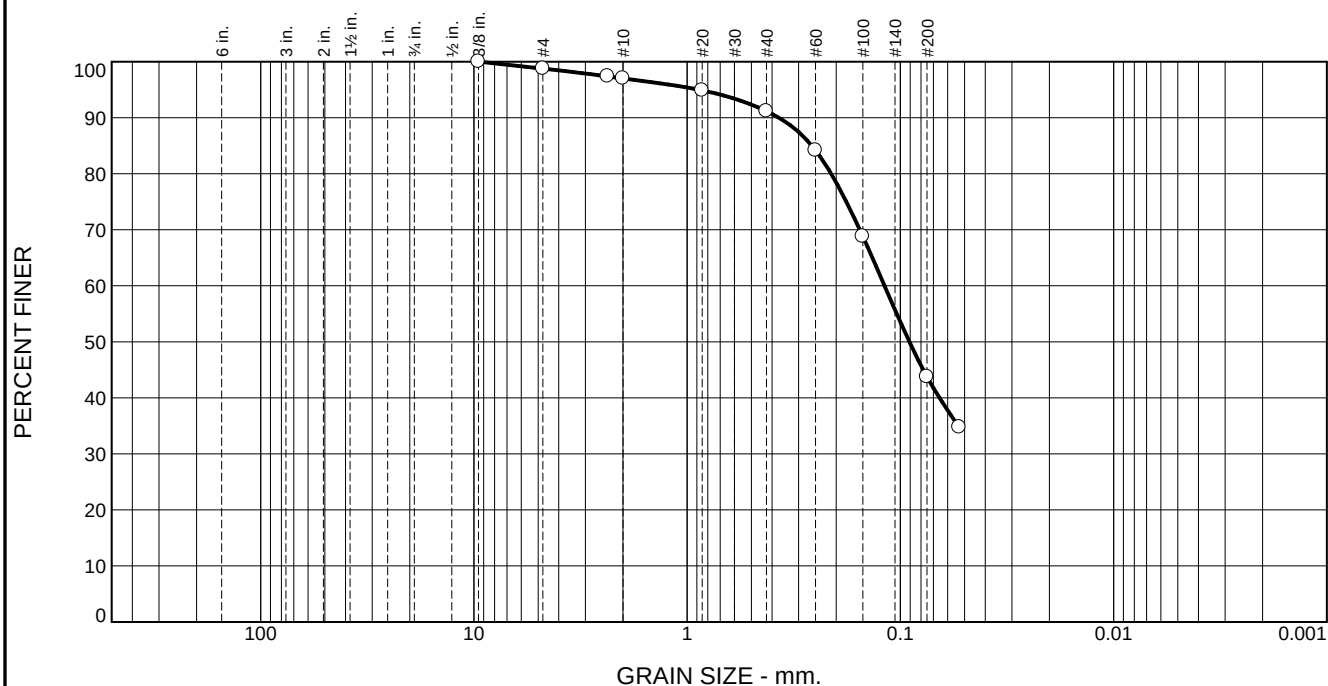
Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	1.8	5.8	47.4	43.8	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	98.8		
#8	97.4		
#10	97.0		
#20	94.9		
#40	91.2		
#60	84.2		
#100	68.8		
#200	43.8		
#270	34.7		

* (no specification provided)

Material Description
very silty SAND, trace gravel

Atterberg Limits (ASTM D 4318)
 PL= NP LL= NV PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 0.3715 D₈₅= 0.2603 D₆₀= 0.1187
 D₅₀= 0.0907 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks

Date Received: 3/25/2022 Date Tested: 3/30/2022
 Tested By: CI
 Checked By: ART/SS
 Title:

Location: Onsite - Qvrl
 Sample Number: IT-3

Depth: 5'

Date Sampled: 3/24/2022



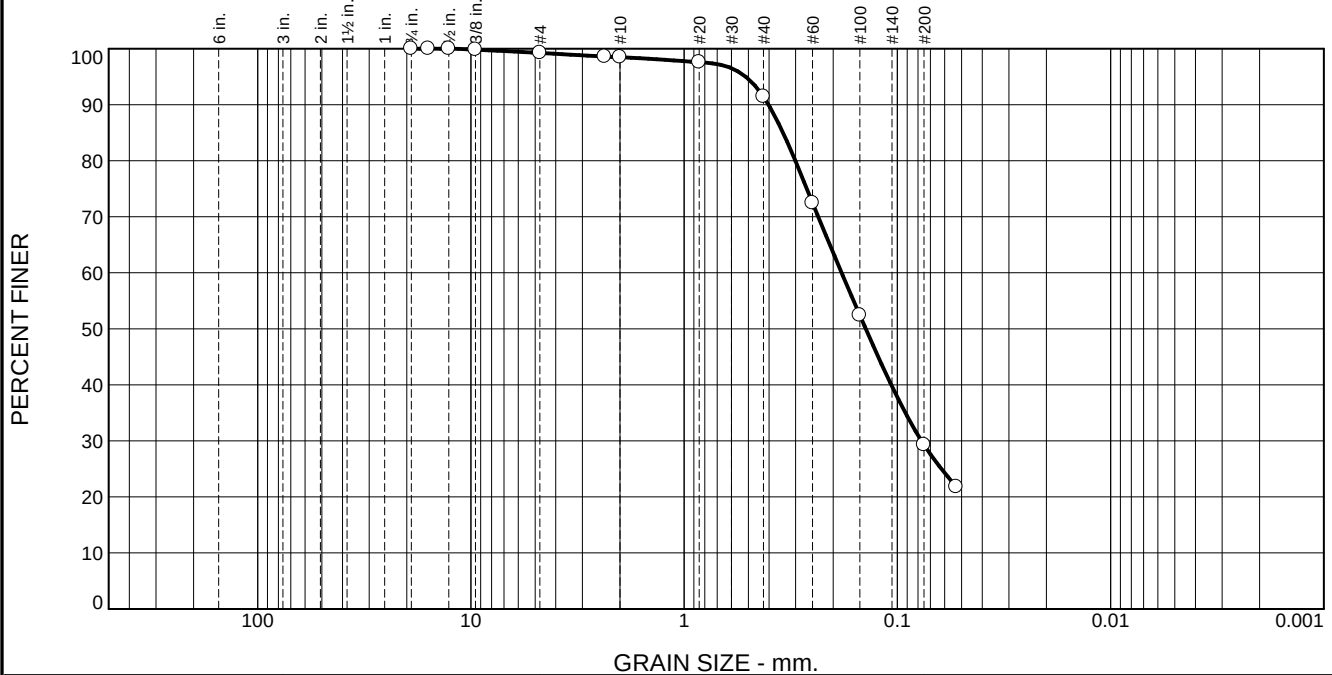
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Client: Puyallup SD
 Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	0.7	7.1	62.1	29.3	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
5/8"	100.0		
1/2"	100.0		
3/8"	99.8		
#4	99.2		
#8	98.6		
#10	98.5		
#20	97.6		
#40	91.4		
#60	72.5		
#100	52.4		
#200	29.3		
#270	21.8		

* (no specification provided)

Material Description

silty SAND, trace gravel

Atterberg Limits (ASTM D 4318)

PL= NP

LL= NV

PI=

Classification

USCS (D 2487)= SM

AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 0.4021

D₈₅= 0.3440

D₆₀= 0.1827

D₅₀= 0.1407

D₃₀= 0.0771

D₁₅=

D₁₀=

C_u=

C_c=

Remarks

Date Received: 3/25/2022 Date Tested: 3/30/2022

Tested By: CI

Checked By: ART/SS

Title:

Location: Onsite - Qyrl

Sample Number: IT-4

Depth: 5'

Date Sampled: 3/24/2022



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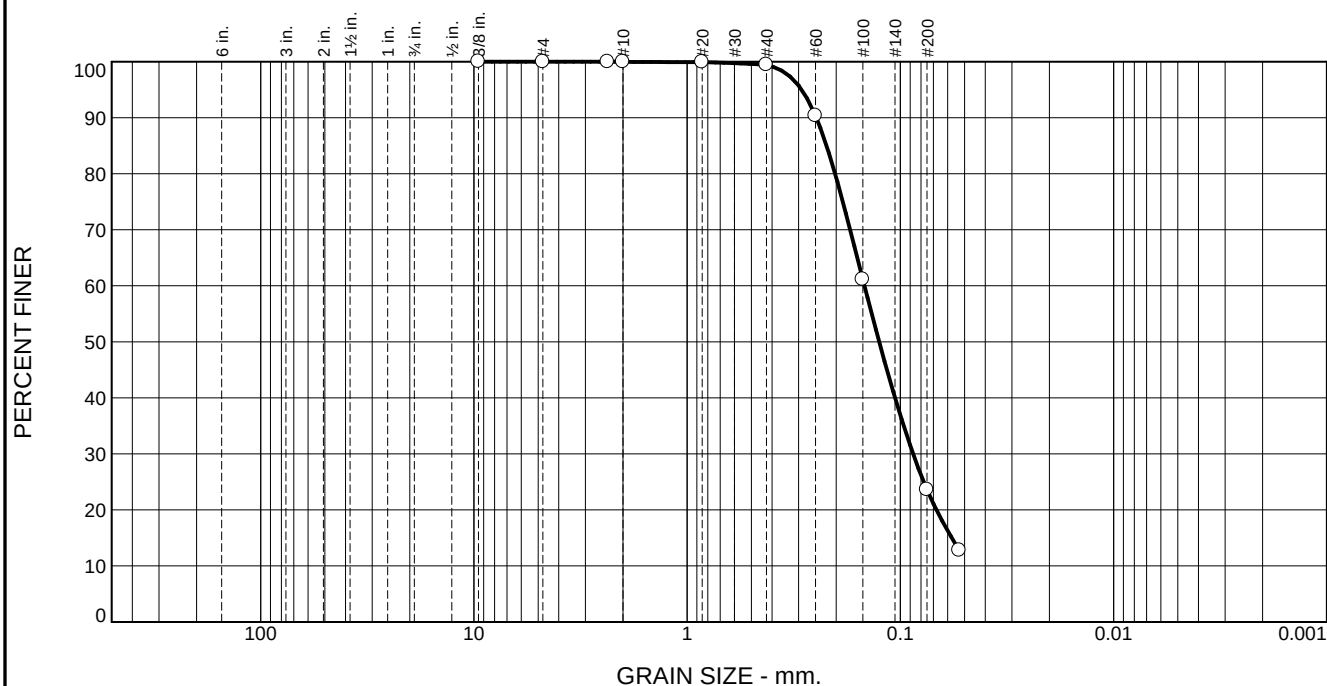
Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	75.8	23.6	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	99.9		
#40	99.4		
#60	90.3		
#100	61.1		
#200	23.6		
#270	12.8		

* (no specification provided)

Material Description

silty SAND

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 0.2478 D₈₅= 0.2221 D₆₀= 0.1474
D₅₀= 0.1257 D₃₀= 0.0871 D₁₅= 0.0574
D₁₀= C_u= C_c=

Remarks

Date Received: 3/25/2022 Date Tested: 3/30/2022

Tested By: CI

Checked By: ART/SS

Title:

Location: Onsite - Qvrl

Sample Number: IT-4

Depth: 7'

Date Sampled: 3/24/2022



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Client: Puyallup SD

Project: Puyallup SD - South Hill Site

Project No: 20210394 E001

Figure



Northwest Agricultural
Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited



Associated Earth Sciences Inc.
911 5th Ave
Kirkland, WA 98033

Report: 58756-1-1
Date: March 29, 2022
Project No: 20210394E001
Project Name:

Sample ID	Organic Matter	Cation Exchange Capacity
IT-1 @ 5ft	2.27%	13.1 meq/100g
IT-2 @ 5ft	1.97%	13.0 meq/100g
IT-3 @ 5ft	1.46%	11.9 meq/100g
IT-4 @ 5ft	1.82%	9.7 meq/100g
Method	ASTM D2974	EPA 9081