associated earth sciences incorporated

December 18, 2019
Project No. 20180090E002

Puyallup School District
323 - 12th Street NW
Puyallup, Washington 98371

Attention: Les Gerstmann

Subject: Subsurface Exploration, Infiltration Testing, and Design Infiltration Rate Determination
LSC Kessler Center
1501 - 39th Avenue 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.

Our understanding of the project is based on information provided by Puyallup School District representatives, conversations with the civil engineer, Sitts & Hill Engineers, Inc. (Sitts & Hill) and review of a draft site plan titled "Sheet C0.1, Overall Site Plan, Kessler Center" provided on December 13, 2019 prepared by Sitts & Hill and BCRA. We are familiar with the site through AESI's previous reporting "Subsurface Exploration and Geotechnical Engineering Evaluation, LCS-Kessler Center" dated June 17, 2019, and "Addendum to Subsurface Exploration and Geotechnical Engineering Evaluation, Infiltration Feasibility Assessment, LCS-Kessler Center" dated July 9, 2019, and previous subsurface exploration and reporting for earlier phases of work on the subject site (AESI, September 13, 2005; December 6, 2005; April 18, 2006; May 30, 2018; and June 21, 2018).

PROJECT AND SITE DESCRIPTION

The project site consists of the Puyallup School District Logistics Support Center (LSC) complex located in the South Hill area of Puyallup, as shown on the attached "Vicinity Map" (Figure 1). This complex occupies a roughly L-shaped parcel that measures approximately 800 feet by 1,200 feet overall and encompasses about 18 acres (Pierce County Parcel 0419043117). It is visually delineated by Highway 512 on the north, by 39th Avenue SW on the south, by 17th Street SW on the west, and by undeveloped land on the east. Presently, the complex includes a cluster of buildings to the north, a bus storage yard, several paved parking lots, a bus training course, and two stormwater ponds. Our attached "Overall Site Plan," Figure 2) illustrates the property boundaries and existing features.

Proposed improvement plans call for the construction of the new Kessler Center located in the southern portion of the LSC site along 39th Avenue SW. The project will include the new Kessler Center building, parking areas, drainage improvements and new portable buildings. The site topography is relatively flat with the exception of an existing stormwater pond so minimal grading is expected, although we do not have a current grading plan. The existing stormwater pond in this area will be backfilled as part of the site grading operations. Our attached "Proposed Site and Exploration Plan" (Figure 3) illustrates the proposed development in relation to adjacent existing features.

The Kessler Center project will result in additional stormwater runoff, and the currently preferred plan is to convey additional runoff water to a proposed infiltration trench facility located on the southwest portion of the project site, east of the existing wetland, and west of the existing driveway from 39th Avenue SW. We understand that the infiltration trench 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. Shallow infiltration systems such as bioretention ponds are also being considered to manage a portion of the runoff. Our attached "Proposed Site and Exploration Plan" (Figure 3) illustrates the proposed infiltration trench in relation to adjacent existing features.

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 a design infiltration rate for the proposed infiltration trench area and conceptual shallow infiltration facilities. Our study included reviewing available geologic literature, observing the drilling/excavation of borings/exploration pits, conducting three 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, and surrounding areas are presented on the "Overall Site Plan," Figure 2. The explorations, and existing and proposed site features are also presented on the "Proposed Site and Exploration Plan," Figure 3.

AUTHORIZATION

Our study was accomplished in general accordance with our scope of work letter dated March 14, 2019 and our change order dated June 10, 2019, and were authorized by your Purchase Order No. CP2829 dated June 28, 2019.

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 Warehouse Infiltration trench, a portion of which extends on the Kessler site. 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). The Vashon advance outwash sediments are the target infiltration receptor horizon at the site.

SUBSURFACE EXPLORATION

Subsurface exploration for this infiltration study consisted of five exploration borings (EB-9 through EB-11, EB-16, and EB-17), four exploration borings completed as monitoring wells (EB-12W through EB-15W), and three infiltration tests (IT-1 through IT-3) located on the subject site. Previous explorations for the overall site include the excavation of thirty-two exploration pits, four exploration borings, four monitoring wells, nine grain-size analyses, and three infiltration tests.

We explored subsurface conditions for the Kessler Center improvements in April, May, July, and August 2019. The drilling and infiltration test locations were selected based on conceptual building and drainage plans, which have since been refined. 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.

Does not comply w Wet-Season
Dec 21 to Apr 1

Exploration Borings

The exploration borings were performed by Advance Drill Technologies, Inc., an independent firm working under subcontract to AESI. Each boring was completed by advancing an 8-inch outside-diameter, hollow-stem auger with both truck-mounted and track-mounted drill rigs. During the drilling process, disturbed but representative soil samples were obtained at 2½- or 5-foot-depth intervals using the Standard Penetration Test (SPT) procedure in accordance with the *American Society for Testing and Materials* (ASTM) Specification D-1586. After completion of drilling, the boreholes were backfilled with bentonite chips, and the surface was patched with concrete or sod. The boreholes for EB-12W, EB-13W, EB-14W, and EB-15W were completed as wells.

The SPT testing and sampling procedure consists of driving a standard, 2-inch outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches represents the Standard Penetration Resistance (also known as the "N-value"). If a total of 50 blows is reached within one 6-inch interval, the N-value is recorded as 50 blows for the corresponding number of inches of penetration. The N-value provides a measure of the relative density of granular soils or the relative consistency of cohesive soils. Higher N-values correspond to a denser or stiffer soil. Our measured N-values are plotted on the exploration boring logs presented in Appendix A.

The exploration borings were continuously observed and logged by an AESI representative. The materials obtained from the split-barrel sampler were classified in the field, and representative portions were placed in watertight containers. These soil samples were then transported to our office for further visual classification and/or laboratory testing. The soil descriptions shown on our exploration logs are based on a combination of N-values, drilling action, field observations, and laboratory test results.

Monitoring Wells

The groundwater monitoring wells were installed by Advance Drill Technologies, Inc. in conjunction with our exploration borings. Each well consists of a 2-inch-diameter polyvinyl chloride (PVC) Schedule-40 well casing with threaded connections, the lower 10 feet of which is finely-slotted (0.020-inch machine slot) well screen to allow water inflow. The annular space around the well screen was backfilled with clean sand, and the upper portion of annulus was sealed with bentonite chips and concrete. A flush-mounted steel monument was placed over the top of the wellhead for protection. The as-built configuration is illustrated on the boring logs in Appendix A. After installation, an AESI representative developed the wells by adding and then bailing out several well-volumes of water.

Infiltration Test Pits

The infiltration test pit were excavated by Northwest Excavating and Trucking, an independent firm working under subcontract to AESI. The pits (IT-1, IT-2 and IT-3) 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 the proposed infiltration trench system and, at the time, a proposed bus loop bioretention pond. The proposed bioretention system was located on the northwest portion of the Kessler Center site, south of the parking lot, north of the existing bus training course. The proposed infiltration trench system is located on the southwest portion of the site, east of an existing off-site wetland, and west of the access driveway from 39th Avenue SW. The drainage plan has since been refined to a bioretention facility located above the infiltration trench. Infiltration testing data summary sheets are included in Appendix C. Infiltration testing is discussed in more detail later in this letter-report.

SUBSURFACE CONDITIONS

The following text sections describe current site conditions, including development features, 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), site survey maps prepared by Sitts & Hill, and aerial photographs published by Google Earth. Subsurface conditions at the project site were inferred from our field explorations accomplished for this study, 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 some 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.

Vashon Recessional Lacustrine Deposits

Immediately below the surficial sod and/or fill, all of our explorations encountered 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. Where fully penetrated, these deposits extended to a depth of about 11 to 31 feet below existing ground surface. These sediments have a low permeability and are challenging for stormwater infiltration due to a high percentage of fines.

Vashon Lodgement Till and Melt-out Till

On the west side of the site in the area of the proposed infiltration trench, several exploration pits, EP-18, EP-24, and EP-25, encountered a thin deposit, 1 to 3½ feet thick, of sediments interpreted to be representative of Vashon lodgement till, directly below the Vashon recessional lacustrine sediments. The lodgement till primarily consisted of dense, slightly moist, grayish brown, unsorted silty fine sand with some gravel. The Vashon lodgement till was deposited directly from basal, debris-laden, glacial ice during the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. The high relative density characteristic of the Vashon lodgement till is due to its consolidation by the massive weight of the glacial ice from which it was deposited. Two borings, EB-10 and EB-11, encountered an interval of transitional melt-out till and Vashon advance outwash sediments were encountered, directly below the Vashon recessional lacustrine sediments. The melt-out till sediments generally consisted of dense to very dense, unsorted, silty sand with minor amounts gravel, and silty gravel with minor amounts of sand. These sediments were about 4 to 5½ feet thick. Vashon lodgement till and melt-out till are not recommended for use as an infiltration receptor.

Vashon Advance Outwash

Several exploration pits on the west side of the site in the area of the proposed infiltration trench, most exploration borings, and the infiltration test, IT-3, encountered dense, gravelly sand with variable amounts of silt to sand with minor amounts of gravel and silt underlying the Vashon recessional lacustrine or lodgement till/advance outwash transitional deposits. These sediments are interpreted to be representative of Vashon advance outwash. 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. These deposits appear to extend across the site in an

unsaturated condition for several 10s of feet. Where permeable and unsaturated, these sediments are suitable for stormwater infiltration.

Laboratory Grain-Size Analysis

Laboratory grain-size (sieve) analysis was performed by AESI's in-house laboratory on seven representative selected samples collected during AESI's subsurface exploration. Five sieves were conducted on the Vashon recessional lacustrine deposits, and four 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 analysis test result (included in Appendix B) indicates that the tested recessional lacustrine deposits correlate to sandy to very sandy silt. As shown below the fines content ranged from about 83 percent to about 52 percent. The tested Qva samples correlate to very sandy gravel some silt to gravelly silty sand. Fines percentage ranges from about 27 to 7 percent.

Table 1
Laboratory Grain-Size Analysis Summary

Exploration No.	Depth (feet)	Geologic Unit	Sieve Results - Calculated Percent			USCS
			Gravel (%)	Sand (%)	Fines (%)	
EB-9	7.5	Qvrl	0.1	17.2	82.7	ML
IT-1 (1)	6	Qvrl	0.0	16.6	83.4	ML
IT-1 (2)	6	Qvrl	4.3	43.5	52.2	ML
IT-2 (1)	6	Qvrl	0.1	37.0	62.9	ML
IT-2 (2)	6	Qvrl	0.2	35.0	64.8	ML
EB-15W	35	Qva	25.4	62.1	12.5	SM
EB-15W	27.5	Qva	16.4	56.3	27.3	SM
EP-17	25	Qva	53.0	36.0	11.0	GP-GM
IT-3	18.5	Qva	62.2	30.8	7.0	GP-GM

USCS = Unified Soil Classification System
Qvrl = Vashon recessional lacustrine deposits
Qva = Vashon advance outwash

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. Ground water 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. One of the project monitoring wells encountered groundwater interpreted as the regional Qva aquifer at about elevation 288 to 289 feet. 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 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. We also interpret that the wetland on the southwest side of the site is formed in a kettle-like setting, perched on the till. There is groundwater at depth in the advance outwash, interpreted as the regional aquifer.

Monitoring wells EB-1W, EB-12W, and EB-15W were completed within the Qva sediments. Monitoring wells EB-2W, EB-13W, and EB-14W were completed within the Vashon recessional lacustrine deposits. Monitoring well EB-2W was completed at an elevation approximately equivalent to the base of the west-adjacent wetland.

Near the proposed infiltration trench facility, perched groundwater was generally encountered at depths of about 8 to 17½ feet below existing ground surface in several exploration pits and borings within the Vashon recessional lacustrine deposits. One exploration boring encountered groundwater within the deeper Qva sediments at the time of exploration.

Water level monitoring is ongoing within the monitoring wells. The monitoring program is intended to document that there is adequate vertical separation from the base of the proposed stormwater infiltration systems and the water table aquifer contained at depth in the Qva deposits. To date, no groundwater has been encountered in monitoring wells EB-1W and EB-15W. Monitoring well EB-12W has encountered groundwater at a depth of about 74 to 75 feet, or elevation 288 to 289 feet above mean sea level.

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 spring and summer of 2019. Groundwater level monitoring has been ongoing for the LCS site since April 2018.

INFILTRATION TESTING

Three infiltration tests were completed at the locations shown on Figures 2 and 3 as IT-1, IT-2, and IT-3. Infiltration tests IT-1 and IT-2, was completed to obtain representative infiltration rates for the proposed bioretention facility located on the northern portion of the Kessler Center site. Infiltration test, IT-3, was completed to obtain representative infiltration rates for the proposed infiltration trench on the southwest portion of the site.

Methodology

The 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 depths between about 5 ½ to 18 ½ feet below existing ground surface. Infiltration tests IT-1 and IT-2 were conducted within the fine sandy, silt lacustrine deposits. Infiltration test IT-3 was dug through the silty lacustrine deposits into the underlying outwash. 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 an on-site fire hydrant. 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 water 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 6 to 8 inches, then maintained for approximately 7 hours. The total time of soil saturation was 7 hours or longer. 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 in IT-1 and IT-2 in the Vashon recessional lacustrine deposits ranged from 1.4 to 2.6 inches per hour. The field infiltration rate in IT-3 in the Vashon advance outwash was 42 inches per hour. The infiltration test data were recorded by hand in the field and subsequently transferred to an electronic spreadsheet. Infiltration test data sheets are included in Appendix C. The test depth, depth to water, discharge time, total water volume discharged, and the uncorrected field infiltration rates of the infiltration test are summarized in Table 2.

Subsurface Observations

Several explorations have been completed in the vicinity of the proposed infiltration trench and bioretention facility during the current and previous studies. We have reviewed this data as part of our analysis.

Proposed Infiltration Trench

As part of this study, two exploration borings, EB-16 and EB-17, and one monitoring well, EB-15W, were advanced in addition to the infiltration test, IT-3, near, or within, the footprint of the proposed infiltration trench. Exploration pits, EP-19, EP-20, EP-24, and EP-25, and infiltration test PD-1 were advanced during previous studies near, or within, the footprint of the proposed infiltration trench. These explorations indicate that the sediment underlying the proposed infiltration trench area generally consist of Vashon recessional lacustrine deposits underlain by Vashon advance outwash deposits. Intermittent zones of perched water were noted atop silt layers within the Vashon recessional lacustrine deposits in three explorations. Where encountered, the Vashon advance outwash deposits were generally in a slightly moist to moist condition. Moist to wet intervals were encountered within silty zones of the Vashon advance outwash deposits.

Bus Loop Infiltration Area

Two monitoring wells, EB-12W and EB-13W, were advanced in addition to the infiltration tests, IT-1 and IT-2, in the bus loop infiltration area (no longer proposed) as part of the current study. These explorations indicate that the sediment underlying the proposed infiltration trench area generally consist of Vashon recessional lacustrine deposits underlain by Vashon advance outwash deposits. Intermittent zones of perched water were noted atop silt layers within the

Vashon recessional lacustrine deposits in the two monitoring wells. Where encountered, the Vashon advance outwash deposits were generally in a moist condition to about 75 feet below ground surface. As noted previously, groundwater level monitoring is ongoing, and has indicated groundwater at a depth of about 74 to 75 feet below ground surface within the Vashon advance outwash deposits.

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	5.5	Recessional Lacustrine	35	420	1.4
IT-2	5.5	Recessional Lacustrine	42	420	2.6
IT-3	18.5	Advance Outwash	32	425	42
PD-1*	18.8	Advance Outwash	16	420	28

*Infiltration test PD-1 was conducted as part of the AESI's subsurface exploration and testing for the LSC Warehouse Addition (AESI, June 21, 2018).

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:

Total Correction Factor = $CF_T = CF_v \times CF_t \times CF_m$

and

K_{sat} design = K_{sat} initial x CF

where K_{sat} design and K_{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.

We recommend using the lower of the two values for the advance outwash for design infiltration rate determination for the proposed infiltration trench system. This long-term design rate is 5.0 inches per hour (in/hr). The design value assumes that actual subgrade soils are consistent with those encountered at our testing locations.

Water level monitoring is ongoing within the monitoring wells. The monitoring program is intended to document that there is adequate vertical separation from the base of the proposed stormwater infiltration systems and the water table aquifer contained at depth in the Qva deposits. The regional Qva aquifer was encountered in monitoring well EB-12W at a depth of about 74 to 75 feet, or elevation 288 to 289 feet above mean sea level. The top of the Vashon advance outwash ranged from about elevation 342 to 352 feet. The unsaturated thickness is on the order of 53 to 62 feet, indicating there is adequate vertical separation from the regional Qva aquifer.

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	1.4	0.7 [1]	0.5 [2]	0.9 [3]	0.315	0.4
IT-2	2.6	0.7 [1]	0.5 [2]	0.9 [3]	0.315	0.8
IT-3	42	0.4 [4]	0.5 [2]	0.9 [3]	0.18	7.5
PD-1	28	0.4 [4]	0.5 [2]	0.9 [3]	0.18	5.0

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 2014 *Stormwater Management Manual for Western Washington*.
4 This value reflects the variable conditions within the Vashon advance outwash.

CONCLUSIONS AND RECOMMENDATIONS

Our explorations and testing indicate that, from a geotechnical and hydrogeologic standpoint, the subject site is suitable for stormwater infiltration in the proposed facilities. Specifically, the infiltration trench is feasible if situated in the Vashon advance outwash. The infiltration trench facility must extend through the fine-grained recessional lacustrine sediments so that the base of the infiltration trench is fully embedded in native Vashon advance outwash. We recommend that the infiltration trench design be consistent with the Ecology Manual and be based on a design rate of 5.0 in/hr.

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.

Stripping and Subgrade Overexcavation

We recommend that the infiltration trench base be stripped of topsoil and excavated through the Vashon recessional lacustrine deposits/Vashon lodgement till (silty sediments) and be embedded a minimum of 3 feet of the underlying Vashon advance outwash sediments. If silty sediments are present at the infiltration facility subgrade, the silty sediments should be overexcavated to expose the underlying cleaner Vashon advance outwash. 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 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

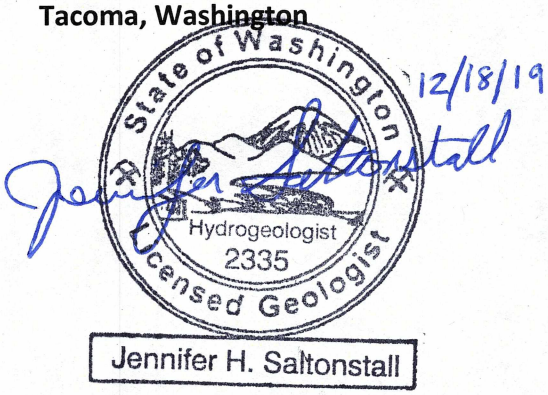
We are available to provide additional geotechnical/hydrogeologic consultation as the project design develops and possibly changes from that upon which this letter-report is based. We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, our infiltration 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.
Tacoma, Washington

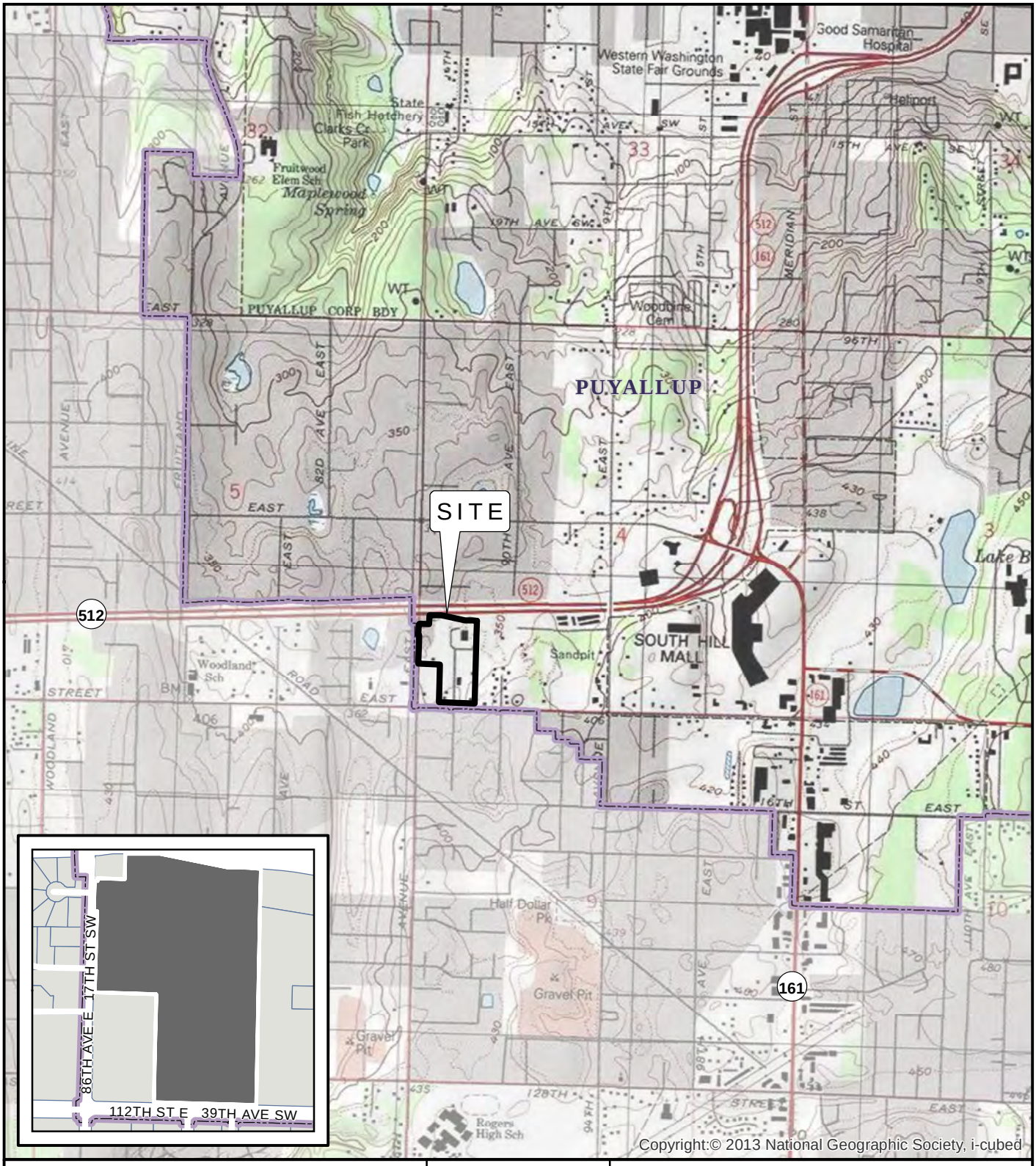


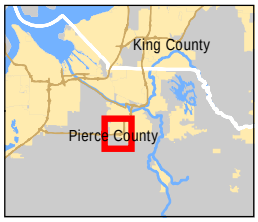
Jennifer H. Saltonstall, L.G., L.Hg.
Principal Geologist/Hydrogeologist

Kurt D. Merriman, P.E.
Senior Principal Engineer

Attachments:

	Figure 1:	Vicinity Map
	Figure 2:	Overall Site Plan
	Figure 3:	Proposed Site and Exploration Plan
	Appendix A:	Exploration Logs
	Appendix B:	Grain-Size Analysis
	Appendix C:	Infiltration Test Data Sheets





DATA SOURCES / REFERENCES:
USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI/I-CUBED/NGS 2013
PIERCE CO: STREETS, CITY LIMITS, PARCELS 1/18

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 1000 2000

FEET

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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VICINITY MAP

LSC - KESSLER CENTER
PUYALLUP, WASHINGTON

PROJ NO.	DATE:	FIGURE:
180090E002	5/19	1

Document Path: G:\GIS_Projects\aaY2018\180090 LSC Warehouse Addition\mxd\180090E002 F1 VM_LSC.mxd

- SITE
- KESSLER CENTER AREA
- INFILTRATION TEST (2019)
- EXPLORATION BORING (2018-2019)
- MONITORING WELL (2018-2019)
- EXPLORATION PIT (2018)
- PIT DRAIN (2018)
- EXPLORATION PIT (2006)
- EXPLORATION PIT (2005)
- INFILTRATION TEST (2005)
- EXPLORATION PIT (2004)
- CITY BOUNDARY
- PARCEL
- CONTOUR 10 FT
- CONTOUR 2 FT

DATA SOURCES / REFERENCES:
PIERCE COUNTY 2010/2011, GRID CELL SIZE IS 3'.
WA STATE PLANE SOUTH COORDINATE SYSTEM.
NAD83(1991 HARN). VERTICAL NAVD88 GEOID09.
US SURVEY FEET. CONTOURS FROM LIDAR
PIERCE CO: PARCELS, STREETS 1/18
BING AERIAL, 7/2014

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 100 200
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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OVERALL SITE PLAN

LSC - KESSLER BUILDING
PUYALLUP, WASHINGTON

PROJ NO.	DATE:	FIGURE:
180090E002	8/19	2

Document Path: G:\GIS_Projects\aaY2018\180090 LSC Warehouse Addition\mxd\180090E002 F2 SM_ExistingSP_LSC.mxd

- SITE
- KESSLER CENTER AREA
- EXPLORATION BORING
- EXPLORATION PIT
- MONITORING WELL
- INFILTRATION TEST
- PIT DRAIN
- PARCEL

DATA SOURCES / REFERENCES:
PIERCE CO: PARCELS, STREETS 1/18
SITE PLAN: BCRA, 18328 - C0.1-LAYOUT, 5/19

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 35 70
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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PROPOSED SITE AND EXPLORATION PLAN

LSC - KESSLER BUILDING
PUYALLUP, WASHINGTON

PROJ NO.	DATE:	FIGURE:
180090E002	12/19	3

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APPENDIX A

Exploration Logs

Coarse-Grained Soils - More than 50% [1] Retained on No. 200 Sieve	Gravels - More than 50% [1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines [5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines [5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% [1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines [5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines [5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% [1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

	Density	SPT [2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT [2] blows/foot**
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

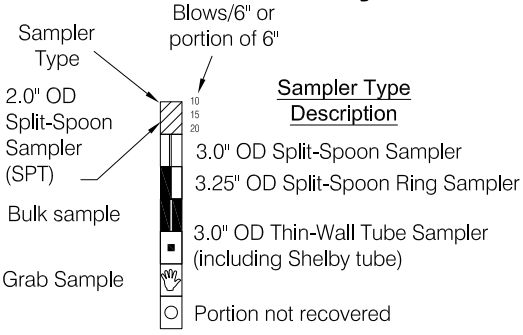
[3] Estimated Percentage

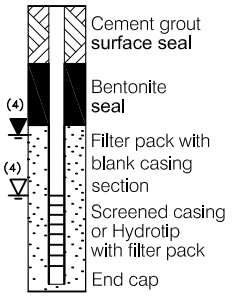
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
▼ ATD = At time of drilling
▽ Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

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Exploration Boring

Project Number	Exploration Number	Sheet
180090E002	EB-9	1 of 1

Project Name	LSC - Kessler Center	Ground Surface Elevation (ft)	364
Location	Puyallup, WA	Datum	NAVD 88
Driller/Equipment	Advance Drill Technologies / HSA D-50	Date Start/Finish	4/25/19,4/25/19
Hammer Weight/Drop	140# / 30	Hole Diameter (in)	7

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-1		**Grass / Topsoil**			13 18 6	▲24	
				Crushed Gravel Base - 2 to 4 inches					
				Vashon Recessional Lacustrine Deposit					
		S-2		Moist to very moist, orangish brown, silty, fine SAND; organics (SM). Moist, orangish brown with light iron oxide staining, fine sandy, SILT, trace medium to coarse sand (dropstones), trace organics; fine laminae otherwise massive (ML).			2 1 3	▲4	
5		S-3		Moist, brownish orange, SILT, trace fine sand, trace organics; trace laminae otherwise massive (ML).			3 2 3	▲5	
		S-4		Moist, brown, fine sandy, SILT; massive (ML).			3 4 6	▲10	X
10		S-5		Moist, brownish gray with trace iron oxide staining, fine sandy, SILT; very fine laminae otherwise massive (ML).			2 3 5	▲8	
15		S-6		Moist, brownish orange, SILT; few fine to medium sand interbeds with iron oxide staining (ML).			2 2 3	▲5	
20		S-7		Wet, brownish gray, SILT, some fine sand; massive (ML).		▼	2 1 3	▲4	
25		S-8		Very moist, brownish gray, sandy, SILT; interbeds of medium to coarse sand with iron oxide staining; fine laminae (ML).			4 3 5	▲8	
30		S-9		Moist, brownish gray, fine silty, SAND; few gravel (dropstones); coarsening down; massive (SM). Driller notes gravel at 31 feet.			3 7 8	▲15	
				Vashon Advance Outwash					
35		S-10		Moist, grayish brown, sandy, GRAVEL, some silt; gravel is broken; sand is mostly fine to medium; gravel is silt coated; only 9 inches of recovery (GW-GM).			10 22 29	▲51	
40		S-11		As above; gravel is not silt coated (GW-GM).			31 46 50/4"	▲50/4"	
				Bottom of exploration boring at 41.5 feet Perhced groundwater encountered at ~20 feet. Bottom of hole was dry.					

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: AT
Approved by: JHS

AESIBOR 180090E002.GPJ October 30, 2019

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Exploration Boring

Project Number	Exploration Number	Sheet
180090E002	EB-10	1 of 1

Project Name	LSC - Kessler Center	Ground Surface Elevation (ft)	365.5
Location	Puyallup, WA	Datum	NAVD 88
Driller/Equipment	Advance Drill Technologies / HSA D-50	Date Start/Finish	4/25/19,4/25/19
Hammer Weight/Drop	140# / 30	Hole Diameter (in)	7

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-1		**Grass / Topsoil**			5 3 3	▲6	
				Crushed Gravel Base - 4 inches					
				Vashon Recessional Lacustrine Deposit					
		S-2		Moist, orangish brown, silty, fine SAND; organics; poor recovery (SM). Moist, brownish orange, SILT, some fine sand, trace medium to coarse sand; organics (ML).			2 1 3	▲4	
5		S-3		Moist, brownish tan, SILT, some fine sand; fine laminae with iron oxide staining otherwise massive (ML).			1 2 4	▲5	
10		S-4		Moist, brownish tan, silty, fine SAND; fine laminae with iron oxide staining otherwise massive; coarsening downward (SM).			2 3 5	▲8	
15		S-5		Moist, grayish brown, SILT, some fine sand; fine laminae otherwise massive (ML). Moist, grayish brown, silty, fine SAND; massive (SM).			2 2 6	▲8	
20		S-6		Moist, brownish gray, SILT, some fine sand; few interbeds of silt with iron oxide staining (ML).			2 2 4	▲6	
25		S-7		Upper 3 inches: moist, brownish gray, SILT, trace gravel (ML). **Vashon Lodgement Till / Vashon Advance Outwash ?** Driller notes gravel at 25 feet. Lower 3 inches: moist, grayish brown with heavy oxidation at contact, silty, GRAVEL, some fine sand; unsorted; 6 inches of recovery (GM).			6 18 18	▲36	
30		S-8		**Vashon Advance Outwash** Moist, grayish brown, fine to medium SAND, some gravel, trace silt; 6 inches of recovery (SP).			17 24 31	▲55	
35				Bottom of exploration boring at 31.5 feet No groundwater encountered.					
40									

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	Exploration Number	Sheet
180090E002	EB-11	1 of 1

Project Name	LSC - Kessler Center	Ground Surface Elevation (ft)	363
Location	Puyallup, WA	Datum	NAVD 88
Driller/Equipment	Advance Drill Technologies / HSA D-50	Date Start/Finish	4/25/19,4/25/19
Hammer Weight/Drop	140# / 30	Hole Diameter (in)	7

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-1		**Grass / Topsoil**			8 6 7	▲13	
				Crushed Gravel Base - 2 to 4 inches					
				Vashon Recessional Lacustrine Deposit					
		S-2		Moist, dark orangish brown with iron oxide staining, silty, fine SAND; organics (SM). Moist, brownish tan, SILT, some fine sand; few dropstones otherwise massive (ML).			3 2 6	▲8	
5		S-3		Moist, brownish tan, SILT, some fine sand, trace gravel (dropstones); some laminae with iron oxide mottling otherwise massive (ML).			3 3 4	▲7	
10		S-4		Moist, brownish gray, silty, fine SAND to sandy, SILT; silt interbeds with iron oxide staining (SM-ML).			2 5 5	▲10	
15		S-5		Moist, brownish gray, SILT, some fine sand, trace gravel (dropstones); interbeds of medium sand and interbeds of silt; coarsening downward (ML).			3 3 6	▲9	
20		S-6		Moist, brownish tan, SILT, some fine sand, trace gravel; massive (ML).			4 6 7	▲13	
25		S-7		Moist to very moist, brownish tan, SILT, trace gravel; massive (ML).			3 4 5	▲9	
				Driller notes gravel at 27.5 feet.					
				Vashon Lodgement Till / Vashon Advance Outwash ?					
30		S-8		Upper 3 inches: moist, grayish brown, silty, fine to medium SAND, some gravel; diamict; 6 inches of recovery (SM).			17 14 28	▲42	
				Vashon Advance Outwash					
35		S-9		Moist, grayish brown, fine to medium SAND, some gravel, trace silt; 6 inches of recovery (SP).			13 19 32	▲51	
				Bottom of exploration boring at 36.5 feet No groundwater encountered.					
40									

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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Approved by: JHS

AESIBOR 180090E002.GPJ October 30, 2019

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-12W	1 of 3

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing): 362.75
Surface Elevation (ft): 363
Water Level Elevation: 74.26
Date Start/Finish: 5/28/19,5/29/19
Drilling/Equipment: Advance Drill Technologies / HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush grade monument Concrete 0 to 1 foot		9 7 6		**Crushed Gravel Base - 4 inches** **Vashon Recessional Lacustrine** Moist, orangish brown, silty, fine SAND; trace organics (SM).
				4 3 5		Moist, grayish brown with light iron oxide staining, fine sandy, SILT, trace coarse sand (dropstones) (ML).
5		Bentonite chips 1 to 15 feet		3 3 5		Moist, light brown with iron oxide staining, SILT, trace fine sand; slightly laminated otherwise massive (ML).
10		2-inch I.D. PVC casing 0 to 74 feet		3 3 4		Upper 6 inches: moist, brownish gray, silty, fine SAND; massive (SM). Lower 12 inches: moist, brownish gray with iron oxide staining, fine sandy, SILT; massive (ML).
15				2 2 3		Moist to very moist, brownish gray with iron oxide staining, SILT, some fine sand, trace coarse sand (dropstones); interbeds of medium sand (ML).
20				3 4 7		Moist, brown, fine sandy, SILT; massive (ML).
25	▼	Bentonite grout 15 to 64 feet		1 2 4		Very moist to wet, brownish gray, SILT, some fine sand, trace gravel (dropstones); coarsening downward (ML). Perched groundwater.
						Vashon Advance Outwash
30				13 30 24		Driller notes gravel at 29 feet. Moist, grayish brown, silty, fine to medium SAND, some coarse sand, trace gravel; gravel is silt coated; poor recovery (SM).
35				18 20 21		As above.

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 (5/29/19)
- Water Level at time of drilling (ATD)

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Approved by: JHS

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-12W	2 of 3

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing): 362.75
Surface Elevation (ft): 363
Water Level Elevation: 74.26
Date Start/Finish: 5/28/19,5/29/19
Drilling/Equipment: Advance Drill Technologies / HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Bentonite grout 15 to 64 feet		22 28 42		Moist to very moist, brownish gray with red in bottom two inches, very silty, fine to medium SAND, trace coarse sand, trace gravel (SM).
45				22 50/5"		Moist, grayish brown, silty, medium to coarse SAND, trace gravel; gravel is silt coated (SM).
50				50/6"		As above; moist to wet; poor recovery. Driller adds water at 52 feet.
55				31 50/6"		Moist, grayish brown, silty, medium to coarse SAND, trace gravel; gravel is silt coated (SM).
60				28 50/4"		Wet, grayish brown, silty, medium SAND, some coarse sand, trace gravel; gravel is silt coated (SM).
65		Natural Pack 64 to 84 feet		30 50/6"		Very moist, brownish gray, silty, medium to coarse SAND, some gravel; gravel is silt coated (SM).
70				40 50/3"		Moist, grayish brown, silty, medium to coarse SAND, some gravel; gravel is silt coated; poor recovery (SM).
75	▽ ▼			26 50/5"		Upper 12 inches: very moist, grayish brown, silty, medium to coarse SAND, some gravel; silt coated (SM). Lower 6 inches: trace gravel (SM).
		2-inch I.D. PVC well screen 0.020-inch slot width 74 to 84 feet				

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 (5/29/19)

▼ Water Level at time of drilling (ATD)

Logged by: ART

Approved by: JHS

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-12W	3 of 3

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing): 362.75
Surface Elevation (ft): 363
Water Level Elevation: 74.26
Date Start/Finish: 5/28/19,5/29/19
Drilling/Equipment: Advance Drill Technologies / HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
				50/5"		Upper 4 inches: wet, brownish gray, silty, fine to medium SAND, some coarse sand, some gravel (SM). Lower 2 inches: moist, brownish gray, fine SAND, some silt; poor recovery (SM).
		Threaded end cap				
85				28		Moist, brownish gray, fine to medium SAND, some gravel, some silt; massive (SP-SM).
		Well tag # BKU 948		28		
				45		Boring terminated at 86.5 feet
						Well completed at 84 feet on 5/29/19.
						Perched groundwater encountered at 25 feet. Groundwater table encountered at 75 feet. Static groundwater table at 74.26 feet.,Before development bottom of well was 83.65 feet. After development bottom of well was 82.21 feet.
90						
95						
100						
105						
110						
115						

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 (5/29/19)
- Water Level at time of drilling (ATD)

Logged by: ART
Approved by: JHS

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-13W	1 of 1

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing): 28
Surface Elevation (ft): 363
Water Level Elevation: 362.59
Date Start/Finish: 5/29/19,5/29/19
Drilling/Equipment: Advance Drill Technologies / HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush grade monument Concrete 0 to 1 foot				**Vashon Recessional Lacustrine Deposit** Well drilled adjacent to EB-12W.
5		Bentonite chips 1 to 15 feet				
				2 4 4		Moist, reddish brown with some iron oxide staining, fine sandy, SILT; interbeds of fine sand otherwise massive (ML).
10		2-inch I.D. PVC casing 0 to 18 feet				
				3 5 5		Moist, brownish red, very silty, fine SAND to fine sandy, SILT; fine laminae otherwise massive (SM-ML).
15		10/20 sand pack 15 to 28 feet				
				2 3 4		Moist, brownish red with slight iron oxide staining, fine sandy, SILT, trace gravel (dropstones); massive (ML).
20						
		2-inch I.D. PVC well screen 0.020-inch slot width 18 to 28 feet		2 2 3		Upper 6 inches: moist, brown, silty, fine SAND (SM). Lower 12 inches: moist, brown with iron oxide staining, fine sandy, SILT; interbeds of fine sand (ML).
25						
	▼	Threaded end cap		2 6 10		Moist to very moist, reddish brown, fine sandy, SILT, trace medium sand, trace gravel (ML).
30		Well tag # BKU 949				Boring terminated at 29.5 feet Well completed at 28 feet on 5/29/19. Perched groundwater encountered at 28 feet.
35						

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

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

associated earth sciences incorporated

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-14W	1 of 1

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing): 365.68
Surface Elevation (ft): 366
Water Level Elevation: 17.5, 22.5
Date Start/Finish: 5/29/19,5/29/19
Drilling/Equipment: Advance Drill Technologies / HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush grade monument Concrete 0 to 1 foot				**Vashon Recessional Lacustrine Deposit**
		Bentonite chips 1 to 8 feet		2 2 3		Moist, reddish brown, fine sandy, SILT, trace organics (ML).
5		2-inch I.D. PVC casing 0 to 11 feet				
				3 2 4		Moist, reddish brown with iron oxide staining, fine sandy, SILT to silty, fine SAND, trace medium sand; interbeds of fine sand (ML-SM).
10		10/20 sand pack 8 to 22 feet				
				4 5 6		Moist, reddish brown, fine sandy, SILT, trace gravel (dropstones) (ML).
15		2-inch I.D. PVC well screen 0.020-inch slot width 11 to 21 feet				
	▼			2 3 6		Moist to wet, brownish red, fine sandy, SILT; fine laminae otherwise massive (ML).
20						**Vashon Advance Outwash**
						Driller notes gravel at 21 feet.
				12 13 11		Moist, grayish brown, fine to medium silty, SAND, trace gravel; gravel is silt coated; unsorted (SM).
25		Bentonite grout 22 to 27.5 feet				
						Moist, grayish brown, fine SAND, some silt; contains broken gravel; poor recovery (SM).
				26 26 26		Boring terminated at 27.5 feet Well completed at 21 feet on 5/29/19. Perched groundwater encountered at 17.5 feet.
		Well tag # BKU 950				
30						
35						

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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NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-15W	1 of 3

Project Name: LSC - Kessler Center
Location: Puyallup, WA
Elevation (Top of Well Casing):
Surface Elevation (ft): 365
Water Level Elevation:
Date Start/Finish: 7/15/19,7/16/19
Drilling/Equipment: Advance Drill Technologies/ HSA D50
Hole Diameter (in): 9
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush mount monument Concrete 0 to 1 foot				**Grass / Topsoil - 3 inches**
						Vashon Lacustrine Deposits
				5 3 4		Moist, brownish red, silty, fine SAND, trace coarse sand; organics (rootlets); broken gravel; poor recovery (SM).
5				3 3 4		Moist, brownish gray, fine sandy, SILT; few medium sand laminations otherwise massive (ML).
10				5 4 4		Moist, brownish gray, fine sandy, SILT to silty, fine SAND, trace gravel (dropstones); few laminae otherwise massive (ML-SM).
15				2 2 4		Moist with increasing moisture with depth, brownish gray with some iron oxide mottling, fine sandy, SILT; massive (ML).
	▼			1 1 2		Wet, brownish gray with some iron oxide mottling, fine sandy, SILT; massive (ML).
20		2-inch I.D. PVC casing 0 to 80 feet		1 2 1		Wet, brownish gray with some iron oxide mottling, fine sandy, SILT; massive (ML).
	▼			2 2 3		Wet, brownish gray with some iron oxide mottling, fine sandy, SILT; massive (ML).
25				8 14 16		Driller notes change in drill action. Moist to wet, brownish gray with some iron oxide mottling, fine sandy, SILT; massive (ML); ranges to moist, grayish brown, medium to coarse SAND, trace fine sand, trace silt (SP) in lower 3 inches.
						Vashon Advance Outwash
				16 17 16		Moist, brownish gray, silty, fine to medium SAND, trace gravel; interbedded with sandy, silt; broken gravel; poor recovery (SM).
30				21 48 38		Drill chatter. Broken gravel, poor recovery.
				20 35 37		Moist, brownish gray, silty, fine to medium SAND, some coarse sand, trace gravel; broken gravel; poor recovery (SM).
35				13 25 16		Moist to wet, grayish brown, silty, fine to medium SAND, some coarse sand, trace gravel; massive (SM).

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

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-15W	2 of 3

Project Name: LSC - Kessler Center
Elevation (Top of Well Casing):
Water Level Elevation:
Drilling/Equipment: Advance Drill Technologies/ HSA D50
Hammer Weight/Drop: 140# / 30"

Location: Puyallup, WA
Surface Elevation (ft): 365
Date Start/Finish: 7/15/19,7/16/19
Hole Diameter (in): 9

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
				32 40 50/3"		Wet, brownish gray, silty, fine to medium SAND, some coarse sand, trace gravel; massive (SM). Drill chatter.
45				28 50/5.5"		Moist, grayish brown, fine to medium SAND, some coarse sand, some silt, trace gravel; broken gravel; poor recovery (SP-SM).
50				50/5"		Moist, grayish brown, medium to coarse SAND, some silt; silt interbeds, broken gravel; poor recovery (SP-SM).
						Drill chatter.
55		Bentonite grout 40 to 70 feet		28 40 50/5"		Moist, grayish brown, medium SAND, some fine to coarse sand, trace silt; broken gravel (SP-SM).
60				26 27 28		Moist, grayish brown, fine to medium SAND, some coarse sand, some silt; broken gravel; interbeds of coarse sand otherwise massive (SM).
65				40 50/3"		Moist, grayish brown, medium to coarse SAND, some fine sand, some silt; broken gravel (SM).
70				30 40 46		Moist, grayish brown, medium to coarse SAND, some silt; broken gravel; poor recovery (SM).
		Bentonite chips 70 to 76 feet				Hard drill action.
75				30 50/6"		Moist, grayish brown, medium SAND, some coarse sand, some silt; broken gravel; poor recovery (SM).
		Sand pack 76 to 91.5 feet				

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

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
180090E002	EB-15W	3 of 3

Project Name: LSC - Kessler Center
Elevation (Top of Well Casing):
Water Level Elevation:
Drilling/Equipment: Advance Drill Technologies/ HSA D50
Hammer Weight/Drop: 140# / 30"

Location: Puyallup, WA
Surface Elevation (ft): 365
Date Start/Finish: 7/15/19,7/16/19
Hole Diameter (in): 9

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
				50/6"		Moist to wet, medium to coarse SAND, some silt; broken gravel; poor recovery (SM).
85		2-inch I.D. PVC well screen 0.020-inch slot width 79 to 89 feet		14 32 38		Moist, gray, fine to medium SAND, trace silt, trace coarse sand; massive (SP).
90				20 26 26		As above.
		Well tag # BKU 951				Boring terminated at 91.5 feet Well completed at 89 feet on 7/16/19. Perched groundwater encountered at 17.5 and 22.5 and 40 feet.
95						
100						
105						
110						
115						

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

NWWELL- B 180090E002W.GPJ BORING.GDT 10/30/19

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Exploration Boring

Project Number	Exploration Number	Sheet
180090E002	EB-16	1 of 1

Project Name	LSC - Kessler Center	Ground Surface Elevation (ft)	364
Location	Puyallup, WA	Datum	NAVD 88
Driller/Equipment	Advance Drill Technologies/ HSA D50	Date Start/Finish	7/16/19,7/16/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	9

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - 4 inches					
				Vashon Lacustrine Deposits Gravel.					
5		S-1		Moist, light brown, fine sandy, SILT; occasional gravel (dropstones); poor recovery (ML).			3 2 5	▲7	
				Driller notes change in drill action at ~9.5 feet.					
10		S-2		**Vashon Advance Outwash** Moist, grayish brown, fine to medium SAND, trace silt; broken gravel; massive (SP).			4 12 20	▲32	
		S-3		As above; frequency of gravel increasing.			7 8 9	▲17	
15		S-4		Moist increasing with depth, grayish brown, fine to medium SAND, some coarse sand, some gravel, trace silt; coarsening down (SP).			7 8 12	▲20	
		S-5		Moist, grayish brown, fine to medium SAND, trace gravel, trace silt; broken gravel (SP).			9 21 37	▲58	
20		S-6		Moist, grayish brown, fine to medium silty, SAND; broken gravel (SM).			34 50/5"	▲50/5"	
				Bottom of exploration boring at 21.5 feet No groundwater encountered.					
25									
30									
35									

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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AESIBOR 180090E002W.GPJ October 30, 2019

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Exploration Boring

Project Number	Exploration Number	Sheet
180090E002	EB-17	1 of 1

Project Name	LSC - Kessler Center	Ground Surface Elevation (ft)	364
Location	Puyallup, WA	Datum	NAVD 88
Driller/Equipment	Advance Drill Technologies/ HSA D50	Date Start/Finish	7/16/19,7/16/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	9

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Topsoil - 3 inches **Vashon Lacustrine Deposits**					
5		S-1		Moist, brownish gray, fine sandy, SILT; massive (ML).			3 3 4	▲7	
10		S-2		Moist, brownish gray with iron oxide mottling, SILT, some fine san; massive; poor recovery (ML).			3 4 3	▲7	
		S-3		Moist, brownish gray with iron oxide mottling, fine sandy, SILT; fine laminae otherwise massive (ML).			2 2 4	▲6	
15		S-4		Moist, brownish gray with iron oxide mottling, fine sandy, SILT to silty, fine SAND; massive (ML-SM).			3 3 3	▲6	
		S-5		Moist, brownish gray with iron oxide mottling, fine sandy, SILT; massive (ML).			1 2 1	▲3	
20		S-6		Moist, brownish gray with heavy iron oxide mottling, fine sandy, SILT; massive (ML). Driller notes chatter at 21.5 feet. Upper 6 inches: as above.		▼	2 3 6	▲9	
		S-7		**Vashon Advance Outwash** Lower 6 inches: moist, grayish brown, fine to medium SAND, some silt, some broken gravel (SM).			10 26 34	▲60	
25		S-8		Moist, grayish brown, fine to medium SAND, trace silt; broken gravel; poor recovery (SP).			15 26 24	▲50	
				Bottom of exploration boring at 26.5 feet Perched groundwater encountered at 20 feet.					
30									
35									

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

AESIBOR 180090E002W.GPJ October 30, 2019

EXPLORATION PIT NO. IT-1

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil - 6 inches

Spalls / Construction Debris - 6-8 inches

Fill

Vashon Recessional Lacustrine Deposit

Soft, moist, brownish tan, fine sandy, SILT; interbeds of fine sand and mottling otherwise massive (ML).

Soft, moist, brownish tan, fine sandy, SILT; small laminations otherwise massive (ML).

Loose, moist, grayish brown, fine silty, SAND; massive (SM).

Stiff, moist, brownish tan, fine sandy, SILT; some mottling and laminations otherwise massive (ML).

Bottom of exploration pit at depth 16 feet
No seepage. No caving. Infiltration test performed at 5.5 feet.

KCTP3 180090E002.GPJ October 30, 2019

LSC Kessler Center
Puyallup, WA

Logged by: ART

Approved by: JHS

associated earth sciences incorporated

Project No. 180090E002

8/20/19

EXPLORATION PIT NO. IT-2

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil - 3-4 inches

Spalls / Construction Debris - 4-6 inches

Fill

Vashon Recessional Lacustrine Deposit

Soft, moist, brownish tan, fine, sandy, SILT; contains fine sandy lenses; occasional dropstones otherwise massive (ML).

As above; more laminations and organics (rootlets).

Laminations observed in sidewall.

Loose, moist, brownish tan, silty, fine SAND; massive (SM).

Bottom of exploration pit at depth 11 feet
No seepage. No caving. Infiltration test performed at 5.5 feet.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

KCTP3 180090E002.GPJ October 30, 2019

LSC Kessler Center
Puyallup, WA

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Project No. 180090E002

8/20/19

EXPLORATION PIT NO. IT-3

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil - 4-6 inches

Fill

Vashon Recessional Lacustrine Deposit

Soft, moist, brownish tan, fine sandy, SILT; some laminations and mottling otherwise massive (ML).

Loose, moist, brownish gray, silty, fine SAND to fine sandy, SILT; bedding present (SM-ML).

Stiff, moist, brownish tan, fine sandy, SILT; some laminations and mottling; silt blocks observed in bucket (ML).

Vashon Advance Outwash

Dense, moist, grayish brown, fine to medium silty, SAND, trace coarse sand, trace gravel (SM).

Dense, moist, grayish brown, silty, medium to coarse SAND, some gravel, trace fine sand, trace cobbles; gravels are silt coated (SM).

As above; coarsening downward.

Bottom of exploration pit at depth 22 feet
No seepage. No caving. Infiltration test performed at 18.5 feet.

KCTP3 180090E002.GPJ October 30, 2019

LSC Kessler Center
Puyallup, WA

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Project No. 180090E002

8/21/19

LOG OF EXPLORATION PIT NO. EP-17

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Grass / Topsoil
1	**Vashon Recessional Lacustrine Deposits**
2	Loose, slightly moist to moist, brown,very silty, fine SAND, to fine sandy, SILT; thickly bedded; occasional dropstones (SM/ML).
3	
4	
5	
6	
7	
8	
9	
10	Discontinuous lens (1 to 2 feet thick) SILT, some fine to coarse gravel; unsorted/diamict (ML). Stiff, moist, brown, sandy, SILT, trace fine to coarse gravel; massive (ML).
11	
12	
13	
14	Becomes very moist.
15	
16	
17	
18	**Vashon Advance Outwash**
19	Moist to very moist, brown to grayish brown, silty, very sandy, fine to coarse GRAVEL; stratified (GM). Moist to very moist, grayish brown, gravelly, fine to coarse SAND, trace silt; stratified; occasional clay
20	

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK
Approved by: JHS

associated earth sciences incorporated

Project No. 180090E001

4/26/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-17

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	coating (SW).
21	Bottom of exploration pit at depth 20 feet No seepage. Minor caving throughout.
22	
23	
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36	
37	
38	
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40	

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK
Approved by: JHS

associated earth sciences incorporated

Project No. 180090E001

4/26/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-18

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Grass / Topsoil
1	**Vashon Recessional Lacustrine Deposits**
	Loose, slightly moist to moist, orangish brown, very silty, fine SAND, trace gravel; massive (SM).
2	Becomes brown.
3	
4	
5	Becomes very moist.
6	
7	
8	Stiff, very moist, brown with dark orange iron oxide mottling, SILT, trace gravel; massive (ML).
9	
10	
11	
12	
13	**Vashon Lodgement Till**
	Medium dense, moist, grayish brown, very silty, fine to medium SAND, some fine to coarse gravel; unsorted/diamict (SM).
14	
15	
16	**Vashon Advance Outwash**
17	Dense, moist, grayish brown, interbedded silty, gravelly, fine to coarse SAND, and very sandy, fine to coarse GRAVEL, trace silt (SM/GW).
18	
19	
20	

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK
Approved by: JHS

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Project No. 180090E001

4/26/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-18

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**	
21	Bottom of exploration pit at depth 19.5 feet No seepage. Moderate caving 0 to 10 feet, minor caving 10 to 19.5 feet.	
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
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36		
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40		

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK
Approved by: JHS

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Project No. 180090E001

4/26/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-19

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Brambles / Topsoil
	Vashon Recessional Lacustrine Deposits
1	Loose, slightly moist, orangish brown, very silty, fine SAND; massive (SM).
2	Becomes brown.
3	
4	
5	
6	
7	
8	Stiff, moist, brown, SILT, trace fine to coarse gravel; massive (ML).
9	
10	Occasional dropstones.
11	
12	
13	**Vashon Advance Outwash**
14	Dense, slightly moist, grayish brown to brown, silty, gravelly, fine to coarse SAND; stratified (SM).
15	
16	Dense, slightly moist, grayish brown, gravelly, fine to coarse SAND, some silt; stratified (SW-SM).
17	
18	
19	Bottom of exploration pit at depth 18.5 feet No seepage. Minor caving 0 to 13 feet.
20	

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK
Approved by: JHS

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Project No. 180090E001

4/26/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-20

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Fill

1

Vashon Recessional Lacustrine Deposits

Loose to stiff, moist, brown with orange mottling, interbedded (1 to 6 inches thick), very silty, fine SAND, to fine sandy, SILT (SM/ML).

2 3 4 5 6 7 8 9 10

Loose, moist, brown, fine SAND, some silt with beds (1/2 to 2 inches thick) (SP-SM/ML).

11 12 13 14 15

Stiff, moist, brown with orange mottling, SILT, with occasional beds (1/2 to 2 inches thick) of fine sand (ML/SP).

16 17 18

Bottom of exploration pit at depth 17.5 feet
No seepage. Moderate caving 0 to 15 feet, minor caving 15 to 17.5 feet.

19 20

KCTP3 180090.GPJ May 31, 2018

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

Approved by: JHS

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Project No. 180090E001

4/26/18

LOG OF EXPLORATION PIT NO. EP-21

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass at surface

Vashon Recessional Lacustrine Deposits

1 Loose, slightly moist, orangish brown, very silty, fine SAND; massive (SM).

2

3

4

5

6 Stiff, moist, brown with orange mottling, SILT, some fine sand, few beds (1/2 to 1 inch thick) of fine sand, otherwise massive (ML).

7 Medium dense, very moist, grayish brown, silty fine SAND; few beds (1/2 inch thick) of orangish brown silt, otherwise massive (SM).

8

9

10

11

12

13

14

15

16 Bottom of exploration pit at depth 15 feet
No seepage. Minor caving 0 to 7 feet.

17

18

19

20

KCTP3 180090.GPJ May 31, 2018

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

Approved by: JHS

associated earth sciences incorporated

Project No. 180090E001

4/26/18

LOG OF EXPLORATION PIT NO. EP-22

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil

Vashon Recessional Lacustrine Deposits

1 Loose, slightly moist, orangish brown, interbedded silty, fine SAND, and fine sandy, SILT (SM/ML).

2

3 Becomes brown.

4

5

6

7 Loose, moist, brown to grayish brown, fine SAND, trace silt; massive (SP).

8

9 Occasional beds (1/4 to 1/2 inches) of silt.

10

11 Dense, wet, gray, medium SAND, trace silt; stratified (SP).

12

13

Vashon Advance Outwash

14 Very stiff to hard, moist, brown with gray and orange staining, SILT, laminated (ML).

15 Dense, moist, grayish brown, gravelly, fine to coarse SAND, some silt; silty areas; stratified (SW-SM).

16 Bottom of exploration pit at depth 15.5 feet
Rapid seepage 10.5 to 13 feet. Moderate caving 0 to 10 feet, severe caving 10 to 15.5 feet.

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KCTP3 180090.GPJ May 31, 2018

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

Approved by: JHS

associated earth sciences incorporated

Project No. 180090E001

4/27/18

LOG OF EXPLORATION PIT NO. EP-23

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil

Vashon Recessional Lacustrine Deposits

Loose, slightly moist, orangish brown, very silty, fine SAND, to fine sandy, SILT; thickly bedded (SM/ML).

Becomes brown.

Loose, very moist, grayish brown to brown, fine SAND, trace silt; massive (SP).

Dense, wet, gray, medium SAND, trace silt; stratified (SP).

Vashon Advance Outwash

Very stiff to hard, moist, brown with orange staining, SILT; laminated (ML).

Dense, moist, grayish brown, silty, gravelly, fine to coarse SAND; stratified (SM).

Bottom of exploration pit at depth 15.5 feet
Moderate seepage 10 to 15.5 feet. Severe caving 10 to 15.5, minor caving 0 to 10 feet.
Let stand open ~1 hour: water at 13 feet from top of hole, caving to 14 feet from top of hole.

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

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Project No. 180090E001

4/27/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-24

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil

Vashon Recessional Lacustrine Deposits

Lose, slightly moist, orangish brown, very silty, fine SAND, to fine sandy, SILT; thickly bedded (SM/ML).

Becomes brown.

Vashon Lodgement Till

Dense, slightly moist, grayish brown to brown with dark orange staining, interbedded silty, fine SAND, sand SILT, trace gravel (SM/ML).

Bottom of exploration pit at depth 18 feet
Minor seepage 8 to 10 feet. Moderate caving 0 to 10 feet.

KCTP3 180090.GPJ May 31, 2018

LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

Approved by: JHS

associated earth sciences incorporated

Project No. 180090E001

4/27/18

LOG OF EXPLORATION PIT NO. EP-25

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Grass / Topsoil
1	**Vashon Recessional Lacustrine**
2	Loose, slightly moist, orangish brown, very silty, fine SAND to fine sandy, SILT; thick bedding (6 to 12 inches) (SM/ML).
3	Becomes brown.
4	
5	
6	
7	Loose, slightly moist, brown, fine SAND, some silt; massive (SP).
8	
9	
10	Becomes wet.
11	
12	Medium stiff, moist to very moist, brown with orange mottling, SILT (ML).
13	
14	Becomes slightly moist.
15	
16	**Vashon Lodgement Till**
17	Dense, slightly moist, grayish brown, very silty, fine to medium SAND, some fine to coarse gravel; unsorted/diamict (SM).
18	**Vashon Advance Outwash -** Dense, slightly moist to moist, grayish brown, gravelly, fine to coarse SAND, some silt; stratified with silt areas (SW-SM).
19	Bottom of exploration pit at depth 18 feet Moderate seepage 10 to 12 feet. Severe caving 0 to 16 feet.
20	

LSC Warehouse Addition
Puyallup, WA

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Project No. 180090E001

4/30/18

KCTP3 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. PD-1

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Topsoil

Vashon Recessional Lacustrine Deposits

Loose, slightly moist, orangish brown, very silty, fine SAND, to fine sandy, SILT; thickly bedded (SM/ML).

Becomes brown.

Loose, slightly moist, brown, silty, fine SAND; massive (SP-SM).

Medium stiff, moist to very moist, brown with orange mottling, SILT (ML).

Vashon Advance Outwash

Dense, slightly moist to moist, grayish brown, very sandy, fine to coarse GRAVEL, some silt; few silty areas; stratified (GW-GM).

Bottom of exploration pit at depth 18.83 feet

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LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

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Project No. 180090E001

4/27/18

LOG OF EXPLORATION PIT NO. PD-1

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Moderate caving 0 to 12 feet.

21

Constructed as a pit drain: Backfilled with native soils 0 to 4 feet; filter fabric placed over pea gravel backfill from 4 feet to 18.83.

22

PVC piezometer placed at the BOH to +3.8 feet. Base of pit 2 x 8 feet; at depth of 4 feet, base widened due to caving to 3x8 feet.

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LSC Warehouse Addition
Puyallup, WA

Logged by: LBK

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Project No. 180090E001

4/27/18

KCTP3 180090.GPJ May 31, 2018

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Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-1W	1 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	357
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/16/18,4/16/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Topsoil					
		S-1		**Vashon Recessional Lacustrine Deposits** Moist to very moist, orangish brown, silty, fine SAND; abundant organics (SM).					
5		S-2		Moist to very moist, brown, with faint orange iron oxide staining, silty, fine SAND; few organics; few fine laminae otherwise massive (SM).			1 2 2	▲4	
		S-3		Slightly moist to moist, brown with faint orange iron oxide staining, fine sandy, SILT, trace medium to coarse sand (dropstones); few organics; occasional faint fine laminae, few thick beds (1 to 2 inches thick) otherwise massive (ML).			2 2 3	▲5	
10		S-4		Slightly moist, brown with orange and gray mottling, SILT, some fine sand, trace fine gravel (dropstones); massive (ML).			3 4 4	▲8	
		S-5		Very moist, brown with orange iron oxide staining, silty, fine SAND to sandy, SILT, trace medium to coarse sand (dropstones), trace fine gravel (dropstones); few fine laminae and bedding (1/4 to 1/2 inch thick) (SM/ML).			3 3 3	▲6	
15		S-6		Wet, brown with orange iron oxide staining, fine sandy, SILT; few faint laminae, otherwise massive (ML).			2 2 3	▲5	
				Vashon Advance Outwash					
		S-7		Slightly moist, grayish brown, silty, very sandy, GRAVEL; stratified (GM). Partial recovery (~12 inches). Drill action rough. Drill chatter (gravel).			23 24 24	▲48	
20		S-8		Slightly moist to moist, grayish brown, gravelly, fine to coarse SAND, some to trace silt; stratified (SW-SM). Partial recovery (~12 inches).			18 28 38	▲66	
				Rough drilling continues to bottom of hole.					
		S-9		No recovery.			50/2"	▲50/2"	
25		S-10		Slightly moist, grayish brown, very gravelly, fine to coarse SAND, some to trace silt; stratified (SW-SM).			24 35 22	▲57	
		S-11		Slightly moist, grayish brown,very gravelly, fine to coarse SAND, some silt; stratified; few silty zones (~1 to 2 inches thick) (SW-SM).			15 25 26	▲51	

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: LBK

Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-1W	2 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	357
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/16/18,4/16/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-12		Slightly moist, grayish brown, silty, very gravelly, fine to coarse SAND, stratified (SM).			31 34 36	▲70	
				Cuttings very gravelly.					
		S-13		Moist, grayish brown, silty, very gravelly, fine to coarse SAND; stratified (SM). Broken coarse gravel.			50/5"	▲50/5"	
35		S-14		Moist, grayish brown, very silty, fine to coarse sandy, fine to coarse GRAVEL; stratified (SM).			20 50/3"	▲50/3"	
				Bottom of exploration boring at 35.8 feet Completed as a monitoring well. Dry at time of drilling.					
40				**Well Completion:** Flush mount monument 0 to 1 foot: Concrete seal 1 to 23 feet: Bentonite chips 23 to 35 feet: Sand pack: pioneer sands 1 to 25 feet: Well casing: PVC, 2-inch I.D. schedule 40 25 to 35 feet: Well screen: 0.020-inch slot, PVC, 2-inch I.D. schedule 40 Well tag: #BZK-501					
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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 Log

Project Number	Exploration Number	Sheet
180090E001	EB-2W	1 of 1

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	357
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/16/18,4/16/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
5				No sampling. Located ~5 feet North of EB-1W.					
10									
15				Bottom of exploration boring at 15 feet Completed as a monitoring well. Dry at time of drilling.					
20				**Well Completion:** Flush mount monument: 12 inch I.D., steel skirt 0 to 3.5 foot: Concrete seal 0.5 to 5 feet: Well casing: PVC, 2-inch I.D. schedule 40 3.5 to 15 feet: Sand pack: Pioneer sands 5 to 15 feet: Well screen: 0.020-inch slot, PVC, 2-inch I.D. schedule 40 Well tag: #BZK-502					
25									

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 Log

Project Number	Exploration Number	Sheet
180090E001	EB-3W	1 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	352
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/16/18,4/16/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Topsoil					
		S-1		**Vashon Recessional Lacustrine Deposits**					
5		S-2		Very moist, brown with faint orange oxide staining, very silty, fine SAND; few faint fine laminae, otherwise massive (SM).			1 1 3	▲4	
		S-3		Moist, brown with occasional orange iron oxide staining, very silty, fine SAND, trace medium to coarse sand; diamict; layer of disturbed texture (SM).			3 4 5	▲9	
10		S-4		Driller notes water. Moist to very moist, brown, very silty, fine SAND, trace fine gravel (dropstones); diamict (SM).			3 3 6	▲9	
		S-5		Moist to very moist, brown, silty, fine SAND; faint fine laminae and beds (1/4 to 1/2 inch thick), otherwise massive (SM). Silt decreasing slightly, but still silty.			2 5 7	▲12	
15		S-6		Slightly moist to moist, brown, interbedded fine SAND, trace silt with thin (1/16 to 1/4 inch thick) interbeds of silt (SP/ML). Slightly moist, brown, fine SAND, some silt; faint fine laminae (SP).			3 4 5	▲9	
		S-7		Moist, brown, very silty, fine SAND; some beds (1/4 to 1/2 inch); massive (SM). Very moist, brown, fine SAND, some silt (SP-SM).			5 6 7	▲13	
20		S-8		Moist to very moist, brown, interbedded layer (1 to 3 inches thick) of fine SAND, trace silt and silty, fine SAND, and SILT (SP/SM/ML).			2 6 7	▲13	
				Vashon Recessional Outwash Sand					
		S-9		Slightly moist, grayish brown, fine to medium SAND, some silt, trace gravel; massive (SP).			7 8 12	▲20	
25		S-10		As above.			6 10 11	▲21	
		S-11		Slightly moist, grayish brown, fine to medium SAND, trace silt; fining downward (SP). Becoming some silt (SP-SM).			9 11 10	▲21	

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: LBK

Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-3W	2 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	352
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/16/18,4/16/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-12		Slightly moist, grayish brown, fine to medium SAND, trace silt; massive (SP).			7 7 9	▲16	
				Vashon Advance Outwash					
		S-13		Slightly moist, grayish brown, fine to medium SAND, some gravel, some silt; stratified (SW). Moist, brown, silty, fine SAND, some medium sand; massive (SM). Last blowcount likely overstated due to coarse gravel in tip.			10 13 33	▲46	
35		S-14		Slightly moist, grayish brown, gravelly, fine to coarse SAND, some silt; stratified (SW-SM).			20 23 22	▲55	
				Bottom of exploration boring at 36.5 feet Completed as a monitoring well. Dry at time of drilling.					
40				**Well Completion:** Flush mount monument 0 to 1.5 foot: Concrete seal 1.5 to 23 feet: Bentonite chips 23 to 35 feet: Sand pack 0.5 to 25 feet: Well casing: PVC, 2-inch I.D. schedule 40 25 to 35 feet: Well screen: 0.020-inch slot, PVC, 2-inch I.D. schedule 40 Well tag: #BKZ-503					
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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 Log

Project Number	Exploration Number	Sheet
180090E001	EB-4W	1 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	349
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass					
		S-1		**Vashon Recessional Lacustrine Deposits** Slightly moist, brown, fine to coarse SAND, some fine to coarse gravel, some to trace silt; stratified (SW-SM).					
5		S-2		Slightly moist, brown, SILT, some fine sand; occasional fine laminae, otherwise massive (ML).			2 2 3	▲5	
		S-3		Wet, brown with occasional orange iron oxide staining, fine sandy, SILT; occasional fine laminae, otherwise massive (ML).		▼	1 1 2	▲3	
10		S-4		Very moist, brown with orange iron oxide staining, SILT, some fine sand; occasional organics; few fine laminae, otherwise massive (ML).			1 2 2	▲4	
		S-5		Very moist, brown with occasional orange iron oxide staining, fine sandy, SILT, trace fine gravel (dropstones); diamict (ML).			4 7 5	▲12	
15		S-6		Wet, brown, SILT, some fine to medium SAND, trace coarse sand, trace fine gravel (dropstones); diamict (ML). Partial recovery likely due to water.			4 7 5	▲12	
		S-7		Wet, brown, SILT; stratified (ML). Wet, grayish brown, fine SAND, trace silt; massive (SP).			2 7 11	▲18	
20		S-8		Wet, brown, fine sandy, SILT; fine laminae (ML).			3 7 10	▲17	
				Wet, brown, fine SAND, trace silt; massive (SP).					
		S-9		Wet, brown, fine sandy, SILT wtih thin interbeds (1/4 to 1/2 inches thick) of fine sand (ML/SP).			4 5 10	▲15	
25		S-10		Moist to very moist, grayish brown, fine to medium SAND, trace coarse sand, trace fine gravel, trace silt, grading to fine SAND, trace silt (SP). Moist, brown, fine sandy, SILT (ML).			7 6 6	▲12	
		S-11		Slightly moist to moist, grayish brown, fine SAND, trace fine gravel, trace silt; massive (SP). Partial recovery (~12 inches).			10 13 16	▲29	

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 Log

Project Number	Exploration Number	Sheet
180090E001	EB-4W	2 of 2

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	349
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-12		Slightly moist, grayish brown to brown, fine SAND, some silt; occasional faint fine laminae and interbeds (1/4 to 1/2 inches thick) of silty, fine sand, otherwise massive (SP). Partial recovery (~12 inches).			8 10 11	▲21	
				Vashon Advance Outwash					
		S-13		Slightly moist, grayish brown, gravelly, fine to coarse SAND, some silt; stratified (SW-SM). Partial recovery (~8 inches).			16 23 33	▲56	
				Driller notes gravel.					
35		S-14		Poor recovery; sampler tip only; generally as above.			50/6"	▲50/6"	
				Bottom of exploration boring at 35.5 feet Completed as a monitoring well.					
40				**Well Completion:** Flush mount monument, 12-inch steel skirt 0 to 3 feet: Concrete seal 0.45 to 5.3 feet: Well casing: PVC, 2-inch I.D. schedule 40 3 to 10.5 feet: Sand pack, pioneer sands 5.3 to 10.3 feet: Well screen: 0.020-inch slot, PVC, 2-inch I.D. schedule 40 10.5 to 35 feet: Bentonite chips Well tag: #BKZ-505					
45									
50									
55									

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: LBK
Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-5	1 of 1

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	355
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Sod/ Structural Fill					
		S-1		Slightly moist, brown, fine to coarse SAND, some fine to coarse gravel, some silt; unsorted (SW-SM).					
				As above.					
				Vashon Recessional Outwash					
		S-2		Slightly moist, brown with faint orange iron oxide staining, fine to medium SAND, some fine gravel, trace silt; stratified (SP). Partial recovery (~8 inches).			2 5 6	▲11	
5		S-3		Moist, brown with occasional orange iron oxide staining, SILT, some to trace fine sand (dropstones); occasional organics; massive (ML).			2 4 5	▲9	
10		S-4		Slightly moist, brown with occasional orange iron oxide staining, interbedded layers (1 to 4 inches thick) of SILT, trace fine sand, and silty, fine SAND; occasional organics; occasional fine laminae, otherwise massive (SM/ML).			2 4 6	▲10	
15		S-5		Moist to very moist, brown with occasional orange iron oxide staining, fine sandy, SILT to very silty, fine SAND; occasional organics; few fine laminae (SM/ML).			1 2 2	▲4	
				Bottom of exploration boring at 16.5 feet No groundwater encountered.					
20									
25									

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: LBK

Approved by: JHS

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Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-6	1 of 1

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	355
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Fill (Structural)					
		S-1		Slightly moist, brown, fine to coarse SAND, some fine to coarse gravel, some silt; unsorted (SM).					
				Vashon Recessional Outwash					
		S-2		Slightly moist, to moist, brown, SILT; laminated (ML).			8 8 9	▲17	
				Slightly moist, brown, fine to coarse SAND, some fine gravel, trace silt; stratified (SW).					
5				As above.					
		S-3		Slightly moist, brown with occasional faint orange iron oxide staining, SILT, trace fine to medium sand (dropstones); occasional organics; diamict (ML).			2 3 5	▲8	
10		S-4		Moist to very moist, brown with orange iron oxide mottling, very silty, fine SAND with very thin silt interbeds (<1/16 inch); fine laminae (SM).			2 3 4	▲7	
15		S-5		Very moist to wet, brown with dark orange iron oxide staining, interbedded layers (2 to 4 inches thick) of very silty, fine SAND, and fine sandy, SILT; fine laminae (SM/ML).		▼	2 2 3	▲5	
				Bottom of exploration boring at 16.5 feet Groundwater encountered at ~16 feet which is interpreted as perched.					
20									
25									

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: LBK

Approved by: JHS

AESIBOR 180090.GPJ May 31, 2018

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-7	1 of 1

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	353
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Gravel Cover					
				Vashon Recessional Outwash					
		S-1		Slightly moist to moist, brown, SILT; massive (ML).					
		S-2		Slightly moist, brown, with occasional faint orange iron oxide staining, very silty, fine SAND to fine sandy, SILT; occasional faint fine laminae, otherwise massive (SM/ML).			2 2 3	▲5	
5		S-3		As above. Becomes moist.			1 2 2	▲4	
10		S-4		Slightly moist, brown, with occasional orange iron oxide mottling, SILT; occasional organics; grading to brown, silty, fine SAND; massive (ML/SM).			3 5 5	▲10	
15		S-5		Slightly moist, brown with occasional orange iron oxide staining, fine sandy, SILT with interbeds (1 to 4 inches thick) of fine sand; laminated (ML/SP).			3 4 10	▲14	
				Bottom of exploration boring at 16.5 feet No groundwater encountered.					
20									
25									

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: LBK
Approved by: JHS

AESIBOR 180090.GPJ May 31, 2018

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180090E001	EB-8	1 of 1

Project Name	LSC Warehouse Addition	Ground Surface Elevation (ft)	355
Location	Puyallup, WA	Datum	Civil Drawing
Driller/Equipment	Holocene Drilling Inc. / Truck	Date Start/Finish	4/17/18,4/17/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Grass / Gravel Cover					
				Vashon Recessional Outwash					
		S-1		Moist, brown, SILT, trace fine sand; massive (ML).					
		S-2		No recovery. Pounding on gravel. Blowcounts likely overstated.			10 9 10	▲19	
5		S-3		Very poor recovery. Generally brown, fine sandy, SILT (ML).			7 4 4	▲8	
10		S-4		Slightly moist, brown with occasional orange iron oxide staining, fine sandy, SILT; few fine laminae, otherwise massive (ML).			1 2 3	▲5	
15		S-5		Slightly moist to moist, fine sandy, SILT, some to trace fine gravel (dropstones); diamict (ML).			2 3 7	▲10	
				Bottom of exploration boring at 16.5 feet No groundwater encountered.					
20									
25									

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: LBK

Approved by: JHS

AESIBOR 180090.GPJ May 31, 2018

LOG OF EXPLORATION PIT NO. EP-1

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Topsoil
1	Loose, dry to damp, brown, silty fine SAND, roots.
	Recessional Outwash
2	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT.
3	
4	Coarser with depth.
5	
6	
7	Medium dense, moist, gray, fine to coarse SAND, few gravel.
8	
9	Medium dense, moist, light gray, very moist, silty fine SAND.
10	
11	Medium dense, moist, light gray, very moist, fine SAND, trace silt.
12	
13	Bottom of exploration pit at depth 12 feet No ground water/seepage. Caving between surface and 2'.
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-2

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**	
	Topsoil	
1	Loose, dry to damp, brown, silty fine SAND, roots.	
	Recessional Outwash	
2	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT.	
3		
4		
5	Color change to light gray.	
6		
7		
8	Orange oxidation staining, moist to very moist.	
9		
10	Siltier with depth.	
11		
12		
13	Bottom of exploration pit at depth 12 feet No ground water/seepage. No caving.	
14		
15		
16		
17		
18		
19		
20		

Central Kitchen Project
Puyallup, WA

Logged by: MT

Approved by:

Associated Earth Sciences, Inc.

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**	
1	**Topsoil** Loose, dry to damp, brown, silty fine SAND, roots.	
2	**Recessional Outwash**	
3	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT, horizontal stratification, orange oxidation staining on some horizontal surfaces.	
4		
5		
6		
7		
8	Becomes very moist with depth.	
9		
10		
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.	
12		
13		
14		
15		
16		
17		
18		
19		
20		

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Logged by: MT

Approved by:

Associated Earth Sciences, Inc.

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-4

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Loose, dry to moist, light brown/brown, SILT/fine to medium SAND, trace gravel.
2	
3	
4	**Topsoil**
	Loose to medium dense, moist, brown, silty fine SAND, roothairs.
5	**Recessional Outwash**
6	Medium dense, moist to very moist, light gray, silty fine SAND, orange oxidation staining, trace gravel and coarse sand.
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Logged by: MT

Approved by:

Associated Earth Sciences, Inc.

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-5

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Topsoil** Loose, dry to damp, brown, silty fine SAND, roots.
2	**Recessional Outwash** Medium dense, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT, orange oxidation.
3	
4	
5	
6	
7	
8	Very moist with depth.
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-6

Depth (ft)	DESCRIPTION
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.
	Topsoil
1	Loose, dry to damp, brown, silty fine SAND, roots.
	Recessional Outwash
2	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, fine to medium SAND with silt, orange oxidation.
3	
4	
5	
6	
7	Medium dense, moist to very moist, gray, fine SAND, trace silt, horizontally stratified.
8	
9	Medium dense, wet, light gray, fine SAND, trace silt, sandier with depth.
10	
11	
12	
13	Bottom of exploration pit at depth 12 feet No ground water/seepage. No caving.
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-7

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**	
1	**Topsoil** Loose, dry to damp, brown, silty fine SAND, roots.	
2	**Recessional Outwash**	
3	Medium dense, damp to moist, light gray, silty fine SAND/fine sandy SILT, few grave.	
4	Very moist at 4'.	
5		
6		
7		
8		
9	Medium dense, very moist, gray, fine to medium SAND.	
10		
11		
12	Bottom of exploration pit at depth 11 feet No ground water/seepage. No caving.	
13		
14		
15		
16		
17		
18		
19		
20		

Central Kitchen Project
Puyallup, WA

Logged by: MT
Approved by:

Associated Earth Sciences, Inc.

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-8

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	3" crushed/washed gravel on surface.
	Fill
1	Loose, moist, light brown-gray, brown, SILT/fine SAND, few gravel.
2	
	Small boulder at 3'.
3	**Recessional Outwash**
	Medium dense, moist, light gray, silty fine SAND/fine sandy SILT.
4	
5	
6	
7	
8	
9	
	Medium dense, moist, gray, SAND.
10	
11	Medium dense, very moist, light gray, silty fine SAND/fine sandy SILT.
12	
	Bottom of exploration pit at depth 12 feet No ground water/seepage. No caving.
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-9

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Gravel on surface.
	Topsoil
1	Loose, dry to damp, brown, silty fine SAND, roots.
	Recessional Outwash
2	
3	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT, orange oxidation.
4	
5	Medium dense, moist to wet, light gray, fine SAND with silt, orange oxidation.
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-10

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	4" gravel on surface.
	Fill
1	Loose, dry to damp, red-brown, silty fine to medium SAND.
	Medium dense, damp, dark brown, gravelly SAND.
2	Medium dense, moist, red-brown, fine to medium SAND with silt and wood fragments.
	Recessional Outwash
3	Medium dense, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT, orange oxidation.
4	
5	
6	Medium dense, moist, gray, gravelly SAND.
7	Medium dense, moist, light gray, silty fine SAND, orange oxidation staining.
8	
9	
10	Bottom of exploration pit at depth 9 feet No ground water/seepage. No caving.
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-11

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

4" crushed/washed, 1" minus on surface.

Fill

Loose, dry to damp, brown, silty fine SAND.

Medium dense below 12", damp to moist, light gray, fine SAND.

Recessional Outwash

Few gravel at 2 1/2'.

Medium dense, damp to moist, light gray, fine sandy SILT, orange oxidation.

Bottom of exploration pit at depth 8 feet
No ground water/seepage. No caving.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-12

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Gravel on surface.
	Recessional Outwash
1	Loose, dry to damp, light brown, silty fine SAND, roots.
2	Medium dense, moist, light gray, fine SAND with silt.
3	Medium dense, moist, dark gray, gravelly SAND.
4	
5	
6	
7	Medium dense, moist, light gray, fine SAND with silt, orange oxidation.
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-13

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Topsoil** Loose, dry to damp, brown, silty fine SAND, roots. **Recessional Outwash**
2	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT.
3	Medium dense, moist, gray, coarse SAND, trace gravel.
4	Medium dense, moist, light gray, SILT, orange oxidation.
5	
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-14

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Topsoil** Loose, dry, brown, silty fine SAND, fine to medium gravel.
2	**Recessional Outwash** Medium dense, moist, dark gray, medium to coarse SAND.
3	Medium dense, moist, gray, silty fine SAND to medium dense, moist to very moist, dark gray, medium to coarse SAND, orange oxidation mottling.
4	
5	
6	Medium dense, moist, gray, fine SAND, medium to coarse sand interbeds (1/2").
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. Caving 2' to 6'.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT
Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-15

Depth (ft)	DESCRIPTION
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.
	Topsoil
1	Loose, dry to damp, brown, silty fine SAND, roots.
	Recessional Outwash
2	
3	Loose to 18" becoming medium dense below, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT, orange oxidation, small boulder at 3', trace gravel.
4	
5	
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 05522A.GPJ August 19, 2005

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

LOG OF EXPLORATION PIT NO. EP-16

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Topsoil/Fill** Loose, dry to damp, brown, silty fine SAND, roots.
2	**Recessional Outwash** Medium dense, damp to moist, light brown to light gray, silty fine SAND/fine sandy SILT.
3	
4	Medium dense, moist, gray, medium to coarse SAND, trace gravel.
5	Medium dense, moist, light gray, SILT/fine SAND, orange oxidation.
6	
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No ground water/seepage. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen Project
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522A

8/15/05

KCTP3 05522A.GPJ August 19, 2005

LOG OF EXPLORATION PIT NO. EP-1

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
1	**Topsoil** Loose, moist, dark brown, silty fine SAND, roothairs.
2	**Outwash** Loose to medium dense, moist, red-brown, silty fine SAND.
3	
4	
5	Medium dense, moist, gray, silty fine SAND.
6	
7	
8	Bottom of exploration pit at depth 7 feet No ground water seepage. No caving.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 14, 2006

LOG OF EXPLORATION PIT NO. EP-2

Depth (ft)	DESCRIPTION
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.
	Topsoil
1	Loose, moist, brown, silty SAND, roothairs.
	Outwash
2	Medium dense, moist, brown-gray, silty fine to coarse SAND, few fine gravel, faint horizontal stratification.
3	
4	
5	Medium dense, moist, light gray, silty fine SAND.
6	
7	
8	
9	Bottom of exploration pit at depth 8 feet No ground water seepage. No caving.
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 18, 2006

LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Loose to medium dense, moist to very moist, brown and gray, silty SAND/sandy SILT, few gravel.
2	**Outwash**
3	Medium dense, very moist to wet, olive-brown, silty very fine SAND.
4	
5	
6	
7	
8	
9	Bottom of exploration pit at depth 8 feet No ground water seepage. No caving.
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT
Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 14, 2006

LOG OF EXPLORATION PIT NO. EP-4

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Loose, moist to very moist, dark brown, silty fine to medium SAND, roots, tire, electric cable, wire, plastic, bike wheel, 5-gallon metal can.
2	**Outwash**
3	Loose to medium dense, moist to very moist, gray, silty SAND.
4	
5	Bottom of exploration pit at depth 4 feet No ground water seepage. No caving.
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 14, 2006

LOG OF EXPLORATION PIT NO. EP-5

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Fill (Previous Exploration Pit?)

1 2 3

Fragments of concrete slab ranging in size from approximately 3" in diameter to approximately 18" in diameter, no soil infill.

Outwash

4 5 6 7 8

Medium dense, moist to very moist, gray, silty fine SAND.

Bottom of exploration pit at depth 8 feet
No ground water seepage. No caving.

9 10 11 12 13 14 15 16 17 18 19 20

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 14, 2006

LOG OF EXPLORATION PIT NO. EP-6

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
1	**Topsoil** Loose, moist, dark brown, silty SAND, roothairs.
2	**Outwash** Loose to medium dense, moist to very moist, red-brown, silty very fine SAND, slight orange oxidation staining.
3	
4	Medium dense, moist, light red-gray, silty very fine SAND, slight orange oxidation.
5	
6	Light gray below 6', slightly coarser with depth; silty fine SAND.
7	
8	Bottom of exploration pit at depth 8 feet No ground water seepage. No caving.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT
Approved by:

Project No. KE05522C
3/29/06

KCTP3 05522C.GPJ April 14, 2006

LOG OF EXPLORATION PIT NO. EP-7

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Loose to medium dense, moist, brown, silty SAND, few concrete chunks with depth.
2	
3	
4	
5	Medium dense, very moist to wet, light gray, silty fine SAND, orange oxidation.
6	
7	
8	
9	Bottom of exploration pit at depth 8 feet No ground water seepage. No caving.
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Central Kitchen (ITC-West)
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE05522C

3/29/06

KCTP3 05522C.GPJ April 18, 2006

LOG OF EXPLORATION PIT NO. EP-1

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Forest Duff
1	Loose, moist, dark brown, silty fine SAND, organics.
2	Loose to medium dense at 18", moist, light brown to gray with depth, silty fine SAND, orange oxidation within gray, roots to 18".
3	
4	
5	
6	
7	
8	Medium dense to dense, moist, gray, silty fine SAND, with medium to coarse sand and fine gravel, orange oxidation.
9	
10	Small boulder at 10'.
11	Medium dense to dense, wet, gray, fine sandy SILT.
12	
13	
14	
15	Bottom of exploration pit at depth 14 feet No ground water/seepage. No caving.
16	
17	
18	
19	
20	

KCTP3 04709A.GPJ December 9, 2004

Capital Projects Portable
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE04709A

12/01/04

LOG OF EXPLORATION PIT NO. EP-2

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
1	**Topsoil** Loose, moist, brown, fine silty SAND, roothairs. Loose to medium dense with depth, moist, light brown, silty fine SAND.
2	
3	
4	
5	
6	Medium dense, moist, brown-gray, silty fine to medium SAND.
7	
8	
9	
10	Medium dense, moist to wet, light brown to light gray, silty fine SAND, orange oxidation.
11	
12	Small boulder at 12'.
13	
14	Bottom of exploration pit at depth 14 feet No ground water/seepage. Caving 0 to 4'.
15	
16	
17	
18	
19	
20	

Capital Projects Portable
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE04709A

12/01/04

KCTP3 04709A.GPJ December 9, 2004

LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Loose, moist, dark brown to brown, silty fine SAND.
1	Loose to medium dense, moist, light red-brown, silty fine SAND, orange oxidation.
2	
3	Slight caving above 3'.
4	
5	Medium dense, moist, gray, fine sandy SILT.
6	
7	
8	
9	Bottom of exploration pit at depth 8 feet No ground water/seepage. Slight caving above 5'.
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Capital Projects Portable
Puyallup, WA

Associated Earth Sciences, Inc.

Logged by: MT

Approved by:

Project No. KE04709A

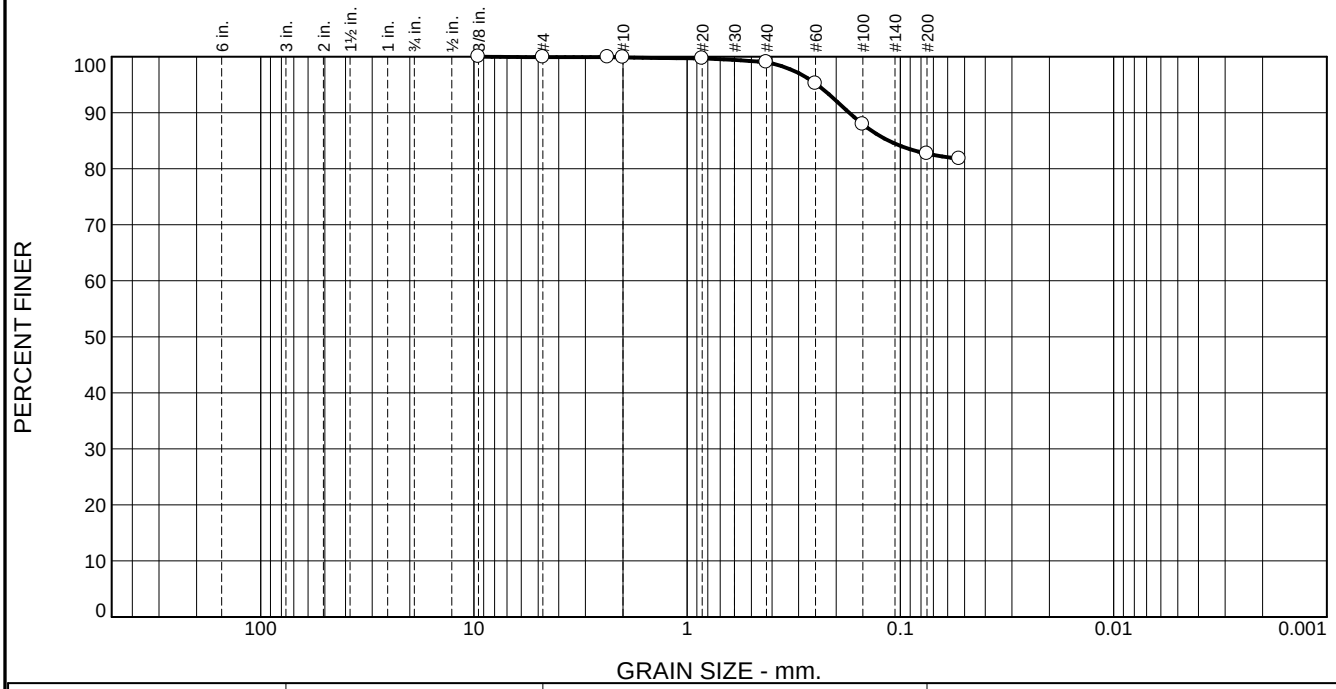
12/01/04

KCTP3 04709A.GPJ December 9, 2004

APPENDIX B

Grain-Size Analysis

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.9	16.3	82.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.9		
#8	99.9		
#10	99.9		
#20	99.7		
#40	99.0		
#60	95.2		
#100	87.9		
#200	82.7		
#270	81.8		

* (no specification provided)

Material Description

Sandy SILT trace gravel - Fine sandy silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

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

Coefficients

D_{90}= 0.1739 D_{85}= 0.1135 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 4/30/19 **Date Tested:** 4/30/19

Tested By: BP

Checked By: KM

Title:

Location: Onsite
Sample Number: EB-9 **Depth:** 7.5'

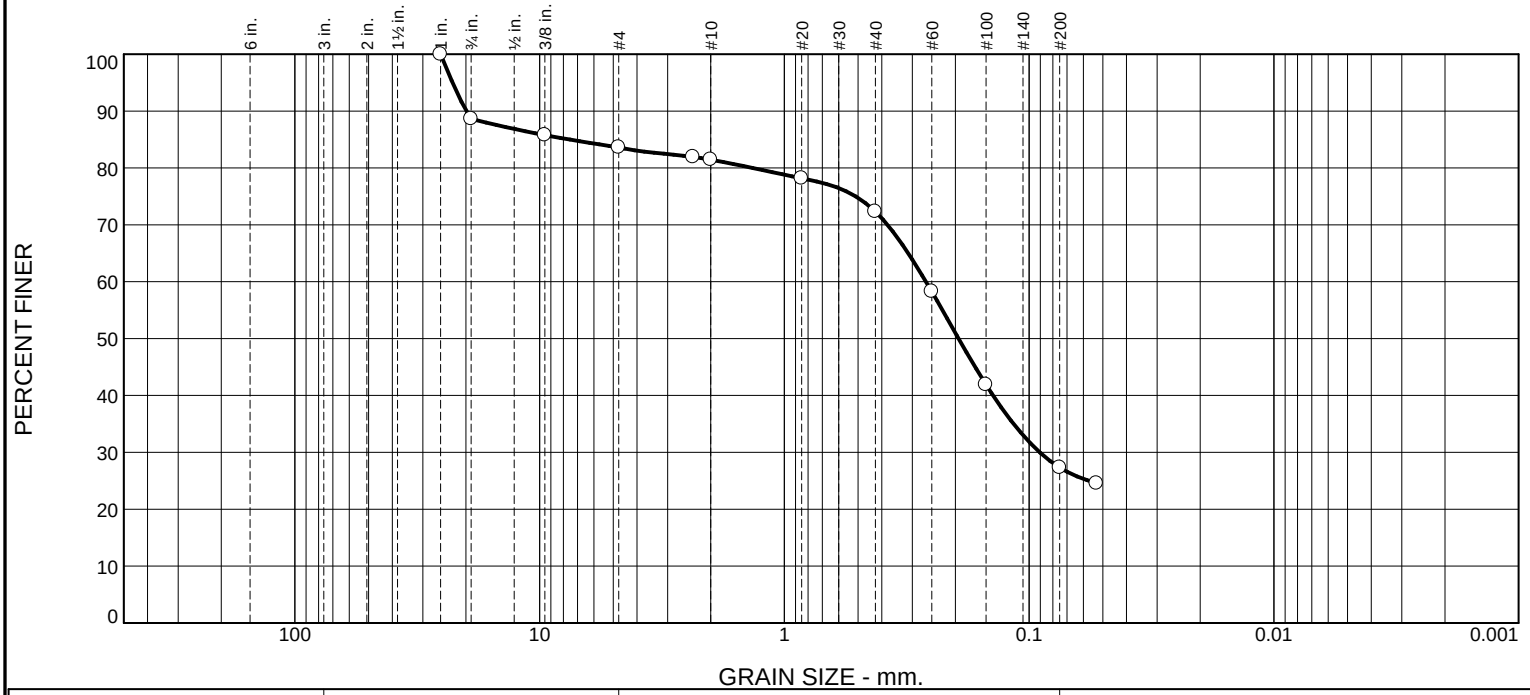
Date Sampled: 4/25/19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.4	5.0	2.2	9.1	45.0	27.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	88.6		
3/8"	85.8		
#4	83.6		
#8	81.9		
#10	81.4		
#20	78.2		
#40	72.3		
#60	58.3		
#100	41.9		
#200	27.3		
#270	24.5		

* (no specification provided)

Material Description

Gravelly 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

D_{90}= 19.9272 D_{85}= 7.5400 D_{60}= 0.2640
D_{50}= 0.1942 D_{30}= 0.0905 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 7-18-19 **Date Tested:** 7-18-19

Tested By: MS

Checked By: JS

Title:

Location: Onsite
Sample Number: EB-15W **Depth:** 27.5'

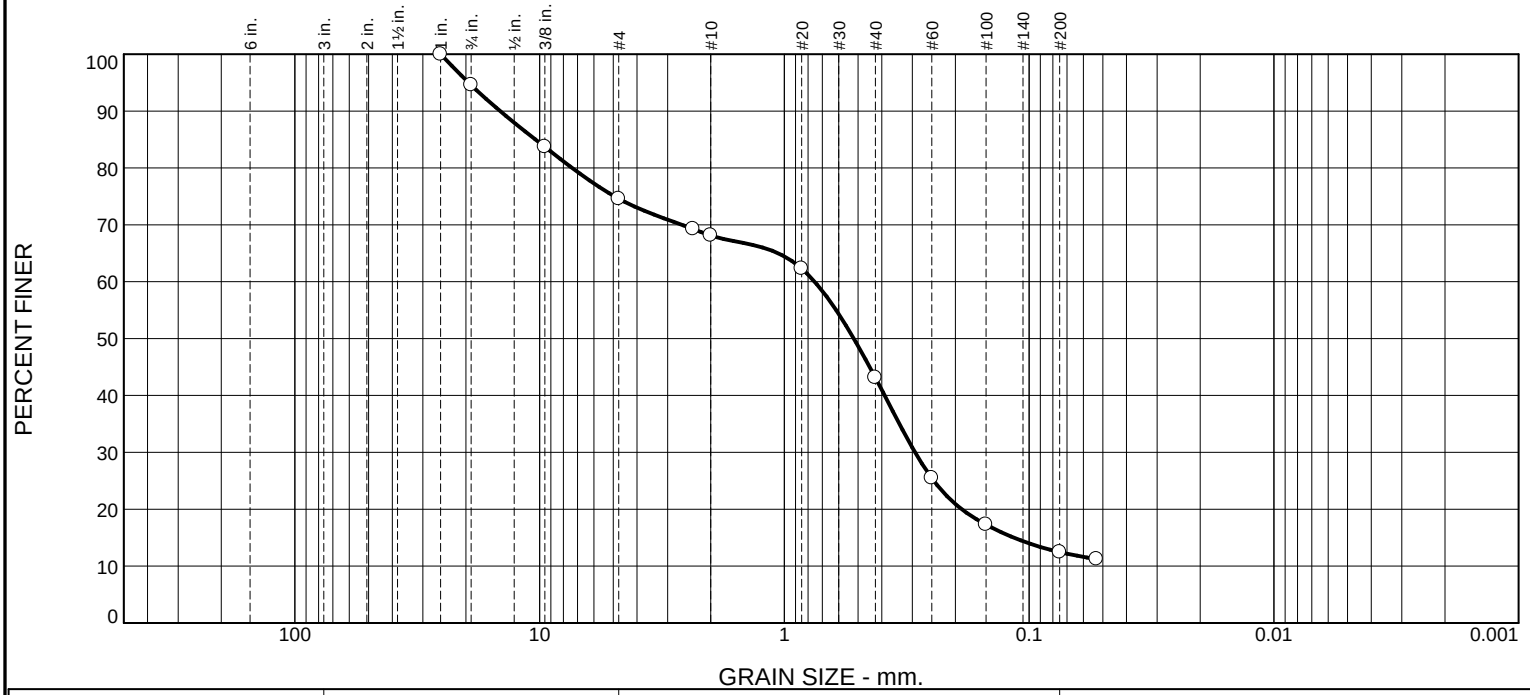
Date Sampled: 7-15-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.4	20.0	6.5	25.0	30.6	12.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	94.6		
3/8"	83.7		
#4	74.6		
#8	69.3		
#10	68.1		
#20	62.3		
#40	43.1		
#60	25.5		
#100	17.3		
#200	12.5		
#270	11.2		

* (no specification provided)

Material Description

Gravelly Silty SAND

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.5020 D_{85}= 10.4045 D_{60}= 0.7521
D_{50}= 0.5204 D_{30}= 0.2924 D_{15}= 0.1155
D_{10}= C_u= C_c=

Remarks

Date Received: 7-18-19 **Date Tested:** 7-18-19

Tested By: MS

Checked By: JS

Title:

Location: Onsite
Sample Number: EB-15W **Depth:** 35'

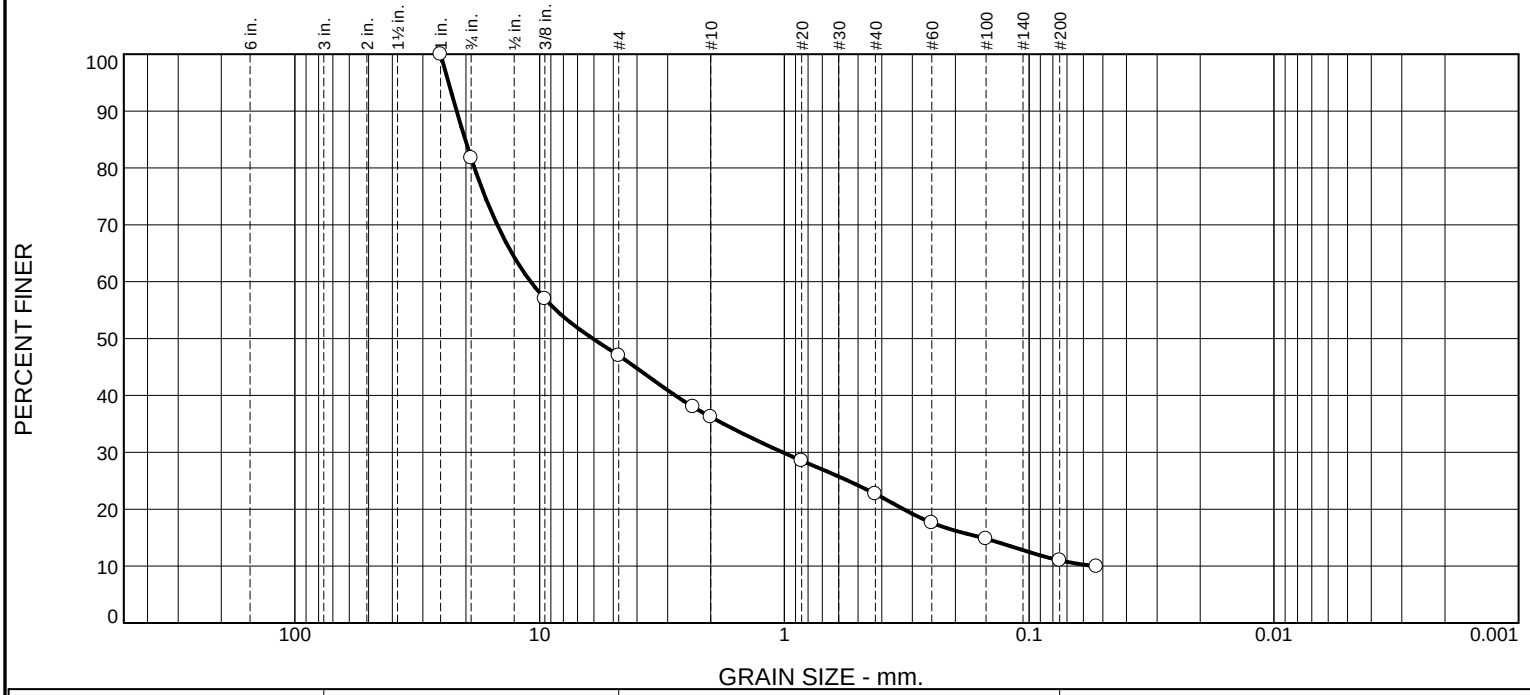
Date Sampled: 7-15-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.3	34.7	10.8	13.5	11.7	11.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	81.7		
3/8"	57.0		
#4	47.0		
#8	38.0		
#10	36.2		
#20	28.5		
#40	22.7		
#60	17.6		
#100	14.8		
#200	11.0		
#270	9.9		

* (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

D_{90}= 21.8337 D_{85}= 20.1486 D_{60}= 10.8843
D_{50}= 6.0648 D_{30}= 1.0164 D_{15}= 0.1564
D_{10}= 0.0548 C_u= 198.61 C_c= 1.73

Remarks

Date Received: 7-18-19 **Date Tested:** 7-18-19

Tested By: MS

Checked By: JS

Title:

Location: Onsite
Sample Number: EB-17 **Depth:** 25'

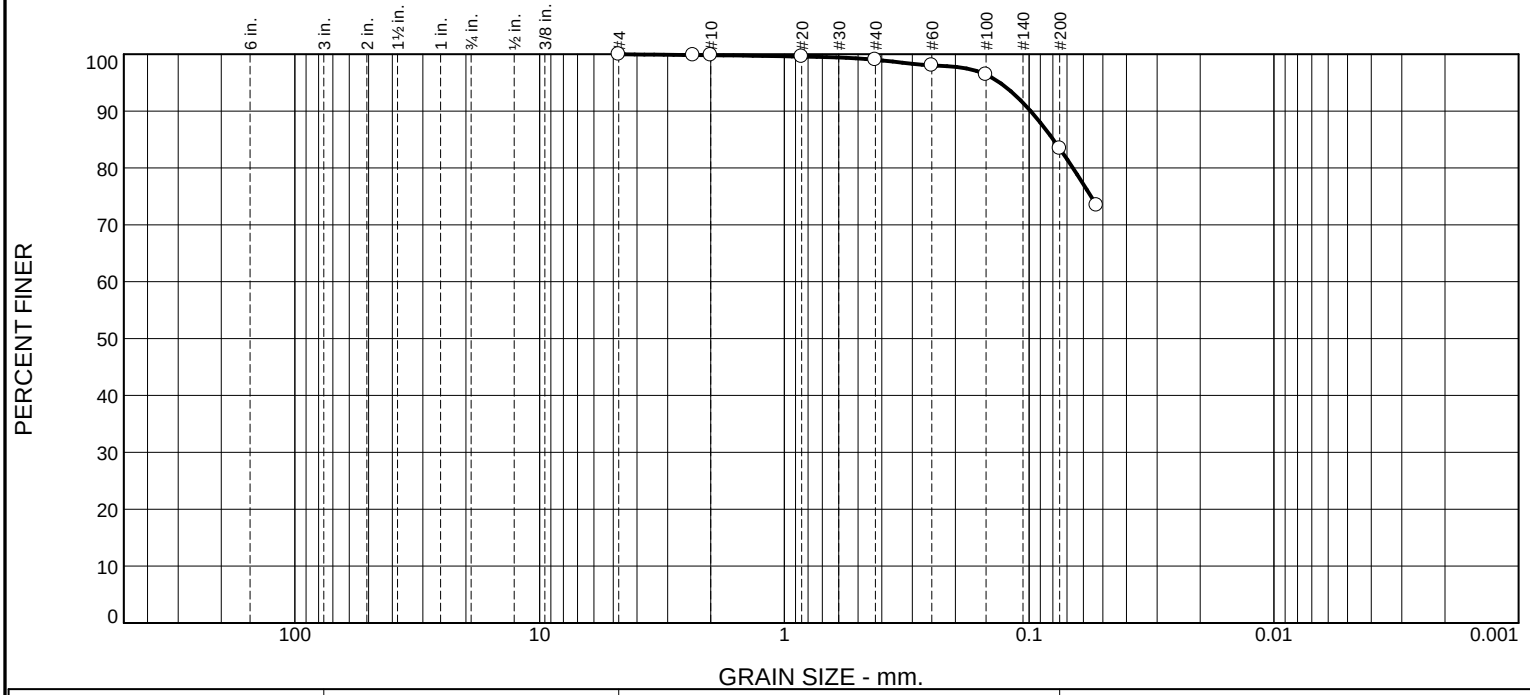
Date Sampled: 7-16-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.8	15.6	83.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.9		
#10	99.8		
#20	99.6		
#40	99.0		
#60	98.0		
#100	96.4		
#200	83.4		
#270	73.5		

* (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

D_{90}= 0.0986 D_{85}= 0.0797 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8-22-19 **Date Tested:** 8-22-19

Tested By: AM

Checked By: JS

Title:

Location: Onsite
Sample Number: IT-1 (1) **Depth:** 6'

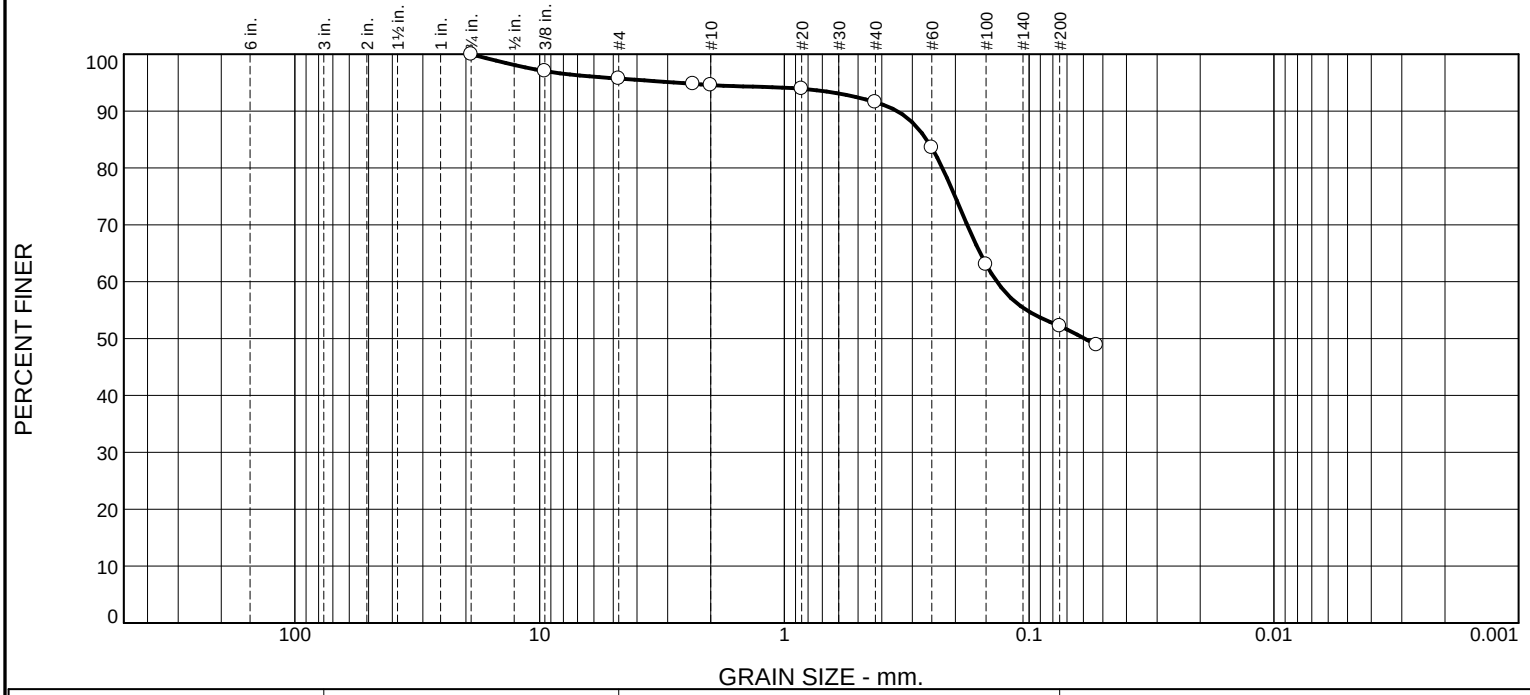
Date Sampled: 8-20-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.3	1.1	3.0	39.4	52.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
3/8"	97.0		
#4	95.7		
#8	94.8		
#10	94.6		
#20	93.9		
#40	91.6		
#60	83.6		
#100	63.0		
#200	52.2		
#270	48.9		

* (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

D_{90}= 0.3457 D_{85}= 0.2623 D_{60}= 0.1355
D_{50}= 0.0593 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8-22-19 **Date Tested:** 8-22-19

Tested By: AM

Checked By: JS

Title:

Location: Onsite
Sample Number: IT-1 (2) **Depth:** 6'

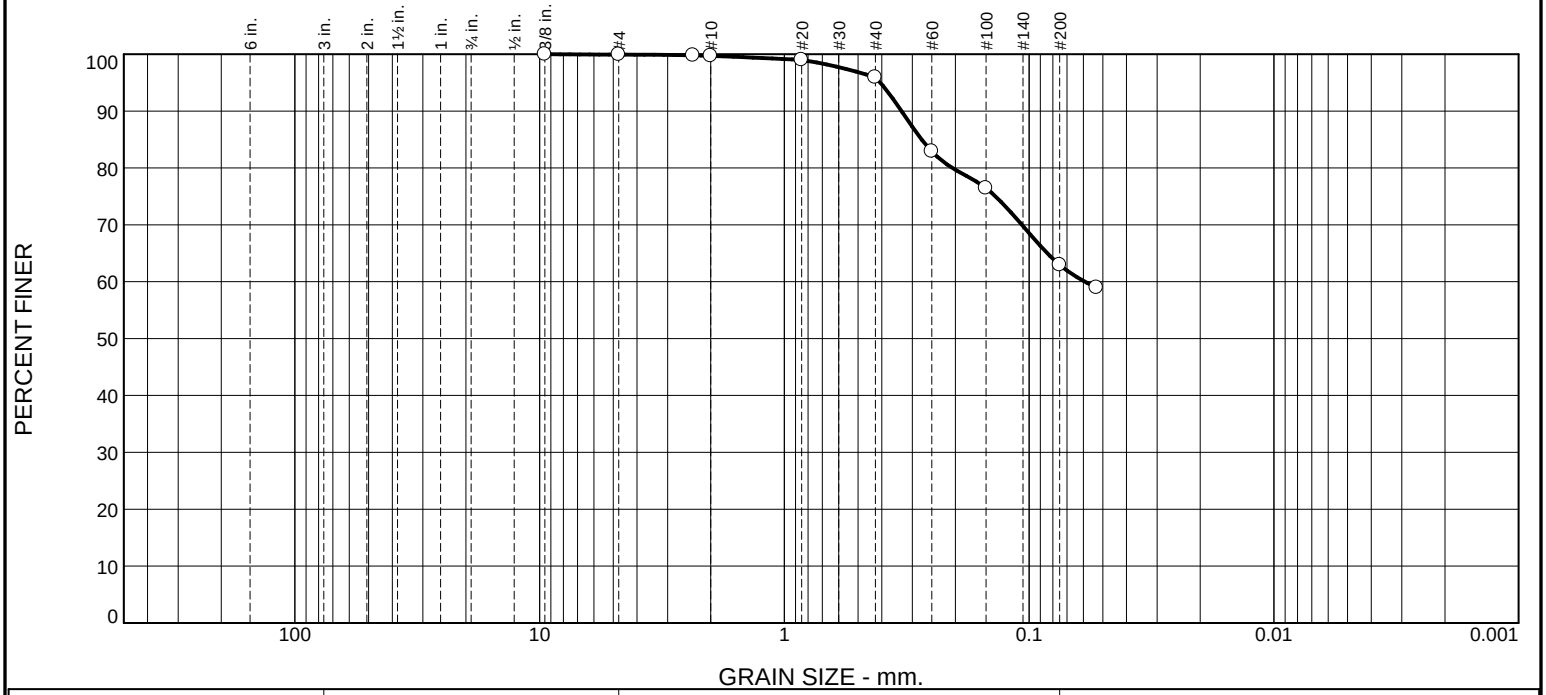
Date Sampled: 8-20-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	3.8	33.0	62.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.9		
#8	99.8		
#10	99.7		
#20	99.0		
#40	95.9		
#60	82.9		
#100	76.4		
#200	62.9		
#270	58.9		

* (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

D_{90}= 0.3321 D_{85}= 0.2749 D_{60}= 0.0592
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8-22-19 **Date Tested:** 8-22-19

Tested By: AM

Checked By: JS

Title:

Location: Onsite
Sample Number: IT-2 (1) **Depth:** 6'

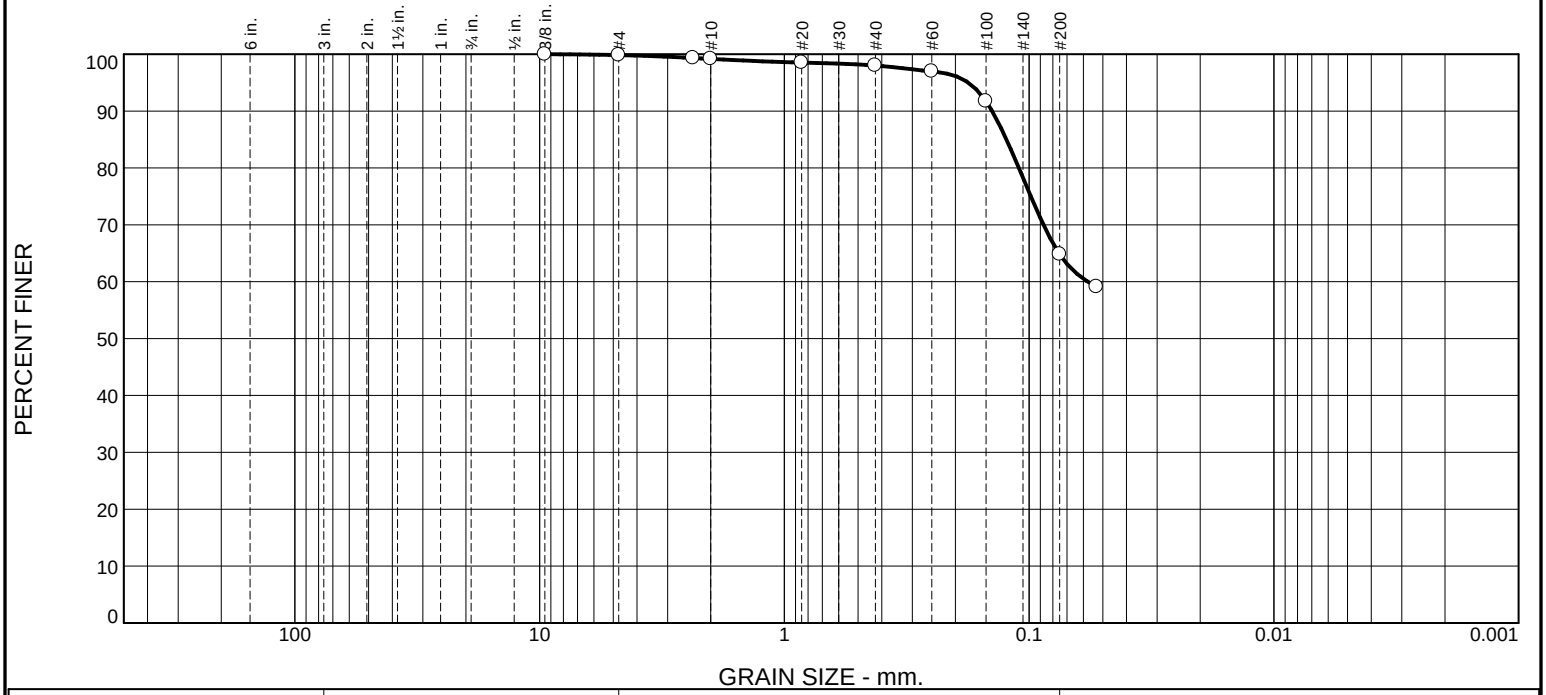
Date Sampled: 8-20-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.6	1.2	33.2	64.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.8		
#8	99.3		
#10	99.2		
#20	98.5		
#40	98.0		
#60	97.0		
#100	91.7		
#200	64.8		
#270	59.1		

* (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

D_{90}= 0.1416 D_{85}= 0.1238 D_{60}= 0.0575
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 8-22-19 **Date Tested:** 8-22-19

Tested By: AM

Checked By: JS

Title:

Location: Onsite
Sample Number: IT-2 (2) **Depth:** 6'

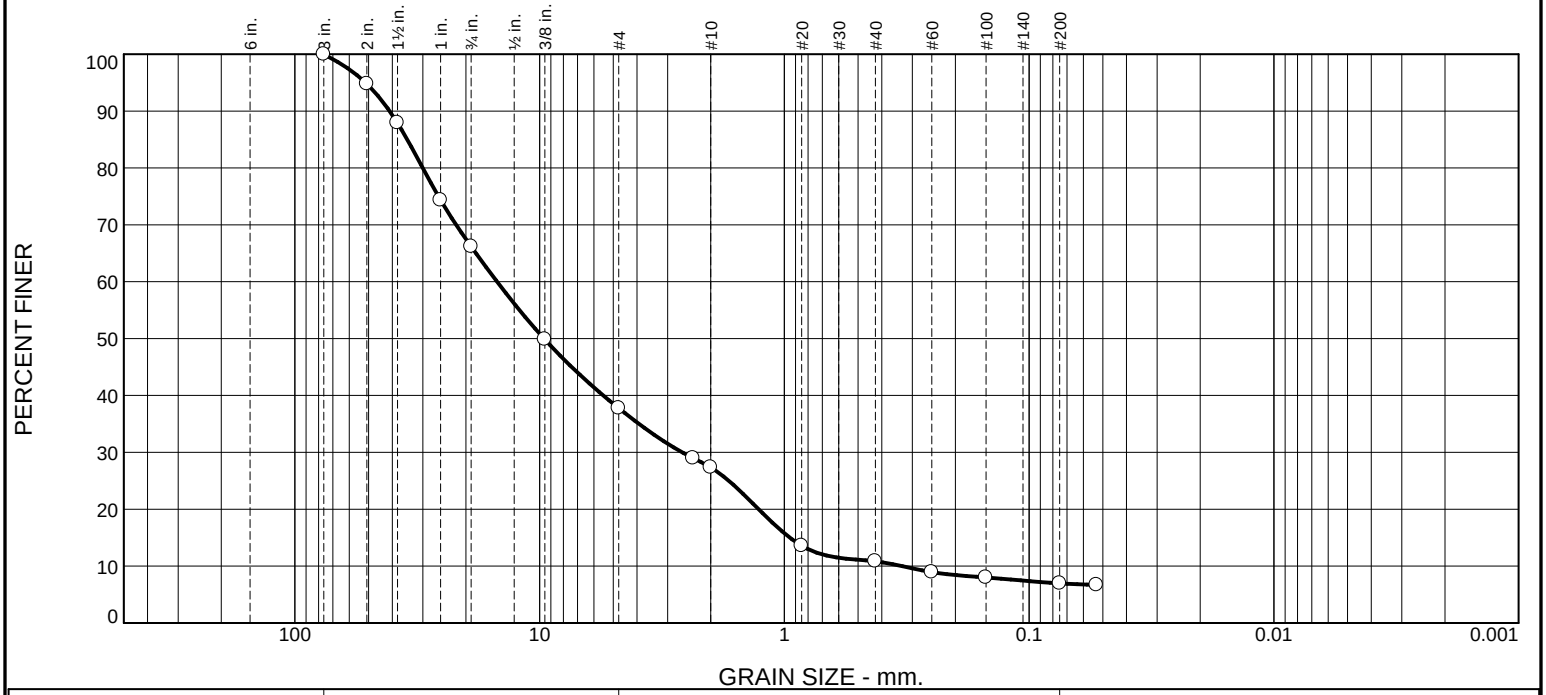
Date Sampled: 8-20-19

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	33.8	28.4	10.4	16.6	3.8	7.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0		
2"	94.8		
1.5"	87.9		
1"	74.3		
3/4"	66.2		
3/8"	49.8		
#4	37.8		
#8	29.0		
#10	27.4		
#20	13.6		
#40	10.8		
#60	8.9		
#100	8.0		
#200	7.0		
#270	6.7		

* (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

D_{90}= 41.0045 D_{85}= 34.7467 D_{60}= 14.9249
D_{50}= 9.5981 D_{30}= 2.6182 D_{15}= 0.9508
D_{10}= 0.3312 C_u= 45.07 C_c= 1.39

Remarks

Date Received: 8-22-19 **Date Tested:** 8-22-19

Tested By: AM

Checked By: JS

Title:

Location: Onsite Composite **Date Sampled:** 8-21-19
Sample Number: IT-3 **Depth:** 18.5'

associated earth sciences incorporated

Client: Puyallup School District
Project: Kessler Building

Project No: 180090 E002 **Figure**

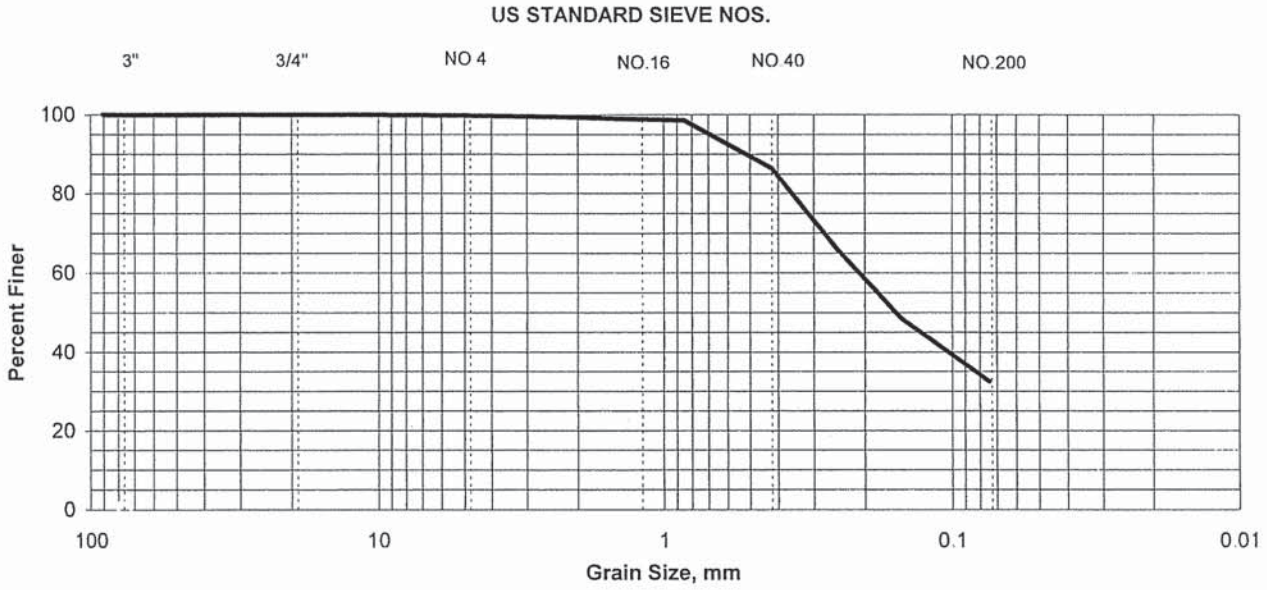
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
8/16/2005	**Puyallup SD Cap. Proj. Kitchen**	**KE05522A**		
Tested By	Location	EB/EP No	Depth	**silty SAND, trace gravel**
CAH		**1**	**4'**	

Wt. Of wet sample + Tare	1340.4
Wt. of Dry Sample + Tare	1211.8
Wt. of Tare	300.5
Wt. of Dry Sample	911.3

Moisture % 14.1

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3.5	90	0	0.0	100.0		
3	76.1	0	0.0	100.0		
2.5	64	0	0.0	100.0		
2	50.8	0	0.0	100.0		
1.5	38.1	0	0.0	100.0		
1	25.4	0	0.0	100.0		
3/4	19	0	0.0	100.0		
3/8	9.51	0	0.0	100.0		
#4	4.76	1.2	0.1	99.9		
#8	2.38	4.7	0.5	99.5		
#10	2	5.6	0.6	99.4		
#20	0.85	12.4	1.4	98.6		
#40	0.42	123.7	13.6	86.4		
#60	0.25	308.9	33.9	66.1		
#100	0.149	469.4	51.5	48.5		
#200	0.074	615	67.5	32.5		



ASSOCIATED EARTH SCIENCES, INC.

911 5th Ave , Suite 100 Kirkland, WA 98033 425-827-7701 FAX 425-827-5424

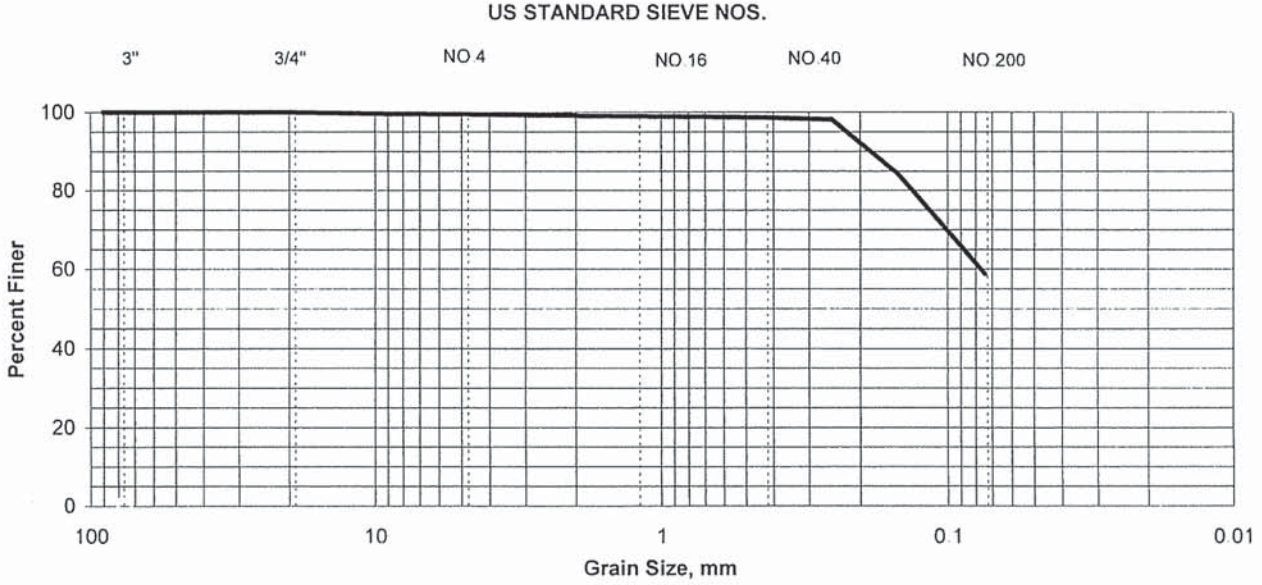
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
8/16/2005	**Puyallup SD Cap. Proj. Kitchen**	**KE05522A**		
Tested By	Location	EB/EP No	Depth	**sandy SILT, trace gravel**
CAH		**1**	**10'**	

Wt. Of wet sample + Tare	1217.7
Wt. of Dry Sample + Tare	1089
Wt. of Tare	312.6
Wt. of Dry Sample	776.4

Moisture % 16.6

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3.5	90	0	0.0	100.0		
3	76.1	0	0.0	100.0		
2.5	64	0	0.0	100.0		
2	50.8	0	0.0	100.0		
1.5	38.1	0	0.0	100.0		
1	25.4	0	0.0	100.0		
3/4	19	0	0.0	100.0		
3/8	9.51	2.8	0.4	99.6		
#4	4.76	3.7	0.5	99.5		
#8	2.38	5.6	0.7	99.3		
#10	2	6.1	0.8	99.2		
#20	0.85	8.3	1.1	98.9		
#40	0.42	10.3	1.3	98.7		
#60	0.25	13.9	1.8	98.2		
#100	0.149	121	15.6	84.4		
#200	0.074	320.7	41.3	58.7		



ASSOCIATED EARTH SCIENCES, INC.

911 5th Ave., Suite 100 Kirkland, WA 98033 425-827-7701 FAX 425-827-5424

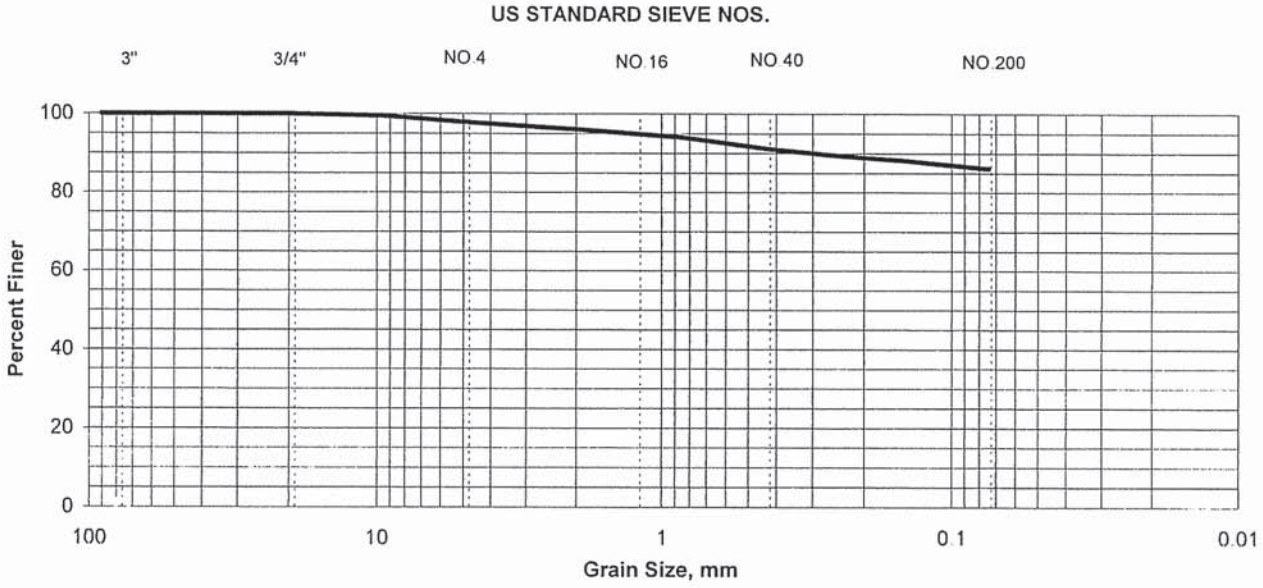
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
8/16/2005	**Puyallup SD Cap. Proj. Kitchen**	**KE05522A**		
Tested By	Location	EB/EP No	Depth	**SILT, few sand trace gravel**
CAH		**12**	**7'**	

Wt. Of wet sample + Tare	1340.4
Wt. of Dry Sample + Tare	1211.8
Wt. of Tare	300.5
Wt. of Dry Sample	911.3

Moisture % 14.1

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3.5	90	0	0.0	100.0		
3	76.1	0	0.0	100.0		
2.5	64	0	0.0	100.0		
2	50.8	0	0.0	100.0		
1.5	38.1	0	0.0	100.0		
1	25.4	0	0.0	100.0		
3/4	19	0	0.0	100.0		
3/8	9.51	4.1	0.4	99.6		
#4	4.76	19.6	2.2	97.8		
#8	2.38	31.7	3.5	96.5		
#10	2	34.9	3.8	96.2		
#20	0.85	53	5.8	94.2		
#40	0.42	80.8	8.9	91.1		
#60	0.25	95.5	10.5	89.5		
#100	0.149	106.7	11.7	88.3		
#200	0.074	125.9	13.8	86.2		



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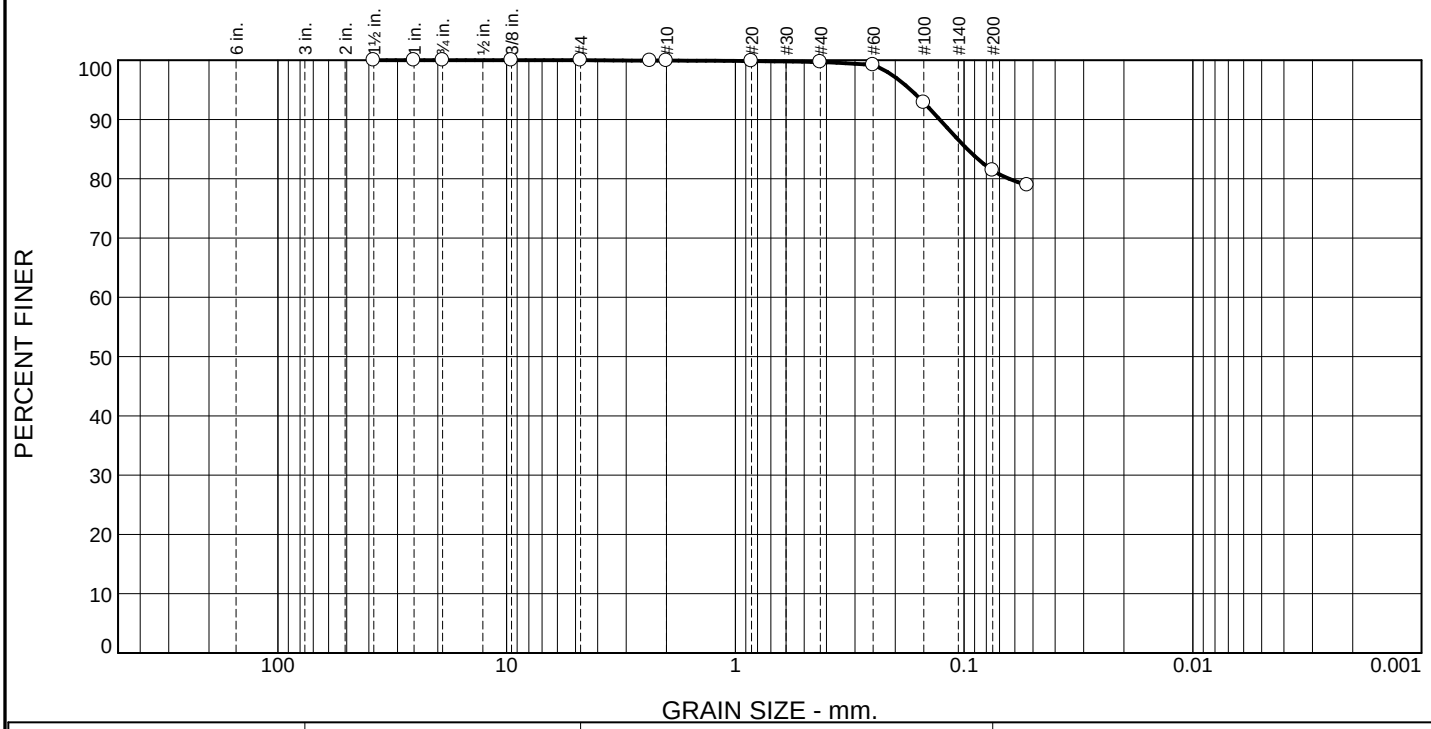
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.2	18.3	81.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#20	99.9		
#40	99.7		
#60	99.2		
#100	92.9		
#200	81.4		
#270	78.9		

* (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

D_{90}= 0.1279 D_{85}= 0.0968 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LBK

Date Received: 05/03/2018 **Date Tested:** 05/08/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EP-17 **Depth:** 10'

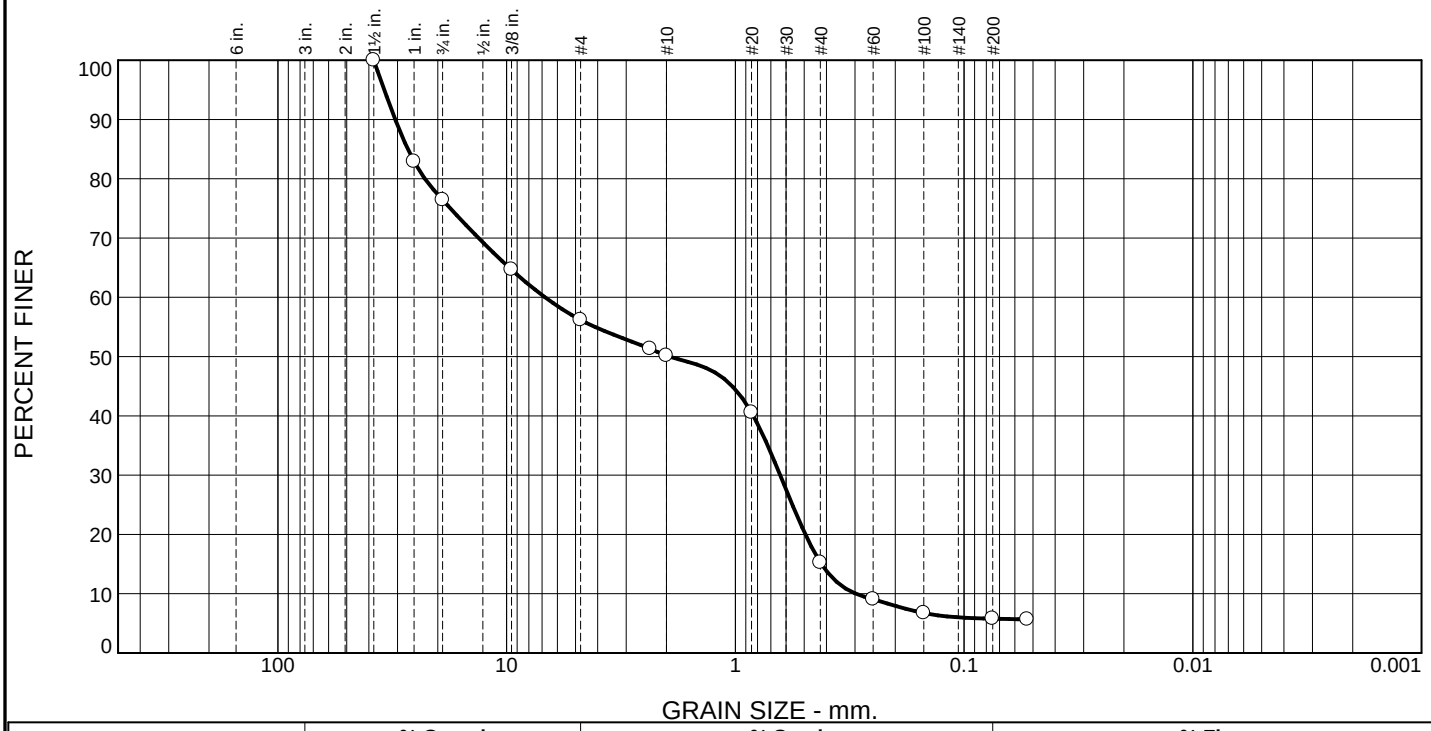
Date Sampled: 04/26/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.6	20.2	6.0	34.9	9.5	5.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	82.9		
.75	76.4		
.375	64.7		
#4	56.2		
#8	51.3		
#10	50.2		
#20	40.6		
#40	15.3		
#60	9.1		
#100	6.7		
#200	5.8		
#270	5.7		

* (no specification provided)

Material Description

very gravelly SAND, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 30.6835 D_{85}= 27.0407 D_{60}= 6.7910
D_{50}= 1.9400 D_{30}= 0.6369 D_{15}= 0.4206
D_{10}= 0.2969 C_u= 22.87 C_c= 0.20

Remarks

Collected by: LBK

Date Received: 05/03/2018 **Date Tested:** 05/08/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EP-17 **Depth:** 18'-20'

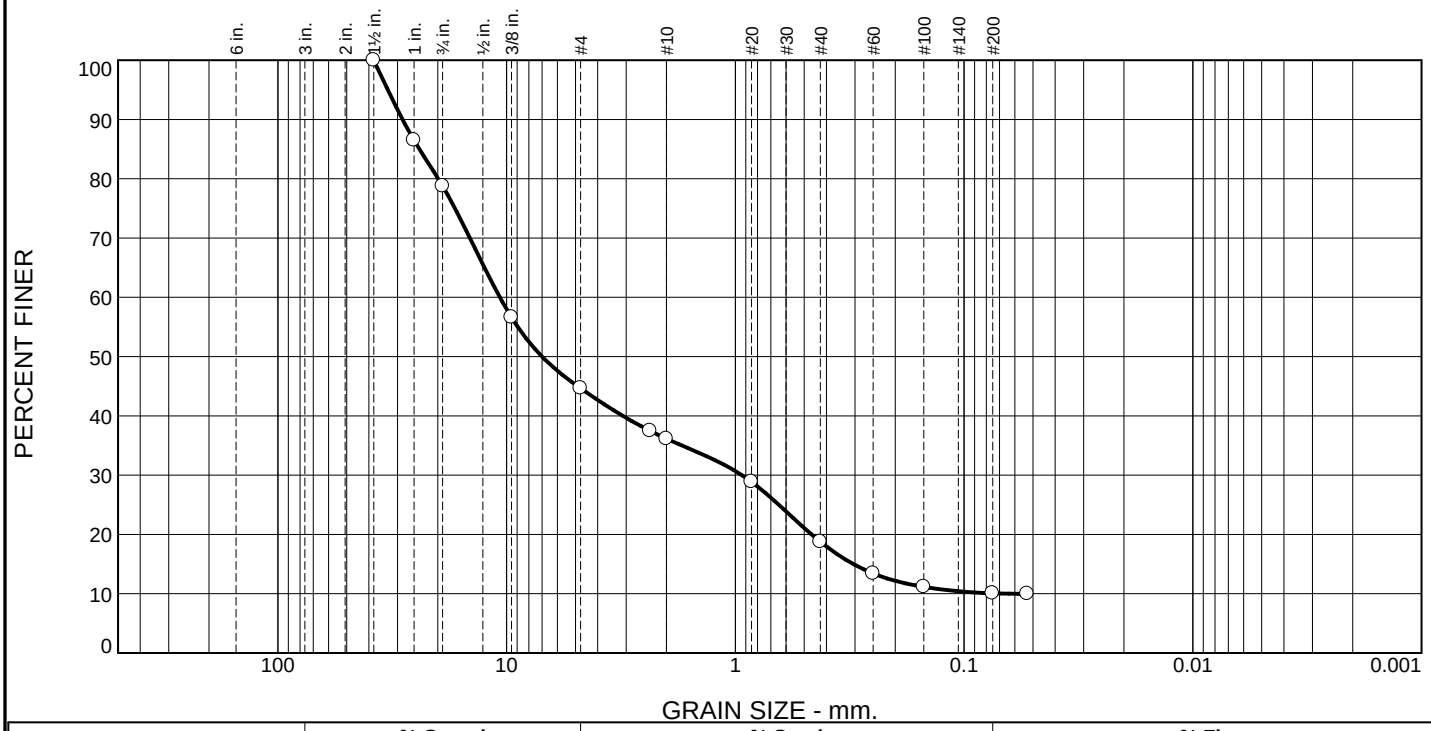
Date Sampled: 04/26/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.2	34.2	8.5	17.3	8.7	10.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	86.5		
.75	78.8		
.375	56.6		
#4	44.6		
#8	37.5		
#10	36.1		
#20	28.9		
#40	18.8		
#60	13.4		
#100	11.2		
#200	10.1		
#270	10.0		

* (no specification provided)

Material Description

very sandy GRAVEL, some silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

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

Coefficients

D_{90}= 28.5083 D_{85}= 24.0683 D_{60}= 10.7050
D_{50}= 7.0037 D_{30}= 0.9369 D_{15}= 0.3048
D_{10}= 0.0634 C_u= 168.84 C_c= 1.29

Remarks

Collected by: LBK

Date Received: 05/03/2018 **Date Tested:** 05/08/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EP-18 **Depth:** 17'

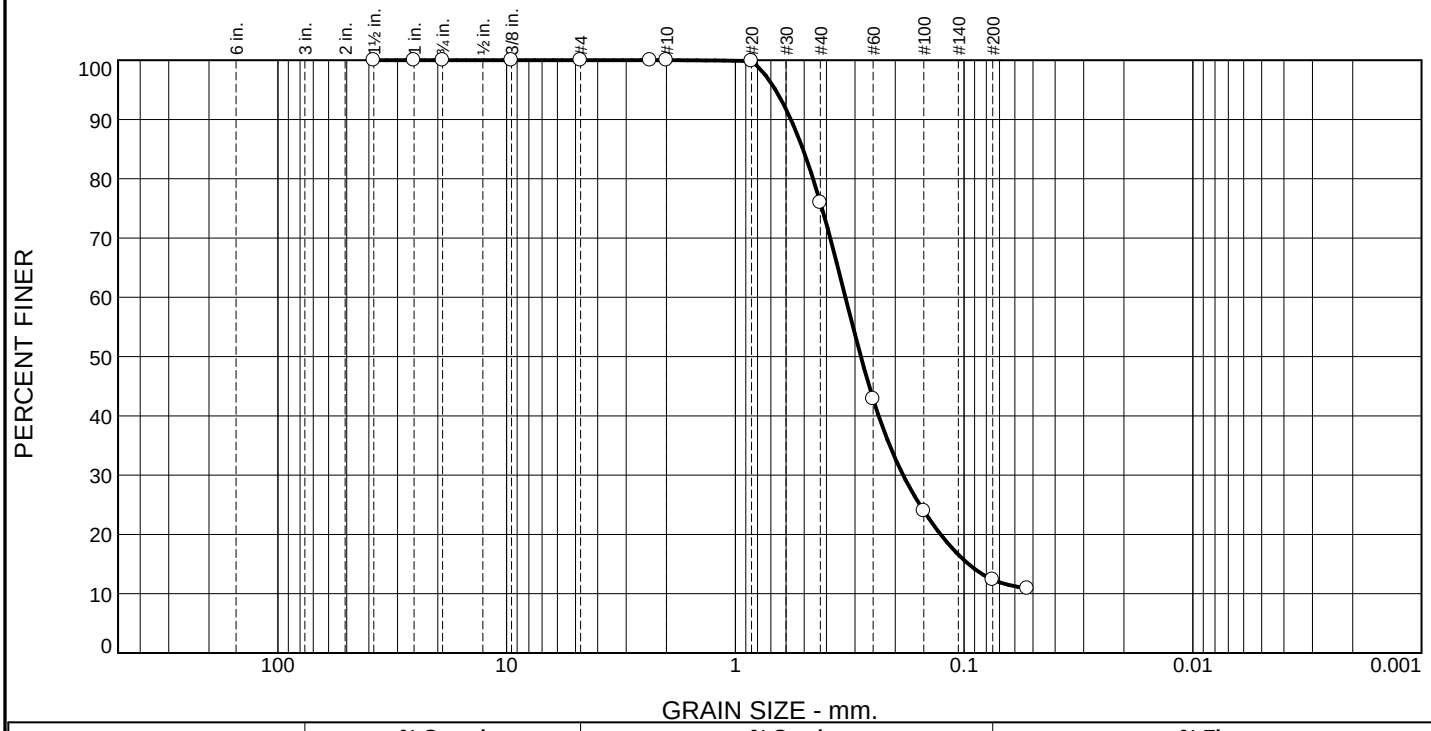
Date Sampled: 04/26/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 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	24.0	63.6	12.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	99.9		
#40	76.0		
#60	42.9		
#100	24.0		
#200	12.4		
#270	10.9		

* (no specification provided)

Material Description

silty SAND

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

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

Coefficients

D_{90}= 0.5718 D_{85}= 0.5065 D_{60}= 0.3301
D_{50}= 0.2827 D_{30}= 0.1848 D_{15}= 0.0957
D_{10}= C_u= C_c=

Remarks

Collected by: LBK

Date Received: 05/03/2018 **Date Tested:** 05/08/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: PD-1 **Depth:** 7'

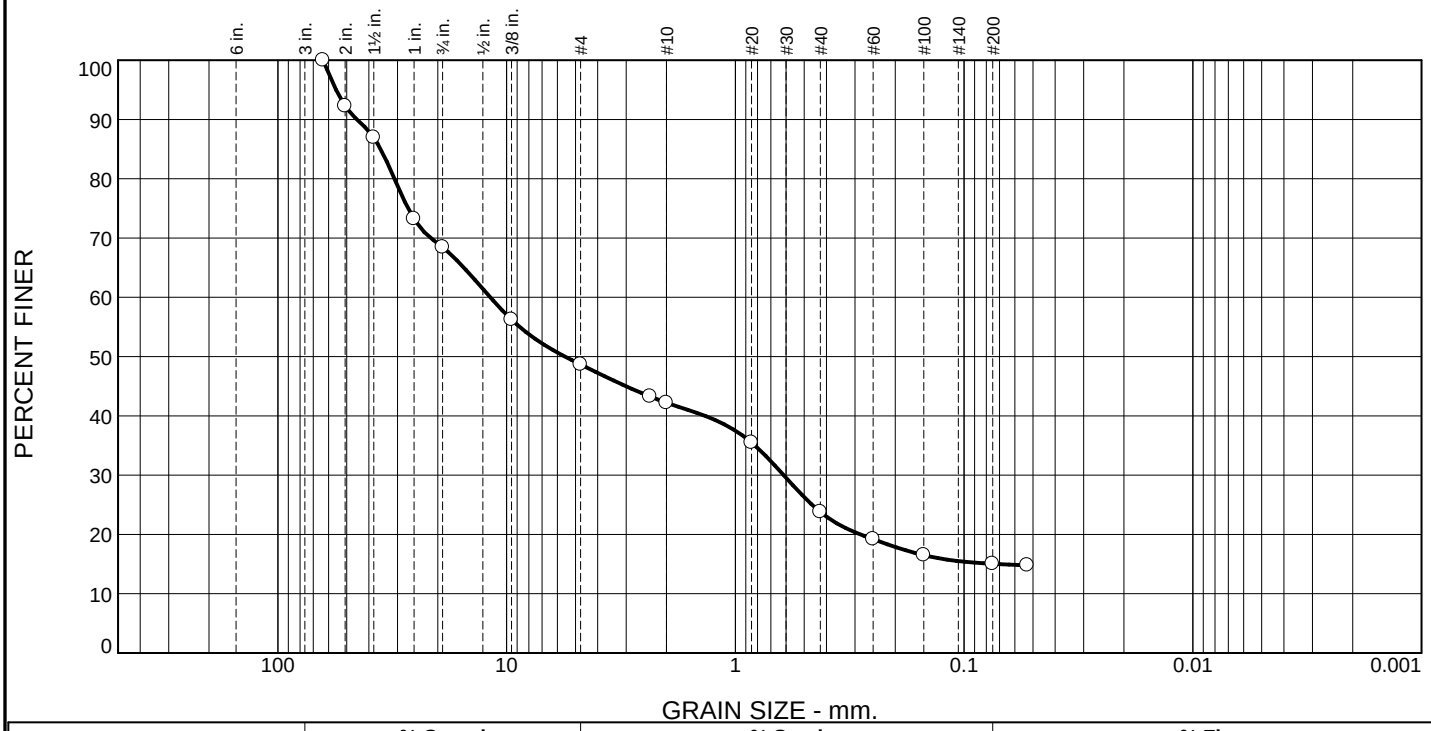
Date Sampled: 04/27/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	31.6	19.7	6.5	18.4	8.8	15.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5	100.0		
2	92.3		
1.5	87.0		
1	73.2		
.75	68.4		
.375	56.2		
#4	48.7		
#8	43.3		
#10	42.2		
#20	35.5		
#40	23.8		
#60	19.2		
#100	16.5		
#200	15.0		
#270	14.8		

* (no specification provided)

Material Description

very sandy, silty GRAVEL

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

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

Coefficients

D_{90}= 45.1739 D_{85}= 35.5524 D_{60}= 11.7832
D_{50}= 5.5612 D_{30}= 0.6149 D_{15}= 0.0714
D_{10}= C_u= C_c=

Remarks

Collected by: LBK

Date Received: 05/03/2018 **Date Tested:** 05/08/2018

Tested By: BN

Checked By: LBK

Title:

Location: Onsite
Sample Number: PD-1 **Depth:** 18'

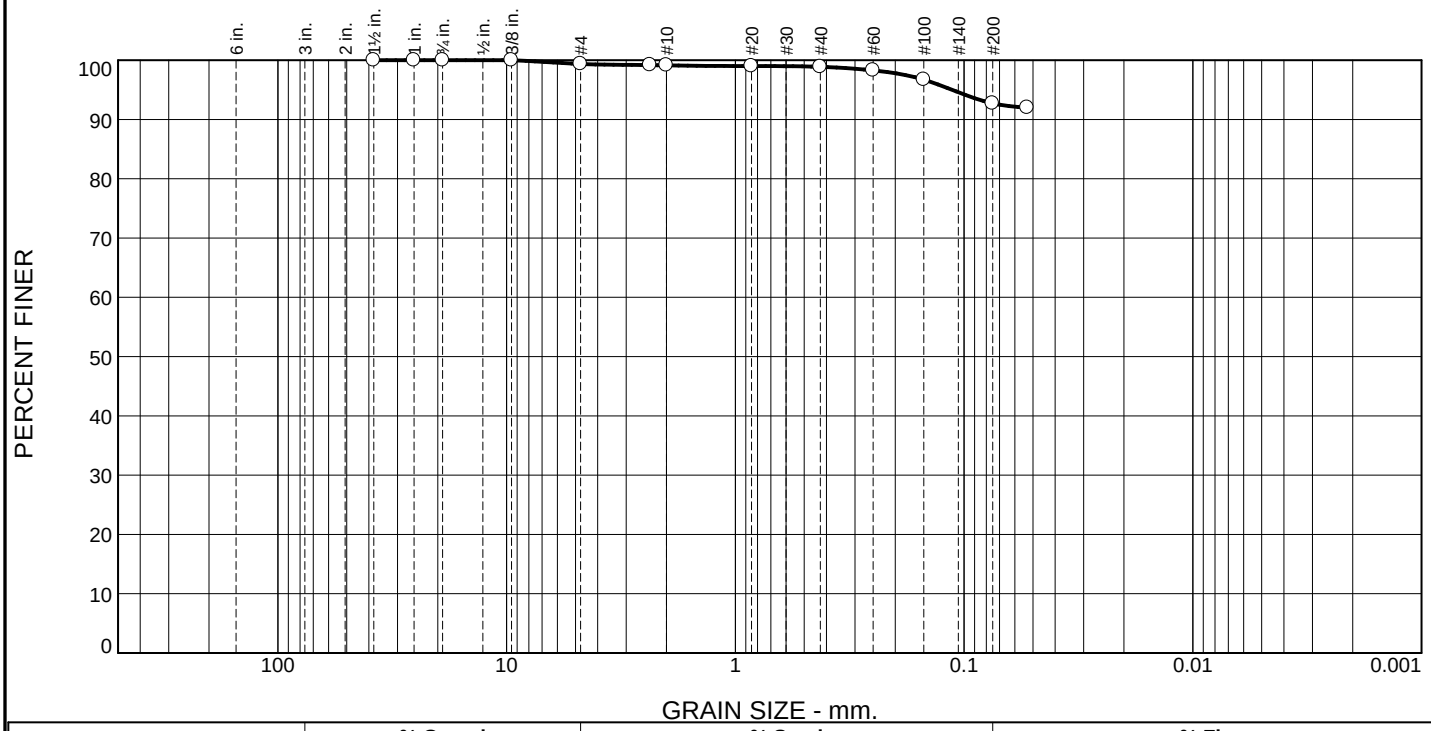
Date Sampled: 04/27/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.3	0.2	6.2	92.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	99.4		
#8	99.2		
#10	99.1		
#20	99.0		
#40	98.9		
#60	98.3		
#100	96.7		
#200	92.7		
#270	92.0		

* (no specification provided)

Material Description

SILT, some sand, trace gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

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

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LBK

Date Received: 04/19/2018 **Date Tested:** 04/23/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EB-1W **Depth:** 10'

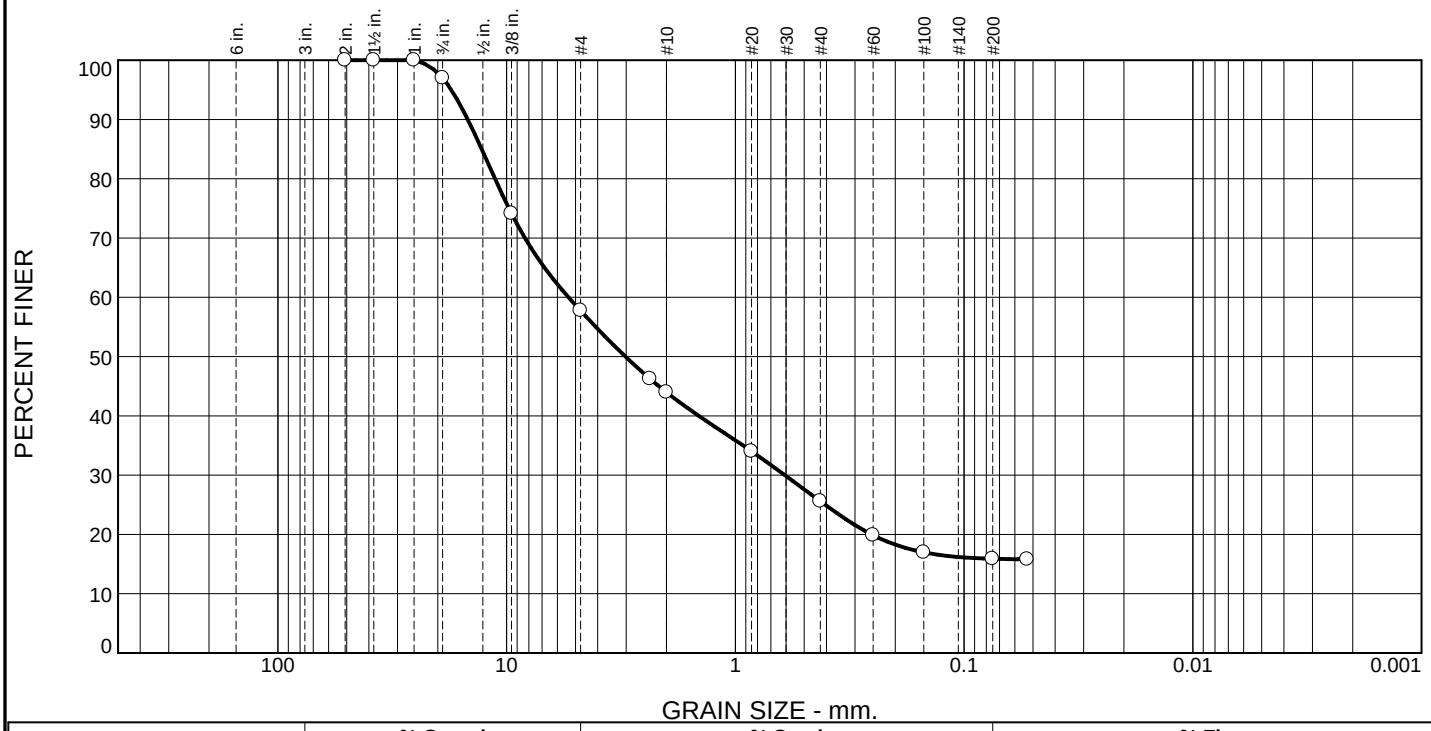
Date Sampled: 04/16/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.0	39.3	13.7	18.4	9.7	15.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100.0		
1.5	100.0		
1	100.0		
.75	97.0		
.375	74.1		
#4	57.7		
#8	46.2		
#10	44.0		
#20	34.0		
#40	25.6		
#60	19.9		
#100	17.0		
#200	15.9		
#270	15.8		

* (no specification provided)

Material Description

very sandy, silty, GRAVEL

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.7837 D_{85}= 12.8508 D_{60}= 5.3660
D_{50}= 3.0232 D_{30}= 0.6078 D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LBK

Date Received: 04/19/2018 **Date Tested:** 04/23/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EB-1W **Depth:** 17.5'

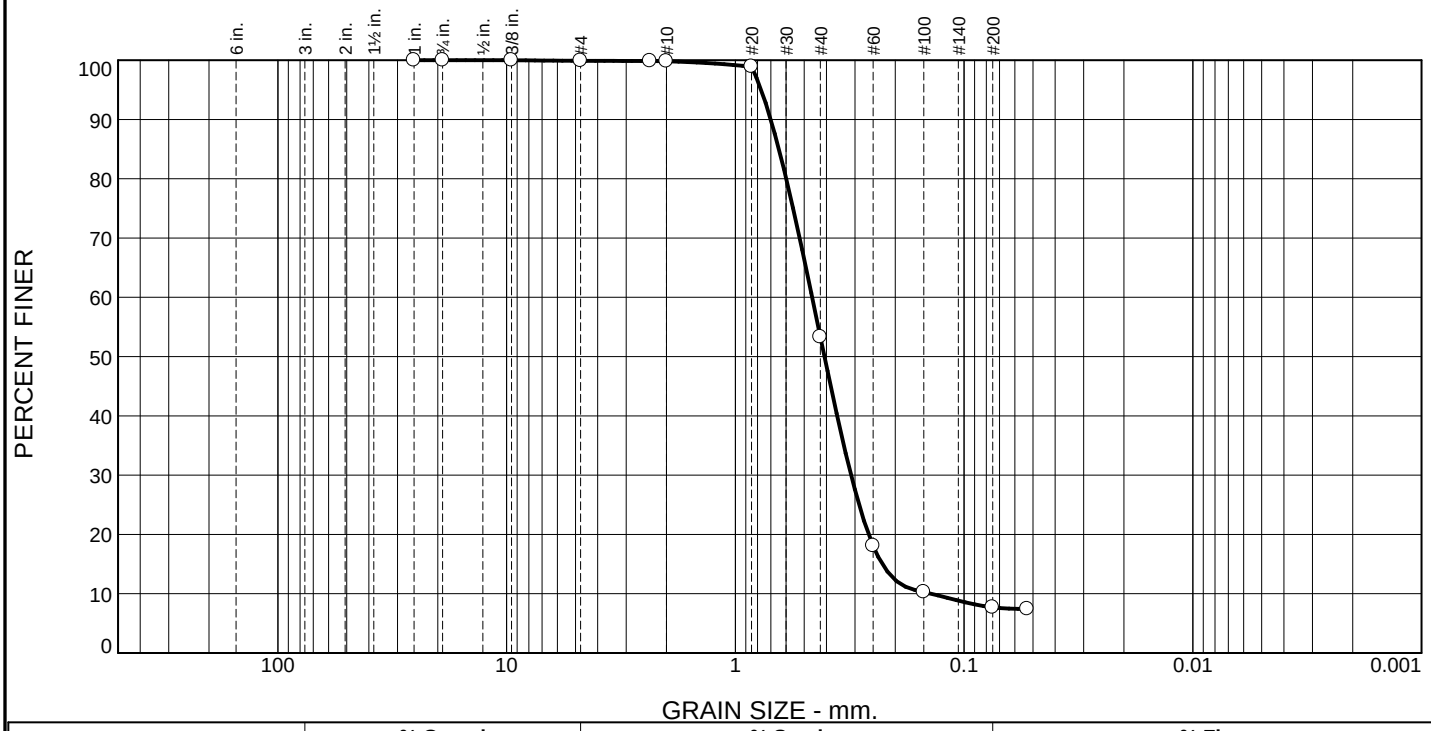
Date Sampled: 04/16/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	46.5	45.6	7.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	100.0		
.375	100.0		
#4	99.9		
#8	99.9		
#10	99.8		
#20	98.9		
#40	53.3		
#60	18.1		
#100	10.3		
#200	7.7		
#270	7.4		

* (no specification provided)

Material Description

SAND, some silt, trace gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.7003 D_{85}= 0.6453 D_{60}= 0.4617
D_{50}= 0.4078 D_{30}= 0.3119 D_{15}= 0.2280
D_{10}= 0.1397 C_u= 3.31 C_c= 1.51

Remarks

Collected by: LBK

Date Received: 04/19/2018 **Date Tested:** 04/23/2018

Tested By: BN

Checked By: JMB

Title:

Location: Onsite
Sample Number: EB-3W **Depth:** 25'

Date Sampled: 04/16/2018

associated earth sciences incorporated

Client: PSD
Project: LSC Warehouse

Project No: 180090 E001 **Figure**

APPENDIX C

Infiltration Test Data Sheets

Project Name:	Kessler Center	**Water Source:**	Fire Hydrant
Project Number:	180090 E002	**Meter:**	AESI FM#2
Date:	8/20/2019	**Pit Area (sq. feet):**	5.8 ft * 6 ft = 34.8 sq. ft
Weather:	clear, 80	**Ring Area (sq. feet):**	NA
Test No.:	IT-1	**Test Depth (feet):**	5.5
Performed By:	BPN/ART	**Receptor Soils:**	Fine silty sand

Time (24-hr)	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments
8:30		0.00	0	Flow on
8:32	2.01	0.00		bumped gpm from 1-->2gpm
8:45	1.79	0.31	28	
9:00	1.78	0.40	55	
9:15	1.68	0.46	82	some caving behind gauge
9:30	1.72	0.50	106	turning down gpm to 0.5
9:45	0.50	0.50	114	
10:00	0.50	0.48	122	gpm up to 0.75
10:16	0.74	0.48	134	
10:31	0.76	0.49	145	
10:46	0.75	0.50	156	
11:00	0.75	0.51	167	
11:15	0.75	0.52	178	gpm down to 0.65gpm
11:30	0.65	0.50	188	
11:45	0.65	0.50	198	
12:00	0.65	0.51	208	
12:15	0.65	0.56	218	
12:45	0.63	0.56	238	
13:00	0.64	0.56	247	
13:15	0.64	0.56	257	
13:30	0.65	0.57	267	
13:45	0.64	0.58	277	
14:00	0.64	0.59	286	
14:15	0.64	0.59	296	
14:30	0.64	0.59	306	
14:45	0.64	0.60	316	
15:00	0.66	0.60	326	
15:15	0.66	0.60	335	
15:30	0.64	0.60	345	Water off
15:45		0.59		Begin falling head calc
16:00		0.54		
16:08		0.52		
16:21		0.50		
16:25		0.49		
16:30		0.48		

	Average Infiltration Rate (in/hr) during last hour of inflow:	1.7
	Average Infiltration Rate (in/hr) during falling head:	1.4

Note: Meter zeroed at start of test. Ran low flow meter (0.3-3gpm) for approximately 4 minutes prior to switching over to 3-30 gpm flow meter at 08:00.
Shut down flow at 12:00
Calculated infiltration rate accounts for change in storage during course of test.

Project Name:	Kessler Center	**Water Source:**	Fire Hydrant
Project Number:	180090 E002	**Meter:**	AESI FM#1
Date:	8/20/2019	**Pit Area (sq. feet):**	6.0 ft *7.0 ft = 42 sq ft
Weather:	clear, 80	**Ring Area (sq. feet):**	NA
Test No.:	IT-2	**Test Depth (feet):**	5.5
Performed By:	BPN/ART	**Receptor Soils:**	Fine silty sand

Time (24-hr)	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments
9:00		0.00	0	Flow on
9:05	1.76	0.00	9	
9:15	1.74	0.00	27	
9:30	1.75	0.00	53	
9:45	1.82	0.30	81	
10:00	1.84	0.30	108	
10:15	1.83	0.32	136	
10:30	1.84	0.34	163	
10:45	1.80	0.36	190	
11:00	2.03	0.37	218	flow up to 2.0
11:15	2.03	0.40	248	
11:30	2.01	0.42	280	
11:46	2.00	0.44	311	
12:01	1.92	0.46	341	
12:15	1.95	0.47	368	
12:30	1.99	0.49	400	
12:47	1.87	0.51	430	flow down to 1.50
13:00	1.50	0.51	449	
13:15	1.50	0.51	472	
13:30	1.50	0.51	495	
13:45	1.50	0.53	517	
14:00	1.51	0.54	540	
14:15	1.50	0.53	562	
14:30	1.50	0.56	585	
14:45	1.50	0.57	607	
15:00	1.50	0.59	630	
15:15	1.50	0.60	652	
15:30	1.49	0.61	675	
15:45	1.54	0.62	699	
16:00	1.52	0.63	721	water off
16:04		0.62		begin falling head calc
16:10		0.60		
16:21		0.55		
16:25		0.52		
16:32		0.50		
16:37		0.48		
16:46		0.46		
16:50		0.45		
17:00		0.41		

	Average Infiltration Rate (in/hr) during last hour of inflow:	3.0
	Average Infiltration Rate (in/hr) during falling head:	2.6

Note: Meter zeroed at start of test. Ran low flow meter (0.3-3gpm) for approximately 4 minutes prior to switching

over to 3-30 gpm flow meter at 08:00.
Shut down flow at 12:00
Calculated infiltration rate accounts for change in storage during course of test.

Project Name:	Kessler Center	**Water Source:**	Fire Hydrant
Project Number:	180090 E002	**Meter:**	AESI FM#9
Date:	8/21/2019	**Pit Area (sq. feet):**	6.3 ft * 5 ft = 31.5 sqft
Weather:	Cloudy, high 60's some rain	**Ring Area (sq. feet):**	NA
Test No.:	IT-3	**Test Depth (feet):**	18.5
Performed By:	BPN/ART	**Receptor Soils:**	Sandy gravel

Time (24-hr)	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments
8:10:00	9.92	0.00	0.0	Flow on
8:15:00	15.02	0.00	69.5	flow up to 15 gpm
8:30:00	15.15	0.14	282.2	
8:45:00	15.06	0.19	506.2	
9:00:00	15.05	0.21	731.1	
9:15:00	15.1	0.21	954.1	flow up to 17.5
9:30:00	17.66	0.28	1217.1	
9:45:00	17.55	0.36	1480.6	
10:00:00	17.58	0.38	1747.0	
10:15:00	17.66	0.40	2015.2	
10:30:00	17.55	0.42	2277.0	wetted area 5.6*5
10:45:00	17.56	0.44	2540.3	
11:00:00	17.6	0.46	2799.8	
11:15:00	17.63	0.48	3067.4	
11:30:00	17.05	0.46	3323.8	flow down to 17 gpm
11:45:00	17.05	0.45	3577.8	
12:00:00	17.53	0.46	3828.3	flow up to 17.5gpm
12:15:00	17.53	0.48	4103.0	
12:30:00	17.46	0.50	4359.8	
12:45:00	17.55	0.50	4630.6	
13:00:00	17.48	0.50	4889.2	
13:15:00	17.48	0.52	5153.2	
13:30:00	17.5	0.54	5422.8	
13:45:00	17.46	0.58	5675.1	flow down to 17.3gpm
14:00:00	17.26	0.59	5925.7	
14:15:00	17.25	0.59	6193.9	
14:30:00	17.25	0.58	6455.2	
14:45:00	17.32	0.58	6713.5	
15:00:00	17.23	0.58	6971.3	wetted area 6.3'*5'
15:15:00	17.30	0.59	7233.6	water off
15:16:00		0.57		
15:17:00		0.53		
15:18:00		0.50		
15:18:30		0.48		
15:19:00		0.40		
15:19:30		0.38		
15:20:00		0.34		
15:20:30		0.30		
15:21:00		0.28		
15:21:30		0.24		
15:22:00		0.20		
15:22:30		0.18		
15:23:00		0.12		last value used in falling head calc

Time (24-hr)	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments
15:23:30		0.08		
15:24:00		0.05		

	Average Infiltration Rate (in/hr) during last hour of inflow:	52.9
	Average Infiltration Rate (in/hr) during falling head:	42.3

Note: Meter zeroed at start of test. Ran low flow meter (0.3-3gpm) for approximately 4 minutes prior to switching over to 3-30 gpm flow meter at 08:00.
Shut down flow at 12:00
Calculated infiltration rate accounts for change in storage during course of test.

Infiltration Testing Data

Project Name:	LSC Warehouse Addition	**Water Source:**	Hydrant, onsite
Project Number:	180090H001	**Meter:**	NW Ex 3 to 50 gpm
Date:	4/30/2018	**Pit Area (sq. feet):**	2 feet x 8 feet = 16 sq feet
Weather:	Overcast, 47 to 57 °F	**Ring Area (sq. feet):**	n/a
Test No.:	PD-1	**Test Depth (feet) :**	18.8
Performed By:	LBK	**Receptor Soils:**	Advance Outwash

Time	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments
7:40:00	7.86	0.00	0	Flow on
7:43:30	7.22	0.67	27	
7:44:42	7.14	1.02	36	
7:52:00	7.03	3.27	90	
8:00:00	6.88	4.92	147	
8:05:00	6.86	5.95	180	
8:10:00	6.83	6.91	214	
8:15:00	6.96	7.64	248	
8:30:00	6.9	8.96	349	
8:45:00	6.88	10.14	458	
9:00:00	6.86	10.74	556	
9:16:00	6.85	11.50	664	
9:30:00	6.83	12.02	765	
10:02:00	6.83	12.85	981	
10:16:00	6.83	13.16	1076	
10:30:00	6.83	13.46	1172	
10:52:00	6.83	13.80	1320	
11:05:00	6.83	13.97	1407	decreased flow to ~5 gpm
11:15:00	4.96	13.88	1460	
11:30:00	4.98	13.78	1535	
11:47:00	4.94	13.73	1619	
12:00:00	4.92	13.71	1683	
12:15:00	4.9	13.70	1756	
12:30:00	4.89	13.69	1849	
12:45:00	4.87	13.70	1937	
13:15:00	4.85	13.71	2026	
13:30:00	4.83	13.71	2116	
13:48:00	4.81	13.72	2208	
14:01:00	4.81	13.73	2269	
14:11:00	4.79	13.74	2318	
14:20:00	4.84	13.75	2384	
14:30:00	4.81	13.76	2410	
14:40:00	4.82	13.77	2458	Flow off
14:41:52	0	13.67	0	Begin falling head
14:45:00	0	13.47	0	
14:50:00	0	13.19	0	
14:56:00	0	12.87	0	
15:00:00	0	12.66	0	
15:05:00	0	12.42	0	
15:10:00	0	12.18	0	
15:15:00	0	11.99	0	
15:20:00	0	11.81	0	
15:25:00	0	11.63	0	
15:30:00	0	11.49	0	

Infiltration Testing Data

Time	Flow Rate (gpm)	Stage (feet)	Totalizer (gallons)	Comments

Average Infiltration Rate (in/hr) during last hour of inflow:	28.8
Average Infiltration Rate (in/hr) during falling head:	36.4

Notes:

start of test.
Shut down flow at 14:40. Last reading at 15:30
Installed logger at 15:30 on 15 second readings.
Logger downloaded next morning at 11:00; piezo dry.
Calculated infiltration rate accounts for change in storage during course of test.