October 2, 2018
Project No. 170017H001

Lakeside Industries, Inc.
6505 226th Place SE, Suite 200
Issaquah, Washington 98027

Attention: Ms. Karen Deal

Subject: Subsurface Exploration, Infiltration Testing, Design Infiltration Rate, and Groundwater Mounding Analysis
Maple Valley Asphalt Plant
18825 SE Renton-Maple Valley Road
King County, Washington

Dear Ms. Deal:

Associated Earth Sciences, Inc. (AESI) is pleased to present this letter-report providing the results of subsurface exploration, infiltration testing, design infiltration rate, and groundwater mounding analysis for the above-referenced project.

Our letter-report is based on our explorations and testing completed for this study; information provided by the civil engineering firm, David Evans and Associates, Inc. (DEA) (Triad is now part of DEA), including advance issue construction plans (including stormwater plans) titled "Maple Valley Asphalt Facility, Site Engineering Plans," Sheet 1 through Sheet 13, labeled preliminary, and dated October 2, 2018; information provided by Lakeside Industries, Inc. (Lakeside), including monitoring well logs and groundwater information provided by Farallon Consulting, Inc. (Farallon); and our previous work at the project site, including the "Revised Critical Area Assessment" (CAA) dated September 20, 2018.

The site location is shown on the "Vicinity Map," Figure 1. The approximate locations of explorations completed by AESI for this study are shown on the "Exploration Map," Figure 2. Monitoring well locations installed onsite by Farallon are presented on Figure 3, "Site Plan." Appendix A contains interpretive logs of AESI's explorations, laboratory test results, and

infiltration testing data. Appendix B contains Farallon's monitoring wells logs, groundwater hydrographs from wells in the infiltration facility area, and a groundwater contour map. Appendix C contains infiltration test data, groundwater mounding analysis documentation and output. In the event that any changes in the nature or design of the proposed project are planned, the conclusions and recommendations contained in this letter-report should be reviewed and modified, or verified, as necessary.

SITE DESCRIPTION

The subject property consists of approximately 25 acres and is located at 18825 SE Renton-Maple Valley Road along the south side of the Renton-Maple Valley Highway, opposite the Cedar River, east of Renton, Washington. The parcel is irregularly shaped with a smaller "panhandle" on the east side. The parcel consists of steep slopes within the southern and eastern panhandle portions of the property and relatively level ground on the northern portion of the site which contains a large fill pad.

A geologic map of the site vicinity (Booth, 1995) indicates that the relatively flat area in the northern part of the site is primarily underlain by Quaternary alluvium (Qyal). Alluvial soils may be suitable for use as a receptor horizon for infiltrating stormwater depending on their vertical and horizontal extent, grain-size characteristics, and local groundwater elevations. Pre-Fraser sediments (Qpf), Vashon advance outwash (Qva), Vashon till (Qvt), and mass wasting deposits (Qmw) are mapped on the steep slopes in the southern and eastern portions of the site.

PROJECT DESCRIPTION

At the time this letter-report was prepared, this project was still in design. This letter-report is focused on design of an infiltration facility using a Stormtech chamber system and was completed with an understanding of the project based on advance issue construction drawings provided by DEA. The proposed infiltration chamber system will manage stormwater for the site, and has been designed in accordance with the 2016 *King County Surface Water Design Manual* (KCSWDM), and consists of below-grade infiltration chambers in the northeast portion of the site.

PURPOSE AND SCOPE

The purpose of this study was to provide subsurface data, conduct field infiltration testing, perform grain-size analyses, determine a preliminary design infiltration rate, and conduct a groundwater mounding analysis for the proposed stormwater infiltration system situated in the Cedar River alluvial sediments. Our current study included reviewing available geologic literature, observing the excavation of twelve exploration pits and one infiltration test pit, conducting one small-scale Pilot Infiltration Test (PIT) as outlined in the 2016 KCSWDM, performing grain-size analysis, groundwater mounding analyses, and preparing this letter-report documenting methods and results. This letter-report summarizes our current field/laboratory work and data analysis and offers recommendations based on our present understanding of the project. We recommend that we be allowed to review the recommendations presented in this letter-report and revise them, if project plans change.

AUTHORIZATION

Authorization to proceed with this study was granted by Ms. Karen Deal and our study was accomplished in general accordance with our proposals dated January 16, 2018 and May 17, 2018. This letter-report has been prepared for the exclusive use of Lakeside and its 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.

SUBSURFACE EXPLORATION, TESTING, AND GROUNDWATER LEVEL MONITORING

Subsurface exploration and infiltration testing were completed on January 18, 2018 and April 24, 2018 and consisted of twelve exploration test pits (EP-1 to EP-12) and one infiltration test (IT-1). Explorations EP-12 and IT-1, completed on April 24, 2018, were focused in the proposed infiltration facility area. Soil samples were obtained from the excavator for grain-size analysis. The various types of materials and sediments encountered in the explorations, as well as the depths where characteristics of these materials changed, are indicated on the exploration logs included in Appendix A. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types in the field. AESI's explorations were approximately located in the field relative to known subject site features (Figure 2).

The conclusions and recommendations presented in this letter-report are based on the explorations and research completed for this study, previous explorations by others, and water level information by others (Farallon). The number, locations, and depths of the explorations were completed within generally accepted hydrogeology practices to access infiltration potential at the site. It should be noted that subsurface conditions differing from those encountered in our explorations may be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this letter-report and make appropriate changes.

Exploration Pits and Infiltration Test Pit

The explorations permitted direct, visual observation of subsurface conditions. Materials encountered in the explorations were studied and classified in the field by a geologist from AESI. All explorations were excavated by Lakeside using a Hitachi Zaxis 350LC track-mounted excavator with an approximately 4-foot straight-edge bucket. After logging the exposed soils, the explorations were backfilled with the excavated soil and lightly tamped with the excavator bucket.

Explorations EP-1 to EP-11 were excavated on January 18, 2018 and explorations IT-1 and EP-12 were excavated on April 24, 2018. 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 review of the samples. The infiltration test pit (IT-1) was excavated to the estimated depth of the proposed infiltration facility to perform the test. After completion of the test, exploration IT-1 was overexcavated to allow observation of the subsurface conditions beneath the infiltration test, as required by the KCSWDM.

Infiltration Testing Procedures

AESI observed excavation and performed infiltration testing of IT-1 on April 24, 2018, using the small-scale PIT procedure outlined in the KCSWDM. Water was obtained by Lakeside using a 4,000-gallon water truck. Water was conveyed from the water truck to the test location using a Honda WT20X water pump and 2.5-inch firehose.

The infiltration testing procedure consisted of excavating an infiltration test pit with a relatively flat bottom. Water was introduced into the test area using fire hoses attached to a digital propeller flow meter assembly. The flow meter has both an instant read flow rate and a total

flow volume readout. The flow meter assembly was equipped with a diffuser to minimize turbulence and scouring of the test base during testing. A staff gauge was installed at the test base to measure the water level rise (head) to the nearest hundredth (0.01) of a foot. Readings of the water level, instantaneous flow rate, and total flow volume were recorded at approximately 5- to 15-minute intervals.

During the initial portion of the test, water was discharged into the infiltration test pit for a "soaking period." The soaking period allows the receptor soils in the immediate vicinity of the pit to become saturated. During the soaking period, typically the flow rate would be adjusted periodically until a constant head was attained at a constant water discharge rate. The test would then continue for an additional "test period" while the water discharge rate was maintained. However, a measurable head of test water did not accumulate in the test pit during the soaking or testing period at the maximum flow rate of the flow meter. Additionally, the water truck was emptied within the soaking period and had to be re-filled. Over 6,000 gallons were discharged at the maximum flow rate of the flow meter in less than 4 hours. The field constant-head infiltration rate was calculated using the metered flow rate and the wetted area.

Typically following completion of the constant-head test, the flow of water into the test area would be discontinued and the rate of water level decline (falling head) in the infiltration test pit would be monitored. However, a measurable water level did not accumulate during the entire soaking and testing period; therefore, a falling-head test could not be performed.

Infiltration test parameters are summarized in Table 1, below.

Table 1
Summary of Infiltration Test Parameters

	PIT[1] Methodology (small or large)	Duration of Flow (hours)	Water Used (gallons)	Wetted Test Area (square feet)	Test Depth (feet)	Test Elevation[3] (feet, approximate)
IT-1	Large	3.9	6,191	3.4[2]	4	165

[1] PIT = Pilot Infiltration Test.
[2] Approximate area of the test pit bottom wetted during test.
[3] Test elevation was not surveyed and is approximate based on field measurements from elevated offset stakes.

Laboratory Testing - Grain-Size Analysis

AESI performed one grain-size analysis (sieve) on a representative sample of Cedar River alluvium collected from IT-1 at a depth of about 4 feet. The grain-size analysis test results are

included in Appendix A. The grain-size analysis test results are presented in Table 2 with soil descriptions based on the *American Society for Testing and Materials* (ASTM) D-2487 Unified Soil Classification System (USCS).

Table 2
Summary of Grain Size Analyses

Exploration Number	Depth (feet)	Geologic Unit	USCS Soil Description	Fines Content (%)
IT-1	4	Cedar River Alluvium	Very sandy, GRAVEL, trace silt (GW)	1.6

USCS - Unified Soil Classification System
% - percent of total weight

Water Level Monitoring

Groundwater monitoring wells MW-1 to MW-7 were previously installed onsite by Farallon. Monitoring well locations are presented on Figure 3. Continuous water level data for wells MW-4 and MW-5 and manual water levels for all wells were provided by Farallon from March 3, 2018 through June 25, 2018. Additional manual water levels for all wells from 2016 were provided (dated April 28, 2016, May 12, 2016, September 28, 2016, and December 14, 2016). The project surveyor established the monitoring well elevations, so that accurate groundwater elevation data could be reported. Hydrographs of the 2018 data and well logs recorded by Farallon are presented in Appendix B. The maximum groundwater elevation recorded in MW-5 was 160.82 feet on April 17, 2018. Groundwater conditions should be expected to vary seasonally, and in response to changes in precipitation, on- and off-site land usage, and other factors. We recommend continuation of groundwater level monitoring through the 2018-2019 wet season to record the seasonal high groundwater level.

SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from the field explorations accomplished for this study, visual reconnaissance of the site, and review of selected applicable geologic literature. The number, locations, and depths of the explorations were completed within generally accepted hydrogeology practices to access infiltration potential at the site. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes 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.

Published Geologic Map

Review of a published geologic map of the site vicinity (*Surficial Geologic Map of the Maple Valley Quadrangle, King County, Washington* by D.B. Booth, 1995) indicates the low-lying areas of the site, including the proposed infiltration facility location, from the base of the steep slopes to the northern site boundary, are mapped as Quaternary alluvium. These deposits are described as loose, stratified to massively bedded fluvial silt, sand, and gravel (Booth, 1995). Fill soils were encountered in all of the exploration pits and exploration borings, completed by AESI and Farallon, and overlie the Quaternary alluvium. The steep slopes located within the southern portions of the site are underlain by glacially consolidated Vashon-age glacial till, Vashon advance outwash, and pre-Vashon, undivided glacial and non-glacial deposits. Holocene mass wasting deposits are mapped on the slope in the southern portion of the site.

Published Soils Map

AESI reviewed regional soils mapping of the site and vicinity (*Soil Survey, King County Area, Washington*, 1973, U.S. Department of Agriculture [USDA], Soils Conservation Service and *Soil Survey, King County Area, Washington*, 2017, Web Soil Survey, USDA-Natural Resources Conservation Service [NRCS]). The low-lying areas of the site, including the proposed infiltration facility location, from the base of the steep slopes to the northern site boundary, are identified as Urban Land. Pre-development or historical soils of this area are not identified by available USDA-NRCS soils maps. Based on the surrounding soils units and on-site explorations, the pre-development soils of the site labeled Urban Land are likely Pilchuck loamy fine sand (Pc) and/or Puyallup fine sandy loam (Py). The parent material is gravelly and sandy alluvium for Pc and alluvium for Py and both soils formed on nearly flat terraces and floodplains. According to the soils survey, soils Pc and Py are in Group A of the hydrologic soil groups, have a high infiltration rate, are well drained to excessively drained with a high to very high capacity to transmit water (USDA-NRCS, 2017). This is consistent with AESI's on-site explorations.

The sloping portions of the parcel are underlain by Alderwood and Kitsap soils on 25 to 70 percent slopes derived from glacial till and glacial lake deposits. A small portion of the property, in the southeast corner, is underlain by Alderwood gravelly sandy loam on 8 to 15 percent slopes. Our interpretation of the soils encountered in our explorations is in general agreement with the regional soils mapping.

Stratigraphy

Explorations were done on the low-lying portion of the site where development and stormwater infiltration is proposed. Exploration logs are included in Appendix A. Sediments

encountered consisted primarily of a surficial layer of fill soils overlying Quaternary alluvium of the Cedar River. The following section presents more detailed subsurface information organized from the youngest to the oldest sediment types.

Fill

Fill soils (those not naturally placed) were encountered at the ground surface in all explorations and generally consisted of medium dense, dark brown, silty sand and gravel. The fill thickness was variable and extended to a depth of 9 feet below ground surface (bgs) in EP-1. Fill thicknesses, density, and grain size can vary over short distances and should be expected near existing or previous structures, buried utilities, and other site improvements. Ponding was observed on top of fill sediments near EP-12, indicating the fill contains silt and has been compacted. Due to the variable density and content, fill soils are generally not suitable for stormwater infiltration.

Quaternary Younger Alluvium (Qyal)

Alluvial sediments interpreted to represent stream deposits of the Cedar River were encountered underlying fill soils across the portion of the property proposed for development and stormwater infiltration. Alluvium was encountered from 2.5 feet bgs to the terminal depth of explorations (up to 13.5 feet bgs) in explorations EP-1 to EP-12 and IT-1. The alluvium encountered generally consisted of medium dense, gray, stratified, gravel and sand with variable silt and trace cobbles. The alluvium encountered at the site is in general agreement with a published geologic map (Booth, 1995). Luzier (1969) indicates the alluvium is generally less than 30 feet thick. Monitoring wells completed at the site by Farallon encountered sediments consistent with alluvium below fill to the terminal depths of borings (up to 20 feet bgs).

Pre-Fraser Undifferentiated (Qpf)

Based on the geologic map (Booth, 1995) and published literature, Qpf sediments are expected to underlie the Qyal sediments in the Cedar River Valley.

Groundwater Conditions

Descriptions of regional hydrogeology are contained in reports prepared by the USGS, including Water-Supply Bulletin No. 28 (Luzier, 1969) and Water-Resources Investigations Report 92-4098 (Woodward et al., 1995). In addition, information about the Cedar Valley Aquifer is provided in the King County Water District #90 (KCWD#90) Wellhead Protection Plan (Pacific Groundwater

Group [PGG], 2014). On-site, shallow groundwater was observed in all AESI's explorations and in Farallon's monitoring wells.

Cedar Valley Aquifer

The shallow aquifer in the site vicinity is an unconfined alluvial aquifer contained within deposits of the Cedar River and may include pre-Fraser undifferentiated sediments at depth. Recharge to the Cedar River Aquifer occurs through rainfall; infiltration of surface runoff from till uplands, streams, and wetlands; and from spring discharge on the margins of the upland. The KCWD#90 wells penetrated the Cedar River Aquifer, extended through an underlying aquitard consisting of silt and clay, and are completed in a deeper regional aquifer (PGG, 2014).

Groundwater was observed in AESI's explorations completed for this study between depths of 6.5 feet to 13.5 feet bgs. On-site monitoring wells, MW-1 to MW-7, were completed within the alluvial aquifer and were terminated above the base of the aquifer at 20 feet bgs. MW-4 was drilled to a bottom hole elevation of approximately 143.5 feet. A groundwater contour map prepared by Farallon (Appendix B) depicts a generally northeast-trending groundwater flow direction, with a gradient of approximately 0.06 to 0.08 feet vertical per foot horizontal (ft/ft). The maximum groundwater elevation recorded by Farallon near the infiltration facility was 160.82 feet (MW-5) in April 2018.

Deeper Aquifers

Deeper aquifers underlie the alluvial aquifer and are comprised of pre-Fraser sediments. The KCWD#90 wells withdraw groundwater from a deeper regional aquifer underlying an aquitard approximately 20 to 30 feet thick (PGG, 2014). Water levels of the KCWD#90 wells indicated an upward groundwater flow gradient at the well field (PGG, 2014). Regional groundwater studies also indicate groundwater flow is upward from deeper regional aquifers and discharges to the Cedar River (Woodward, 1995).

INFILTRATION TESTING RESULTS

An infiltration test was completed at the location shown on Figure 2 to obtain a preliminary design infiltration rate for the proposed infiltration facility. The field-calculated infiltration rate was over 750 inches per hour (in/hr) (Appendix A). Applying suitable correction factors to the field-derived rates, as required in the 2016 KCSWDM, results in a rate of 134 in/hr. However, the maximum design infiltration rate allowable by the 2016 KCSWDM is 20 in/hr.

GROUNDWATER MOUNDING ANALYSIS

The groundwater mounding analysis was completed to simulate the maximum groundwater mound height and compare it to the design high water elevation (DHWE) of the proposed infiltration facility. Groundwater mounding can occur when water is introduced into an infiltration facility at a higher rate than can be conveyed from the area beneath the facility. The introduced water can "mound" on the groundwater table or on a less-permeable silty interbed within the receptor sand and gravel during a storm event. When the storm event is over and water is not being introduced into the system, the mound will normally dissipate. The mounding analysis is used to simulate the maximum groundwater mound beneath the facility during a design storm series.

The MODRET computer program was used to model potential groundwater mounding beneath the proposed infiltration facility under two design time series. Infiltration system civil design details and stormwater inflow hydrographs were provided by DEA, the project civil engineer. The MODRET program utilizes the Greene Ampt method for unsaturated conditions and the USGS MODFLOW model for saturated conditions.

The soil and groundwater input parameters used in the MODRET evaluation were consistent with KCSWDM requirements, field/laboratory data and applicable published hydrogeologic literature. The model input parameters are included in Appendix C, and an explanation of the basis for all parameters used is included in Table 3. The civil design and hydrogeologic conceptual model are described below.

Civil Design and Proposed Stormwater Inflow Hydrographs

A Stormtech SC-740 chamber system is proposed for infiltration. DEA provided undated site and infiltration system plan details. The design of the infiltration chamber system includes excavating the facility from ground surface to elevation 164.9 feet. A system of chambers will be installed surrounded by washed drain rock with an assumed porosity of 40 percent. The design includes an overflow pipe at the DHWE, 168.73 feet.

DEA provided two stormwater hydrographs for the infiltration facility: one from a period that includes the highest flow rate (peak flow) and one from a period of maximum volume, derived from the Western Washington Hydrology Model (WWHM) surface water model. In DEA's analyses, the period of the peak flow hydrograph is November 2, 2006 to December 1, 2006, with the peak flow occurring on November 6, 2006. The 30-day date range with the maximum volume is October 6, 2003 to November 4, 2003. Prints of the spreadsheet pages containing the hydrographs provided by DEA are included in Appendix C. DEA also provided facility

elevation and volume parameters via email dated August 8, 2018, which is included in Appendix C. These facility parameters are included in Table 3.

Hydrogeologic Conceptual Model and Aquifer Parameters

Based on the KCSWDM, the maximum design infiltration rate for the infiltration facility is 20 in/hr. The maximum groundwater elevation collected in the vicinity of the infiltration facility was 160.82 feet (MW-5) in April 2018. AESI used a maximum groundwater elevation of 161.9 feet, equating to a 3-foot separation from the bottom of the facility. The bottom of the aquifer was not encountered in our explorations or Farallon's monitoring wells. The elevation of the deepest point explored in the vicinity of the infiltration facility was 143.5 feet in MW-4 and was used in the model as the base of the aquifer.

The hydraulic conductivity values used in the model are based on the maximum allowable design infiltration rate. The hydraulic conductivity is considered saturated vertical hydraulic conductivity (Kvs). The model requires input of two hydraulic conductivity values: saturated horizontal hydraulic conductivity (Khs) and unsaturated vertical hydraulic conductivity (Kvu). The KCSWDM specifies using a relationship of Khs = 3 times the saturated vertical hydraulic conductivity (Kvs) to derive the Khs value. This value is generally considered conservative, within the range of published hydraulic conductivity ratio values for sediments deposited by flowing water and is recommended in Section 5.2.1 of the KCSWDM. Kvu is assumed to be two-thirds the value of Kvs (Andreyev and Wiseman, 1989).

Using the maximum allowable infiltration rate of 20 in/hr as the basis for determining vertical and horizontal infiltration rates is extremely conservative compared to the field-based infiltration test results and observed characteristics of the alluvium. In our opinion, actual hydraulic conductivity values are much higher than the KCSWDM maximum design rate allows. This means the simulated mound heights presented under the Groundwater Mounding Analysis Results section are overstated.

Table 3 presents the model input values for the infiltration facility and the basis for these values.

Table 3
Basis for MODRET Input Parameters

Parameter	Value	Basis
Facility Bottom Area	6490.64 ft^2	DEA
Facility Volume Between Bottom and DHWE	14803.74 ft^2	DEA
Facility Length to Width Ratio	4.16	DEA
Elevation of Effective Aquifer Base	143.5 ft	Bottom of Farallon's MW-4.
Elevation of Seasonal High Ground Water Table	161.9 ft	AESI. One foot above Farallon's recorded groundwater high.
Elevation of Starting Water Level	164.90 ft	Facility bottom elevation (DEA).
Elevation of Facility Bottom	164.90 ft	DEA
DHWE	168.73	DEA
Storage Coefficient of Soil for Unsaturated Analysis	0.25	AESI - Within range of published values for the soil types present.
Unsaturated Vertical Hydraulic Conductivity (Kvu) (ft/day)	26.67 ft/day	Based on design infiltration rate, 20 in/hr (40 ft/day). (2/3 x Kvs). See text.
Factor of Safety	2	Standard value.
Saturated Horizontal Hydraulic Conductivity (Khs) (ft/day)	120 ft/day	3 x Kvs. See text.
Storage Coefficient of Soil for Saturated Analysis	0.25	AESI - Within range of published values for the soil types present.
Average Effective Storage Coefficient of Pond/Exfiltration Trench	0.6	DEA
Time Increment During Storm Event (hours)	24	Increments match hydrograph time steps.
Time Increment After Storm Event (hours)	24	Increments match hydrograph time steps.
Total Number of Increments After Storm Event	6	Program default.

DEA = David Evans and Associates, Inc.
AESI = Associated Earth Sciences, Inc.
Farallon = Farallon Consulting, Inc.
DHWE = design high water elevation
ft = feet
ft^2 = square feet
ft/day = feet per day
in/hr = inches/hour
Kvs = saturated vertical hydraulic conductivity

Groundwater Mounding Analysis Results

The results of the MODRET simulation are included in Appendix C and indicate that the modeled infiltration facility will have the capacity to infiltrate all of the stormwater runoff routed to the facility during the design storm time series hydrographs provided by DEA, without reaching the DHWE.

Under the peak flow hydrograph, the maximum groundwater mound elevation was 168.68 feet, and occurred 360 hours into the simulation. The maximum volume hydrograph yielded a maximum groundwater mound elevation of 168.64 feet. These elevations are below the DHWE of 168.73 feet for the facility.

CONCLUSIONS AND RECOMMENDATIONS

Based on our subsurface exploration, field infiltration testing, analysis of the alluvial sediments, groundwater monitoring performed by others, and the groundwater mounding analysis completed for this letter-report, it is our opinion that the alluvial sediments beneath the site comprise a suitable receptor horizon for stormwater infiltration and that the infiltration facility, as designed, will be capable of infiltrating the design storm series provided by DEA for maximum volume and peak flow periods.

As the infiltration facility design progresses, additional exploration, testing, or analysis may be necessary to meet KCSWDM requirements. AESI has the following recommendations:

- As the facility design progresses, AESI should be allowed to review the design with respect to the information presented in this letter-report for applicability to the design.

- Care must be taken during construction not to contaminate the infiltration facility with stormwater and silt. The infiltration facility must not be used to infiltrate stormwater during construction. All construction site stormwater should be directed to a suitable location as specified on the approved Temporary Erosion and Sedimentation Control (TESC) plan. During construction, the infiltration facility must be configured to prevent silt-laden construction runoff water from entering the facility.

- The KCSWDM requires “as-built” performance testing and verification of soils in the bottom of the facility before final construction approval, including an infiltration rate test as performed for design. AESI should be allowed to observe performance testing.

- Continue groundwater monitoring through the 2018/2019 wet season.

Converting the Infiltration Facility to On-Line Status

During construction, the infiltration facility must be configured to prevent inflow of turbid, silt-laden construction runoff. Prior to bringing the infiltration facility on-line, the following elements must be achieved:

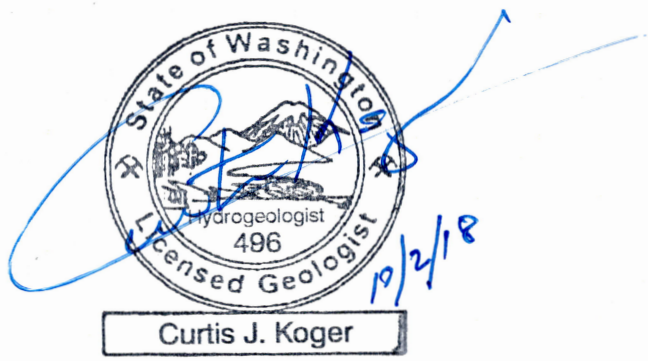
1. All planned earthwork must be complete.
2. Site stabilization must be complete:
    a. All permanent groundcover in place.
    b. No exposed topsoil.
    c. Hydroseeded areas must have established growth sufficient to fix topsoil in place.
    d. No visible sediment transport by stormwater during rain events.
    e. Catch-basin filter socks should no longer be needed and shall be removed.
3. Hard surfaces such as paving and sidewalks must be cleaned with no visible sediment or substances that could be transported by stormwater.
4. All stormwater collection system components must be cleaned and inspected:
    a. All catch basins, manholes, and similar structures shall be cleaned by rinsing and vacuuming to remove visible sediment. No water used in the cleaning of the upstream system shall be discharged into the infiltration facility.
    b. All stormwater pipes shall be jetted to remove visible sediment.
    c. After cleaning, a video survey shall be completed of all pipes and structures in the stormwater collection system. The owner shall be notified prior to the video survey work so they may observe the work in progress if desired. A recording of the video survey shall be provided to the owner, civil engineer, and AESI. The survey shall include sufficient detail to correlate video images with on-site locations.
5. AESI shall be notified that construction is complete, and shall be allowed to install long-term monitoring components such as water level loggers before water is routed to the infiltration facility.
6. The owner, civil engineer, and AESI must be notified that the above items have been completed, and must concur that the above items have been satisfactorily completed.
7. Written authorization must be provided from the owner, civil engineer, and AESI to the contractor that water may be routed to the infiltration facility for disposal.
8. Following the first substantial rain event after the infiltration facility is brought on-line, the system shall be visually inspected. The contractor shall contact the owner, civil engineer, and AESI to attend the inspection, and shall open facility enclosures, catch basins, manholes, and other structures as needed to allow visual inspection.

CLOSURE

AESI has prepared this letter-report for the exclusive use of our client and their agents, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted local geotechnical and hydrogeological engineering practices in effect at the time our letter-report was prepared. No other warranty, express or implied, is made.

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this letter-report or other geotechnical aspects of the site, please call at your earliest convenience.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



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Senior Principal Geologist/Hydrogeologist

ATTACHMENTS

Figure 1: Vicinity Map
Figure 2: Exploration Map
Figure 3: Site Plan

Appendix A: AESI Exploration Logs, Laboratory Testing Results and Infiltration Testing Data
Appendix B: Farallon Monitoring Well Logs, Hydrograph and Groundwater Contour Map
Appendix C: AESI Groundwater Mounding Analysis Data and Input Data from Civil Engineer

REFERENCES

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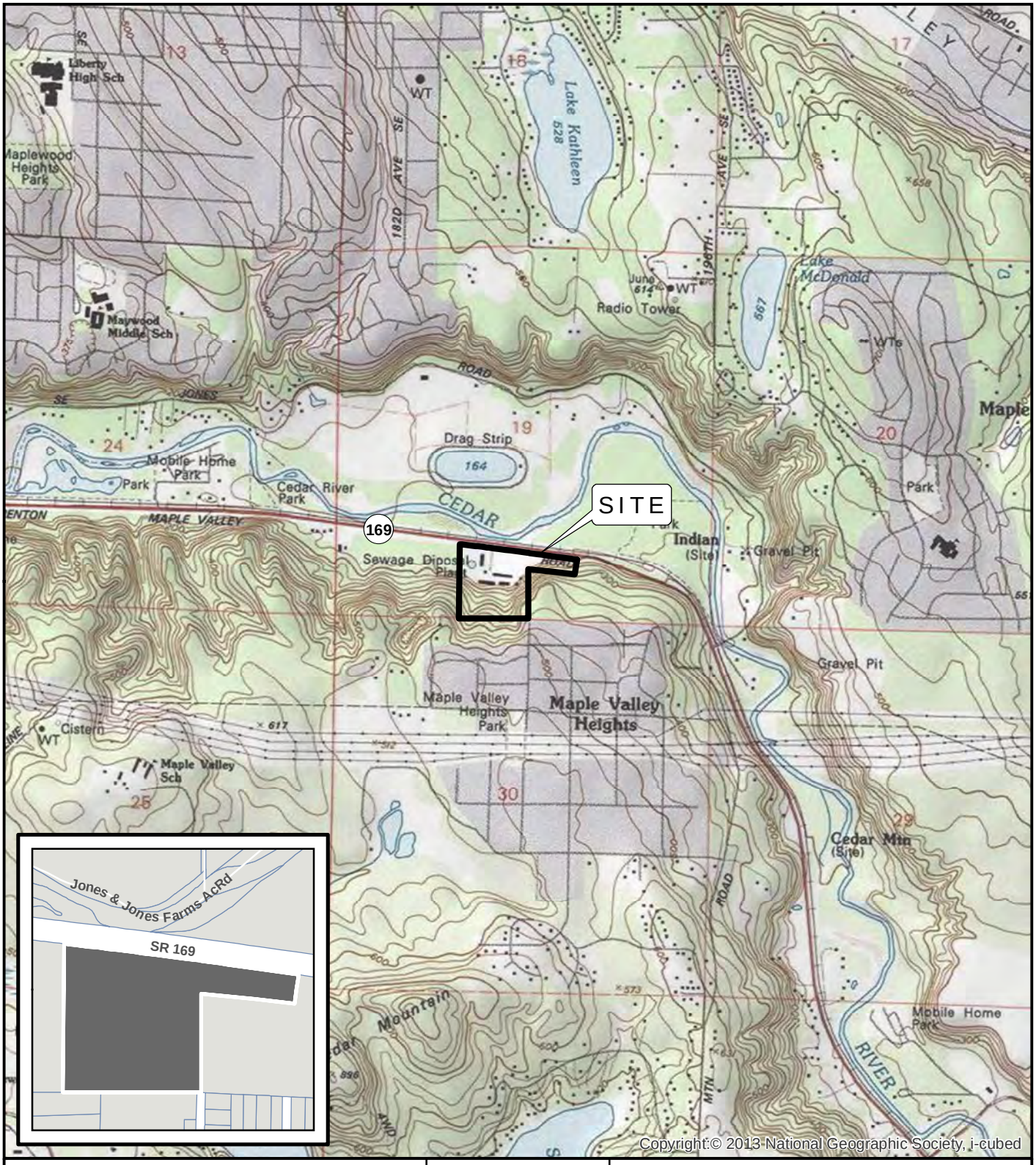

Document Path: G:\GIS_Projects\aaY2017\170017 Maple Valley Asphalt\mxd\H001\170017H001 F1 VM_MapleValley0918.mxd

DATA SOURCES / REFERENCES:
USGS: 24K SERIES TOPOGRAPHIC MAPS
KING CO: PARCELS 02/17

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

associated earth sciences incorporated

VICINITY MAP

MAPLE VALLEY ASPHALT PLANT
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
170017H001	9/18	1

LEGEND:

- SITE
- EXPLORATION PIT (AESI)
- INFILTRATION TEST (AESI)
- PARCEL
- CONTOUR 25 FT
- CONTOUR 5 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO. GRID CELL SIZE IS 3'.
DELIVERY 3 FLOWN 3/2/16 - 3/29/16, CONTOURS FROM LIDAR
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET

KING CO: PARCELS, STREETS, HYDRO 1/18
AERIAL PICTOMETRY INT. 2015

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 75 150
FEET

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

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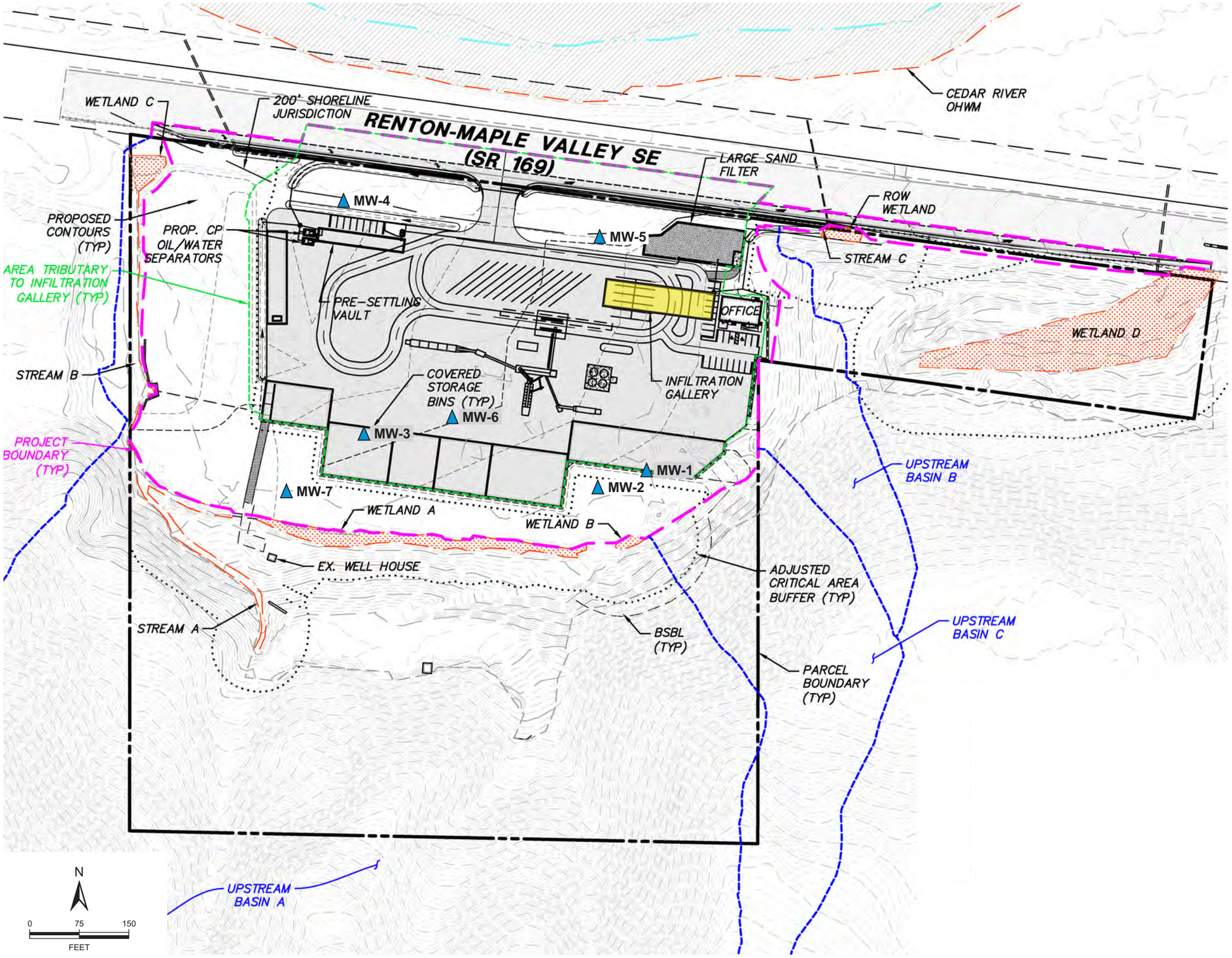
EXPLORATION MAP

MAPLE VALLEY ASPHALT PLANT
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
170017H001	9/18	2

Document Path: G:\GIS_Projects\aaY2017\170017 Maple Valley Asphalt\mxd\H001\170017H001 F2 SM_MapleValley0918.mxd



LEGEND:

▲ MONITORING WELL - BY OTHERS FARALLON

PROPOSED INFILTRATION SYSTEM

CONTOUR INTERVAL = UNKNOWN

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: TRIAD, LAKESIDE INDUSTRIES, INC., MAPLE VALLEY ASPHALT PLANT, DEVELOPED CONDITIONS EXHIBIT, SHEET 1, UNSTAMPED, UNDATED.

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

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SITE PLAN

MAPLE VALLEY ASPHALT PLANT
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
170017H001	9/18	3

170017 Maple Valley Asphalt \ 170017h001 F3 Site-MW 9-18.cdr

APPENDIX A

AESI Exploration Logs, Laboratory Testing Results and Infiltration Testing Data

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)

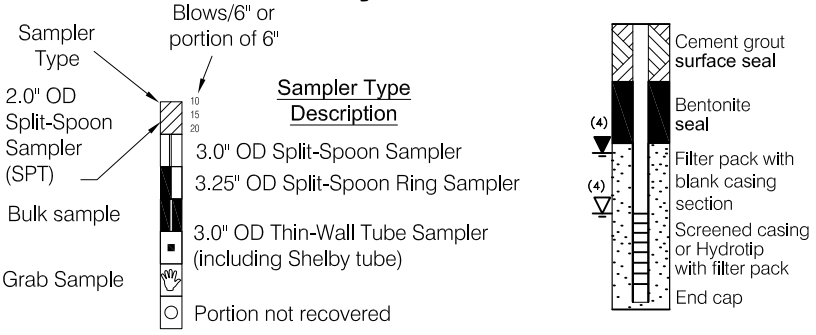
[3] Estimated Percentage

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.

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

Fill

1 Medium dense, moist to wet, dark brown, silty, fine to medium SAND; abundant organic material (SM).

2

3

4

5

6

7

8

9

Younger Alluvium

10 Medium dense, moist, gray with trace iron oxidation, silty, gravelly, fine to medium SAND, trace coarse sand; stratified (SM).

11 Medium dense, wet, gray, fine to coarse GRAVEL, some fine to coarse sand, trace cobbles, trace silt; stratified (GW).

12

13 Bottom of exploration pit at depth 12 feet
Minor to moderate seepage 2 to 10 feet. Minor caving 0 to 9 feet, moderate to severe caving 9 to 12 feet. Water table at 10 feet.

14

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KCTP3 170017.GPJ February 5, 2018

Maple Valley Asphalt
Renton, WA

Logged by: KB

Approved by: CJK

associated earth sciences incorporated

Project No. 170017H001

1/18/18

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

Fill

1 — Medium dense, moist, brown, silty, fine to medium SAND, trace coarse sand, trace fine to coarse gravel, trace rootlets (SM).

2

3 — Charcoal brown fill material and concrete fragments.

4

5

Younger Alluvium

6 — Medium dense, moist to wet, gray, fine to coarse gravelly, medium to coarse SAND, trace fine sand, trace silt; stratified (SW).

7

8

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13

14 — Bottom of exploration pit at depth 13 feet
No seepage. Severe caving 4 to 13 feet. Water table at 12 feet.

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Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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 — Medium dense, moist, brownish gray to dark brown, silty, gravelly, fine to coarse SAND, trace wood chips; concrete fragments, rail fragment, fabric, small wire springs, and rebar (SM).

2

3

4

5 — Medium dense, moist to wet, gray, silty fine SAND to fine to medium SAND, trace coarse sand (SP-SM).

6

7 — Excavation appears to have encountered a weathered concrete box or culvert at the southwest corner of the pit at 6.5 feet. A vertical concrete wall crossed from the north to the south side of the pit, and water flowed freely in and out of an opening.

8

9 — Bottom of exploration pit at depth 8 feet
No seepage. Minor caving 0 to 8 feet. Water table at 6.5 feet.

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Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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	Medium dense, moist, grayish brown, silty, gravelly fine to medium SAND, trace coarse sand, trace rootlets and wood chips (SM).
2	
3	Medium dense, moist, gray, silty, fine SAND to fine to medium SAND, trace coarse sand, trace fine to coarse gravel, trace cobbles, trace concrete fragments (SP-SM).
4	
5	Layer (6 inches thick) of charcoal brown fill material.
6	**Younger Alluvium**
7	Medium dense, moist to wet, gray, fine to coarse very gravelly, medium to coarse SAND, trace fine sand; stratified (SW).
8	
9	
10	
11	
12	Bottom of exploration pit at depth 11 feet Minor seepage 3 to 4 feet. Severe caving 6 to 11 feet. Water table at 9 feet.
13	
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Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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

Medium dense, moist, brownish gray to dark brown, silty, gravelly, fine to coarse SAND, trace cobbles, trace wood chips; plastic, rubber fragments (SM).

Younger Alluvium

Medium dense, moist, gray, medium to coarse sandy, fine to coarse GRAVEL, trace fine sand, trace cobbles; stratified (GW).

Bottom of exploration pit at depth 7.5 feet
Minor to moderate seepage 1 to 7 feet. Severe caving 1 to 7.5 feet. Water table at 7 feet.

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

Maple Valley Asphalt
Renton, WA

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

LOG OF EXPLORATION PIT NO. EP-6

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
2

Medium dense, moist, brownish gray, silty, gravelly, fine to coarse SAND; charcoal brown fill material at the east end of the pit (SM).

Younger Alluvium

3
4

Medium dense, moist, gray, fine to medium SAND, trace coarse sand; stratified (SP).

5
6

Medium dense, moist to wet, medium to coarse sandy, fine to coarse GRAVEL, trace fine sand, trace cobbles; stratified (GW).

7
8
9

Bottom of exploration pit at depth 9 feet
No seepage. Moderate to severe caving 3 to 9 feet. Water table at 8 feet.

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Maple Valley Asphalt
Renton, WA

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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	**Fill** Medium dense, moist, brownish gray, silty, gravelly, fine to coarse SAND (SM).
2	Medium dense, moist, light brown, silty, fine SAND, trace medium to coarse sand, trace fine to coarse gravel (SM).
3	
4	
5	**Younger Alluvium** Medium dense, moist, brownish gray, fine to medium SAND, trace coarse sand; stratified (SP).
6	
7	Medium dense, moist to wet, gray to reddish brown with iron oxidation, medium to coarse sandy, fine to coarse GRAVEL, trace cobbles; stratified (GW).
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. Moderate to severe caving 4.5 to 10 feet. Water table at 9 feet.
12	
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Maple Valley Asphalt
Renton, WA

Logged by: KB
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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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

Fill

1 — Medium dense, moist, dark brown to brownish gray, silty, gravelly, fine to coarse SAND (SM).

2 — Charcoal brown fill material with wood fragments and gravel.

3

4

5

6

7

8

Younger Alluvium

9 — Medium dense, wet, brownish gray, medium to coarse sandy, fine to coarse GRAVEL, trace fine sand; stratified (GW).

10

Bottom of exploration pit at depth 10 feet
11 — Moderate seepage 7 to 9. Moderate to severe caving 2 to 10 feet. Water table at 9 feet.

12

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KCTP3 170017.GPJ February 5, 2018

Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

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

Fill

1 Medium dense, moist, light brown to brownish gray, silty, gravelly, fine to coarse SAND (SM).

2

3

Younger Alluvium

4 Medium dense, moist to wet, brownish gray, fine to coarse sandy, fine to coarse GRAVEL, trace cobbles; stratified (GW).

5

6

7

8

9

10 Bottom of exploration pit at depth 9 feet
No seepage. Severe caving 0 to 9 feet. Water table at 8 feet.

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Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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**
	Fill
1	Fill material consisting of gravel, cobbles, sticks and wood fragments, fabric, and other debris.
2	
3	Fill material consisting of light tan coarse sand, light brown silty sand, charcoal brown material with abundant root fragments, and organic odor - possible hydrocarbon.
4	
5	**Younger Alluvium**
6	Medium dense, moist, gray, fine to medium SAND; stratified interbeds of silty fine sand, organic odor - possible hydrocarbon (SP).
7	
8	Medium dense, moist to wet, gray, fine to medium sandy, fine to coarse GRAVEL, trace cobbles; stratified, organic odor - possible hydrocarbon (GW).
9	
10	
11	
12	
13	
14	Bottom of exploration pit at depth 13 feet Heavy seepage at 1 foot, moderate seepage 5 to 6 feet. Moderate caving 0 to 5 feet, severe caving 5 to 13 feet. Water table at 11 feet.
15	
16	
17	
18	
19	
20	

Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

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

Fill

1 — 2 — 3 — 4 — 5 — 6 — 7

Medium dense, moist, dark brown, silty, gravelly, fine to coarse SAND; abundant roots and wood debris, trace plastic fragments, organic odor - possible hydrocarbon (SM).

Younger Alluvium

8 — 9 — 10 — 11 — 12 — 13

Medium dense, moist, gray, fine to medium SAND, trace coarse sand, trace fine gravel; stratified, organic odor - possible hydrocarbon (SP).

Medium dense, moist to wet, gray, fine to medium sandy, fine to coarse GRAVEL, trace cobbles; stratified, organic odor - possible hydrocarbon (GW).

14 — 15 — 16 — 17 — 18 — 19 — 20

Bottom of exploration pit at depth 13.5 feet
Heavy seepage at southeast corner of pit at 1 foot. No caving. Water table at 13.5 feet.

Maple Valley Asphalt
Renton, WA

Logged by: KB
Approved by: CJK

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Project No. 170017H001

1/18/18

KCTP3 170017.GPJ February 5, 2018

LOG OF EXPLORATION PIT NO. EP-12

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, very moist to wet, dark brown, gravelly, silty, fine to coarse SAND; abundant wood and organics (SM).

Younger Alluvium

2 Medium dense, moist to very moist, dark brownish gray, fine to coarse sandy to very sandy, fine to coarse GRAVEL, trace silt; scattered cobbles; stratified (GW).

3

4

5

6

7

8 Medium dense, wet, dark brownish gray, medium to coarse sandy, GRAVEL, trace fine sand, trace silt; abundant cobbles; stratified; organic odor; fines content may be understated due to washing (GW).

9

10 Medium dense, wet, dark gray, gravelly, fine to coarse SAND, trace silt; stratified; fines content may be understated due to washing (SW).

11 Bottom of exploration pit at depth 10 feet
No seepage. Heavy caving 1 to 10 feet. Groundwater encountered at 8 feet.

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Maple Valley Asphalt
Maple Valley, WA

Logged by: MJP
Approved by: CJK

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Project No. 170017H001

4/24/18

KCTP3 170017.GPJ April 30, 2018

LOG OF 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

Fill

1 Loose, very moist to wet, dark brown, gravelly, silty, fine to coarse, SAND; abundant wood and organics (SM).

Younger Alluvium

2 Medium dense, moist to very moist, dark brownish gray, fine to coarse sandy, fine to coarse GRAVEL and gravelly, fine to medium SAND, some coarse sand, trace silt; scattered cobbles; stratified (GW).

3

4 Medium dense, very moist, dark brownish gray, medium to coarse very sandy, fine to coarse GRAVEL, trace fine sand, trace silt; scattered cobbles; stratified (GW).

5

6

7

8 Medium dense, wet, dark brownish gray, medium to coarse sandy, GRAVEL, trace fine sand, trace silt; abundant cobbles; organic odor; fines content may be understated due to washing (GW).

9

10

11

12 Bottom of exploration pit at depth 11 feet
No seepage. Heavy caving 1 to 11 feet. Groundwater encountered at 8 feet.

13

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Maple Valley Asphalt
Maple Valley, WA

Logged by: MJP
Approved by: CJK

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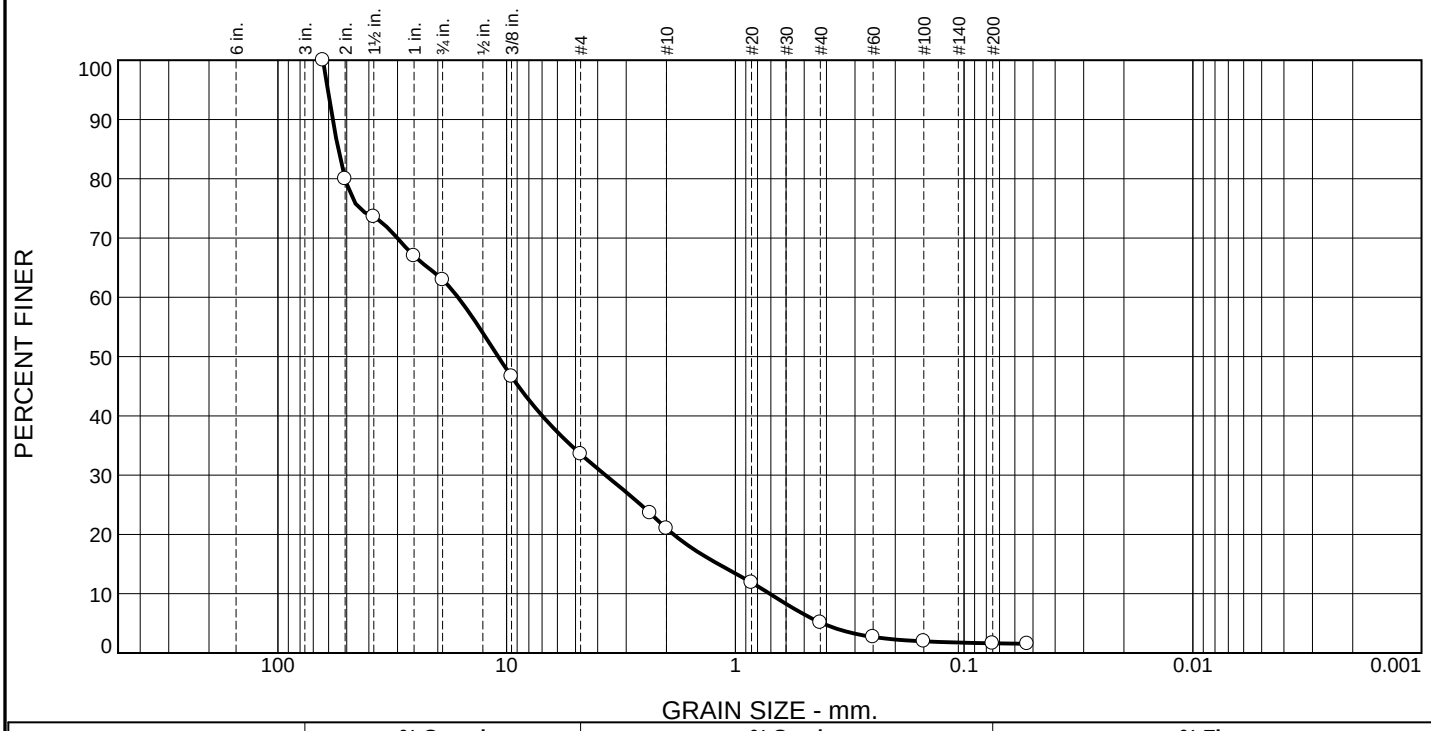
Project No. 170017H001

4/24/18

KCTP3 170017.GPJ April 30, 2018

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	37.0	29.4	12.6	15.9	3.5	1.6	

TEST RESULTS (ASTM D 422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5	100.0		
2	80.0		
1.5	73.6		
1	67.0		
.75	63.0		
.375	46.6		
#4	33.6		
#8	23.6		
#10	21.0		
#20	11.9		
#40	5.1		
#60	2.7		
#100	2.0		
#200	1.6		
#270	1.5		

* (no specification provided)

Material Description

very sandy, GRAVEL, trace silt

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 57.5894 D_{85}= 54.4900 D_{60}= 16.3051
D_{50}= 10.8953 D_{30}= 3.6978 D_{15}= 1.1872
D_{10}= 0.7076 C_u= 23.04 C_c= 1.19

Remarks

Collected by: MJP

Date Received: 04/25/2018 **Date Tested:** 04/27/2018

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: IT-1 **Depth:** 4'

Date Sampled: 04/24/2018

associated earth sciences incorporated

Client: Lakeside
Project: Maple Valley Asphalt

Project No: 170017 H001 **Figure**

Project Name	Maple Valley Asphalt	**Initial Pit Area (ft^2)**	3.4
Project Number	170017H001	**Test Depth (ft)**	4
Date	4/24/2018	**Receptor Soils**	Alluvium
Weather	70s Sunny	**Testing Performed By**	Matthew Porter
Test No.	IT-1		
Meter	3-50 (FM-4)		
Water Source	Water truck (4,000 gal)		

CONSTANT HEAD DATA

Time (24-hr)	Incremental (min)	Total (min)	Flow Rate (gpm)	Stage (ft)	Totalizer (gal)	Incremental Infiltration Rate (in/hr)	Notes
8:54	0	0	22	0.00	0		
8:55	0	0	23.75	0.00	10.1	672.29	
8:57	2	2	24.69	0.00	58	698.90	
9:02	5	7	28.78	0.00	201	814.68	
9:09	7	15	28.42	0.00	401	804.49	
9:24	15	30	28.18	0.00	825	797.69	
9:36	12	41	27.67	0.00	1158	783.25	
9:46	10	52	27.59	0.00	1435	780.99	
9:57	11	62	27.52	0.00	1738.00	779.01	
10:08	11	74	27.33	0.00	2040.00	773.63	
10:20	12	86	27.24	0.00	2367.00	771.08	
10:28	8	94	27.05	0.00	2584.00	765.70	
10:31	3	97	26.95	0.00	2664.00	762.87	
10:37	6	103	0	0.00	2702.00	0.00	
11:13	36	139	0	0.00	0.00	0.00	
11:14	1	140	26.7	0.00	0.00	755.80	
11:16	2	142	28.3	0.00	54.00	801.09	
11:21	5	147	28.24	0.00	194.50	799.39	
11:32	11	158	28.04	0.00	504.50	793.73	
11:39	7	165	27.93	0.00	700.00	790.61	
11:48	9	174	27.85	0.00	952.00	788.35	
11:56	8	182	27.72	0.00	1174.00	784.67	
12:07	11	193	27.6	0.00	1478.00	781.27	
12:23	16	209	27.34	0.00	1918.00	773.91	
12:38	15	224	27.23	0.00	2328.00	770.80	
12:50	12	236	27.08	0.00	2654.00	766.55	
12:58	8	244	27.97	0.00	2870.00	791.75	
13:09	11	255	26.88	0.00	3166.00	760.89	
13:17	8	263	26.72	0.00	3380.00	756.36	
13:21	4	267	26.7	0.00	3489.00	755.80	
					Averag Infiltration Rate During Last Hour of Inflow:	765.63	

FALLING HEAD DATA

Time (24-hr)	Incremental (min)	Total (min)	Falling Head Stage (ft)	Incremental Infiltration Rate (in/hr)	Notes
13:21	0.0	0.0	0		No head accumulated
			Falling Head Infiltration Rate:	NA	

APPENDIX B

Farallon Monitoring Well Logs, Hydrograph and Groundwater Contour Map

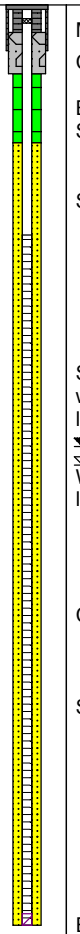
Log of Boring: MW-1

Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington
Farallon PN: 525-022
Logged By: Ken Scott

Date/Time Started: 4/25/16 @ 0930
Date/Time Completed: 4/25/16 @ 1030
Equipment: Terra Sonic
Drilling Company: Holt Drilling
Drilling Foreman: Pete Rosenberg
Drilling Method: Sonic

Sampler Type: 2.5' Poly-sacs
Drive Hammer (lbs.): Autohammer
Depth of Water ATD (ft bgs): ~10.0'
Total Boring Depth (ft bgs): 20.0'
Total Well Depth (ft bgs): 20.0'

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed
0	0.0-1.0': Silty SAND with gravel Fill (60% sand, 20% silt, 20% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen.	SM					
	1.0-7.5': Silty SAND Fill (70% sand, 25% silt, 5% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen.	SM	100	NA	0.0	MW1-5.0 @ 940	X
5							
10	7.5-12.2': Well-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist to wet @ ~10-feet bgs, no odor, no sheen. Subrounded gray gravel, some 3-inch subrounded gray cobbles.	GW	100	NA	0.0	MW1-10.0 @ 955	X
	12.2-19.0': Silty SAND (80% sand, 20% silt), fine to medium sand, brown, wet, no odor, no sheen. Loose consistency, orange colored ferric-banding.	SM	100	NA	0.1	MW1-15.0 @ 1005	X
15							
20	19.0-19.8': SILT with sand (80% silt, 15% sand, 5% gravel), fine to medium sand, fine to coarse gravel, tan, wet, no odor, no sheen. Rounded black gravel.	ML	100	NA	0.0	MW1-20.0 @ 1015	
	19.8-20.0': Poorly graded SAND (90% sand, 5% silt, 5% gravel), fine to medium sand, fine to coarse gravel, tan, wet, no odor, no sheen. Rounded black gravel.	SP					



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 5 to 20'

Filter Pack: 10/20 sand
Surface Seal: Cement
Annular Seal: Bentonite
Boring Abandonment: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Surveyed Location: **X:** 1329373.32 E
Y: 170563.21 N

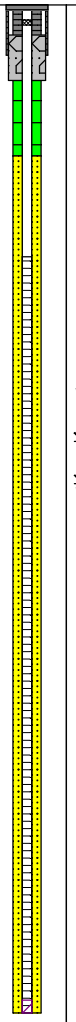
Log of Boring: MW-2

Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington
Farallon PN: 525-022
Logged By: Ken Scott

Date/Time Started: 4/25/16 @ 1135
Date/Time Completed: 4/25/16 @ 1245
Equipment: Terra Sonic
Drilling Company: Holt Drilling
Drilling Foreman: Pete Rosenberg
Drilling Method: Sonic

Sampler Type: 2.5' Poly-sacs
Drive Hammer (lbs.): Autohammer
Depth of Water ATD (ft bgs): ~9.5'
Total Boring Depth (ft bgs): 20.0'
Total Well Depth (ft bgs): 20.0'

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed
0	0.0-1.5': Sandy SILT with gravel Fill (55% silt, 30% sand, 15% gravel), fine sand, fine to coarse gravel, brown, moist, no odor, no sheen.	ML					
	1.5-2.5': Silty SAND Fill (70% sand, 25% silt, 5% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen.	SM					
	2.5-13.0': Well-graded GRAVEL with sand (55% gravel, 40% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist to wet @ ~9.5-feet bgs, no odor, no sheen. Subrounded gray gravel, some 3 to 4-inch subrounded gray cobbles.	GW	100	NA	0.1	MW2-5.0 @ 1145	X
10			100	NA	0.1	MW2-10.0 @ 1200	X
	13.0-14.2': Silty SAND (80% sand, 15% silt, 5% gravel), fine to medium sand, fine to coarse gravel, tan, wet, no odor, no sheen.	SM					
15	14.2-17.5': Silty SAND (80% sand, 20% silt), fine sand, dark gray, wet, no odor, no sheen.	SM	100	NA	0.0	MW2-15.0 @ 1215	X
	17.5-20.0': Silty SAND (85% sand, 15% silt), fine sand, dark gray, wet, no odor, no sheen.	SM					
20			100	NA	0.1	MW2-20.0 @ 1230	



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 5 to 20'

Filter Pack: 10/20 sand
Surface Seal: Cement
Annular Seal: Bentonite
Boring Abandonment: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Surveyed Location: **X:** 1329301.96 E
Y: 170535.83 N

Log of Boring: MW-3

Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington
Farallon PN: 525-022
Logged By: Ken Scott

Date/Time Started: 4/25/16 @ 1340
Date/Time Completed: 4/25/16 @ 1445
Equipment: Terra Sonic
Drilling Company: Holt Drilling
Drilling Foreman: Pete Rosenberg
Drilling Method: Sonic

Sampler Type: 2.5' Poly-sacs
Drive Hammer (lbs.): Autohammer
Depth of Water ATD (ft bgs): ~10.5'
Total Boring Depth (ft bgs): 20.0'
Total Well Depth (ft bgs): 20.0'

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0.0-2.5': Silty SAND with gravel Fill (60% sand, 20% silt, 20% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen.	SM							Monument
		2.5-10.5': Well-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, slight petroleum-like odor, no sheen. Subrounded green, gray, and black gravel, rounded 3 to 5-inch green, and gray cobbles.	GW							Concrete Bentonite Seal Sand
5					100	NA	0.1	MW3-5.0 @ 1350	X	Stabilized water level
10					100	NA	0.1	MW3-10.0 @ 1400	X	Water level
		10.5-20.0': Silty SAND (80% sand, 15% silt, 5% gravel), fine to medium sand, fine to coarse gravel, dark gray, wet, no odor, no sheen. Mostly fine sand (~90%), subrounded 3 to 5-inch gray cobbles between 18 to 20-feet bgs.	SM							Casing
15					100	NA	0.0	MW3-15.0 @ 1415	X	Screen
20					100	NA	0.1	MW3-20.0 @ 1430		End cap

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 5 to 20'

Filter Pack: 10/20 sand
Surface Seal: Cement
Annular Seal: Bentonite
Boring Abandonment: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Surveyed Location: **X:** 1328945.56 E
Y: 170614.99 N

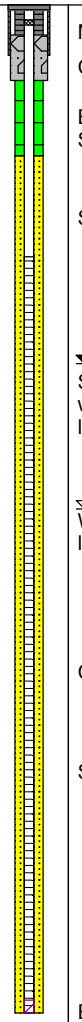
Log of Boring: MW-4

Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington
Farallon PN: 525-022
Logged By: Ken Scott

Date/Time Started: 4/25/16 @ 1515
Date/Time Completed: 4/25/16 @ 1615
Equipment: Terra Sonic
Drilling Company: Holt Drilling
Drilling Foreman: Pete Rosenberg
Drilling Method: Sonic

Sampler Type: 2.5' Poly-sacs
Drive Hammer (lbs.): Autohammer
Depth of Water ATD (ft bgs): ~9.5'
Total Boring Depth (ft bgs): 20.0'
Total Well Depth (ft bgs): 20.0'

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed
0	0.0-2.5': Silty SAND with gravel Fill (60% sand, 25% silt, 15% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen.	SM					
	2.5-4.1': Sandy SILT with gravel (50% silt, 35% sand, 15% gravel), fine to medium sand, fine to coarse gravel, dark brown, moist, no odor, no sheen.	ML					
5	4.1-4.6': SILT (100% silt), dark gray, moist, no odor, no sheen.	ML					
	4.6-9.5': Well-graded GRAVEL with sand (55% gravel, 40% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, no sheen. Subrounded gray gravel, and 3 to 4-inch subrounded gray cobbles.	GW	100	NA	0.0	MW4-5.0 @ 1525	X
10	9.5-13.5': Silty SAND with gravel (50% sand, 20% silt, 30% gravel), fine to coarse sand, fine to coarse gravel, brown, wet, no odor, no sheen.	SM	100	NA	0.0	MW4-10.0 @ 1535	X
15	13.5-17.5': Well-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), coarse gravel, fine to coarse sand, brown, wet, no odor, no sheen. Subrounded gray gravel, and 3 to 4-inch subrounded gray cobbles between 15 and 17-feet bgs.	GW	100	NA	0.1	MW4-15.0 @ 1545	
	17.5-20.0': Silty SAND (80% sand, 20% silt), fine sand, dark gray, wet, no odor, no sheen.	SM					
20			100	NA	0.0	MW4-20.0 @ 1600	



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 5 to 20'

Filter Pack: 10/20 sand
Surface Seal: Cement
Annular Seal: Bentonite
Boring Abandonment: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Surveyed Location: **X:** 1328916.58 E
Y: 170968.26 N

Log of Boring: MW-5

Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington
Farallon PN: 525-022
Logged By: Ken Scott

Date/Time Started: 4/26/16 @ 830
Date/Time Completed: 4/26/16 @ 930
Equipment: Terra Sonic
Drilling Company: Holt Drilling
Drilling Foreman: Pete Rosenberg
Drilling Method: Sonic

Sampler Type: 2.5' Poly-sacs
Drive Hammer (lbs.): Autohammer
Depth of Water ATD (ft bgs): ~9.0'
Total Boring Depth (ft bgs): 20.0'
Total Well Depth (ft bgs): 20.0'

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0.0-3.6': Silty SAND with gravel Fill (60% sand, 25% silt, 15% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen. Subrounded gray gravel.	SM							Monument; Concrete; Bentonite Seal
		3.6-11.5': Well-graded GRAVEL with sand (55% gravel, 40% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist to wet @ ~9.0-feet bgs, no odor, no sheen. Subrounded gray gravel.	GW							Sand
5					100	NA	0.2	MW5-5.0 @ 840	X	
										Stabilized water level; Water level
10					100	NA	0.2	MW5-10.0 @ 850	X	
		11.5-14.5': Well-graded GRAVEL (90% gravel, 5% sand, 5% silt), fine to coarse gravel, fine to coarse sand, tan, wet, no odor, no sheen. Subrounded gray gravel, and 3 to 5-inch subrounded gray cobbles.	GW							Casing
15		14.5-15.5': Well-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor, no sheen. Subrounded gray gravel, and subrounded 3 to 4-inch gray cobbles.	GW		100	NA	0.2	MW5-15.0 @ 905		Screen
		15.5-20.0': Silty SAND (75% sand, 25% silt), fine to medium sand, brown, wet, no odor, no sheen. Loose consistency.	SM							
20					100	NA	0.1	MW5-20.0 @ 920		End cap

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 5 to 20'

Filter Pack: 10/20 sand
Surface Seal: Cement
Annular Seal: Bentonite
Boring Abandonment: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Surveyed Location: **X:** 1329303.03 E
Y: 170916.06 N

FARALLON CONSULTING

Log of Boring: MW-6

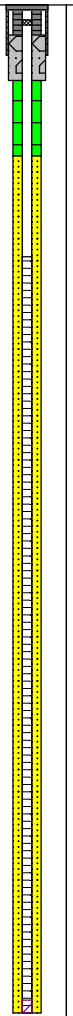
Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington

Farallon PN: 525-022

Logged By: Ken Scott

Date/Time Started:	4/26/16 @ 950	**Sampler Type:**	2.5' Poly-sacs
Date/Time Completed:	4/26/16 @ 1050	**Drive Hammer (lbs.):**	Autohammer
Equipment:	Terra Sonic	**Depth of Water ATD (ft bgs):**	~10.0'
Drilling Company:	Holt Drilling	**Total Boring Depth (ft bgs):**	20.0'
Drilling Foreman:	Pete Rosenberg	**Total Well Depth (ft bgs):**	20.0'
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed
0		0.0-1.6': Silty SAND with gravel Fill (60% sand, 20% silt, 20% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen. Subrounded gray gravel.	SM					
		1.6-2.4': Sandy SILT (60% silt, 35% sand, 5% gravel), fine to medium sand, fine gravel, brown, moist, no odor, no sheen.	ML					
		2.4-8.5': Silty SAND (70% sand, 25% silt, 5% gravel), fine to medium sand, fine to coarse gravel, reddish brown, moist, no odor, no sheen.	SM	100	NA	0.1	MW6-5.0 @ 1000	X
5								
		8.5-10.5': Well-graded SAND (90% sand, 5% silt, 5% gravel), fine to coarse sand, fine to coarse gravel, reddish brown, moist to wet @ ~10-feet bgs, no odor, no sheen. Subrounded gray gravel.	SW	100	NA	0.1	MW6-10.0 @ 1015	X
10		10.5-20.0': Well-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, greenish gray, wet, no odor, no sheen. Subrounded green, gray gravel, and subrounded 3 to 4-inch green, and gray cobbles.	GW					
15				100	NA	0.0	MW6-15.0 @ 1025	
20				100	NA	0.1	MW6-20.0 @ 1035	



Well Construction Information

Monument Type:	Flush Mount	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	2	**Surface Seal:**	Cement	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	**X:** 1329078.79 E
Screened Interval (ft bgs):	5 to 20'	**Boring Abandonment:**	NA		**Y:** 170643.93 N

FARALLON CONSULTING

Log of Boring: MW-7

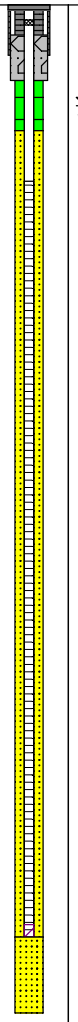
Client: Lakeside Industries
Project: Goodnight Property
Location: Renton, Washington

Farallon PN: 525-022

Logged By: Ken Scott

Date/Time Started:	4/26/16 @ 1135	**Sampler Type:**	2.5' Poly-sacs
Date/Time Completed:	4/26/16 @ 1315	**Drive Hammer (lbs.):**	Autohammer
Equipment:	Terra Sonic	**Depth of Water ATD (ft bgs):**	~2.0'
Drilling Company:	Holt Drilling	**Total Boring Depth (ft bgs):**	20.0'
Drilling Foreman:	Pete Rosenberg	**Total Well Depth (ft bgs):**	18.5'
Drilling Method:	Sonic		

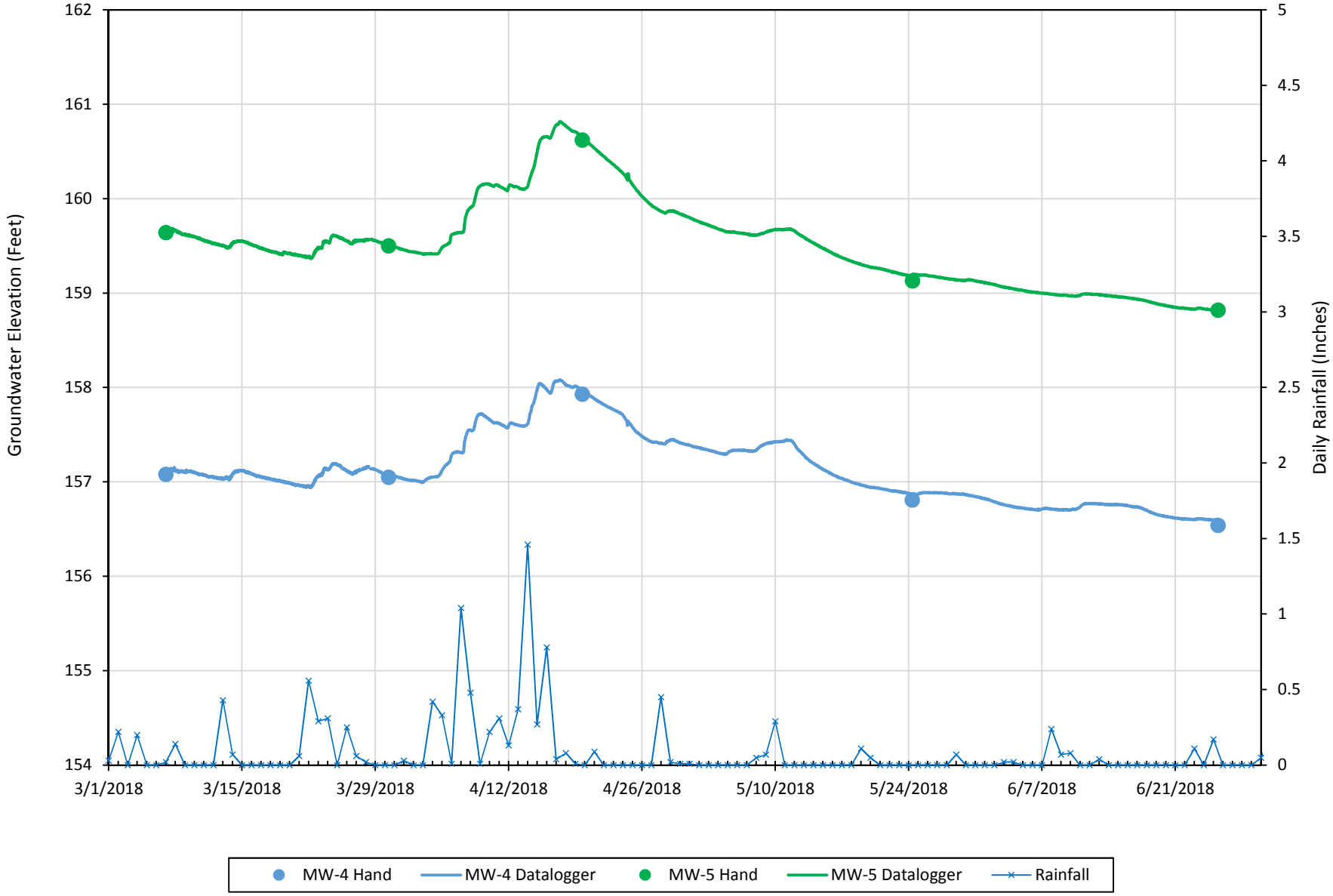
Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed
0	0.0-1.5': Silty SAND with gravel Fill (60% sand, 20% silt, 20% gravel), fine to medium sand, fine to coarse gravel, brown, moist, no odor, no sheen. Subrounded to subangular gray gravel.	SM					
	1.5-6.5': Well-graded SAND Fill (85% sand, 10% silt, 5% gravel), fine to coarse sand, fine to coarse gravel, brown, moist to wet @ ~2-feet bgs, no odor, no sheen.	SW	100	NA	0.0	MW7-5.0 @ 1145	X
5							
	6.5-12.5': Well-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, reddish brown, wet, no odor, no sheen. Subrounded tan, green, gray gravel, and subrounded 3 to 4-inch tan, green, and gray cobbles. Observed red brick debris~7-feet bgs.	GW	100	NA	0.0	MW7-10.0 @ 1155	X
10							
	12.5-14.6': Well-graded GRAVEL with sand (65% gravel, 30% sand, 5% silt), fine to coarse gravel, fine to coarse sand, reddish brown, wet, no odor, no sheen. Subrounded black, green, gray gravel, and subrounded 3 to 5-inch black, green, and gray cobbles.	GW					
15	14.6-20.0': Silty SAND (80% sand, 15% silt, 5% gravel), fine to medium sand, fine gravel, dark gray, wet, no odor, no sheen.	SM	100	NA	0.0	MW7-15.0 @ 1205	
			100	NA	0.1	MW7-20.0 @ 1215	
20							

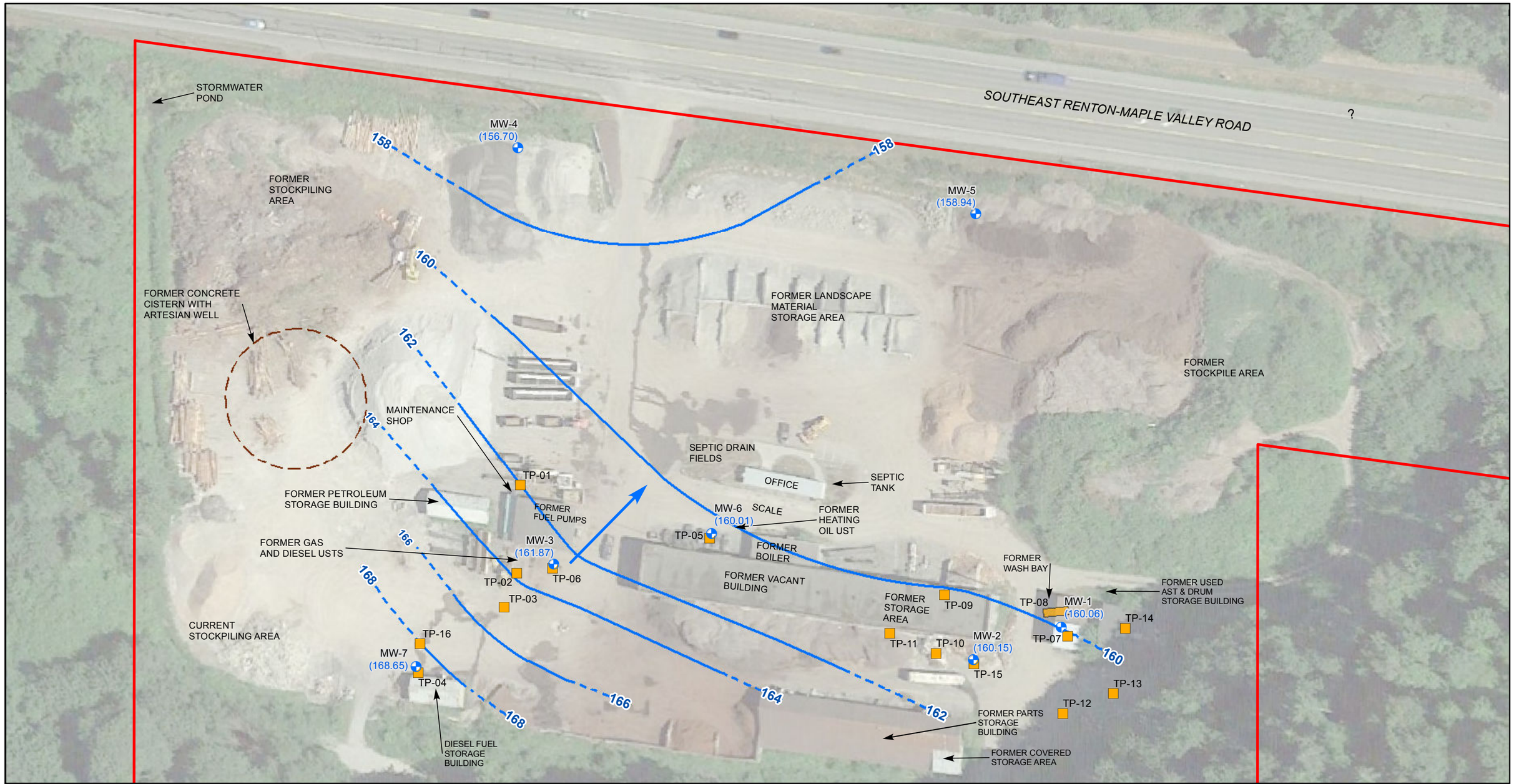


Well Construction Information

Monument Type:	Flush Mount	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	2	**Surface Seal:**	Cement	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	**X:** 1328829.46 E
Screened Interval (ft bgs):	2.5 to 18.5'	**Boring Abandonment:**	NA		**Y:** 170532.13 N

Appendix B: Groundwater Hydrograph MW-4 and MW-5
Maple Valley Asphalt Plant





LEGEND

- MW-7 — MONITORING WELL
- TP-01 — TEST PIT LOCATION
- SITE BOUNDARY
- 168 — GROUNDWATER SURFACE ELEVATION CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- (160.01) GROUNDWATER LEVEL ELEVATION

KING COUNTY PARCEL: 1923069026
SOURCE AERIAL: GOOGLE EARTH IMAGERY (JULY 2014)

NOTES:
ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER

AST = ABOVEGROUND STORAGE TANK
UST = UNDERGROUND STORAGE TANK
BOLD = ANALYTICAL RESULT REPORTED ABOVE THE CLEANUP LEVEL
< = DENOTES RESULT IS LESS THAN LABORATORY PRACTICAL QUANTITATION OR ANALYTE NOT DETECTED AT OR ABOVE THE REPORTING LIMIT

THE SITE SLOPES NORTH
ALL LOCATIONS ARE APPROXIMATE

N

0 80
SCALE IN FEET

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Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Bend | Baker City
California
Oakland | Sacramento | Irvine

FIGURE 3

GROUNDWATER CONTOURS
LAKESIDE INDUSTRIES
18825 SOUTHEAST RENTON-MAPLE VALLEY ROAD
RENTON, WASHINGTON

FARALLON PN: 525-022

Drawn By: tperrin | Checked By: HC | Date: 6/22/2016 | Disc Reference:
Document Path: G:\Projects\525 Lakeside Ind\525022 18825 Southeast Renton-Maple Valley Road\GIS\Figure 3_GW_CNT_NoUtil.mxd

APPENDIX C

AESI Groundwater Mounding Analysis Data and Input Data from Civil Engineer

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : LIMV - Peak Flow
HYDROGRAPH RUNOFF DATA USED
UNSATURATED ANALYSIS INCLUDED

Pond Bottom Area	6,490.64 ft²
Pond Volume between Bottom & DHWL	14,803.74 ft³
Pond Length to Width Ratio (L/W)	4.16
Elevation of Effective Aquifer Base	143.50 ft
Elevation of Seasonal High Groundwater Table	161.90 ft
Elevation of Starting Water Level	164.90 ft
Elevation of Pond Bottom	164.90 ft
Design High Water Level Elevation	168.73 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.25
Unsaturated Vertical Hydraulic Conductivity	26.67 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	120.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.25
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	0.60
Time Increment During Storm Event	24.00 hrs
Time Increment After Storm Event	24.00 hrs
Total Number of Increments After Storm Event	6.00

Runoff Hydrograph File Name: LIMV Peak Flow.hyd

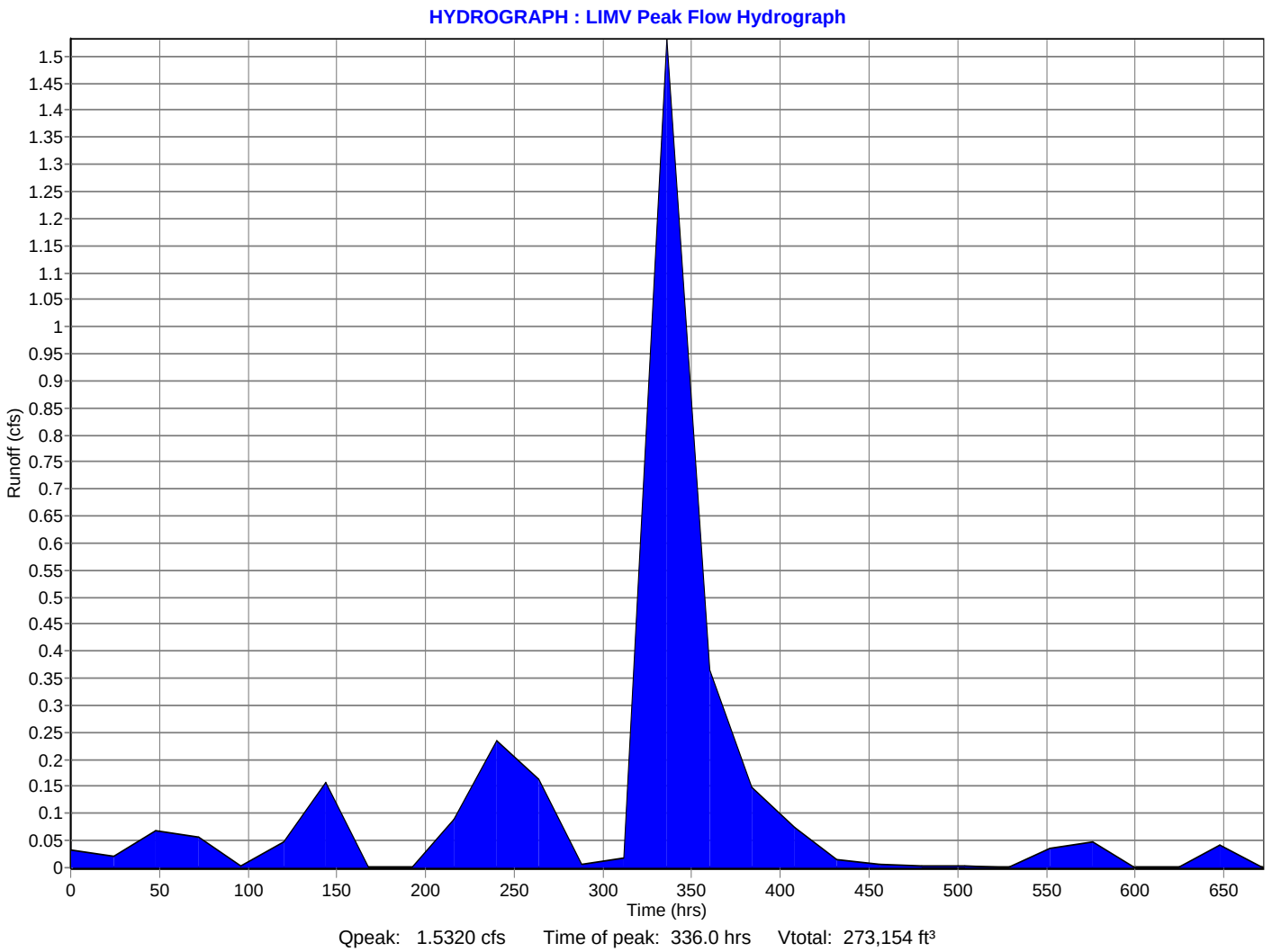
Time of Peak Runoff: 336.00 hrs

Rate of Peak Runoff: 1.53 cfs

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

Analysis Date: 9/17/2018



Qpeak: 1.5320 cfs Time of peak: 336.0 hrs Vtotal: 273,154 ft³

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Peak Flow

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
00.00 - 0.00	161.900	0.000 *		
			0.00000	
0.00	161.900	0.09932		
			0.07529	
72.00	164.900	0.05127		0.00
			0.04326	
96.00	164.900	0.03675		0.00
			0.03024	
120.00	164.900	0.05840		0.00
			0.08656	
144.00	164.900	0.08195		0.00
			0.07735	
168.00	164.900	0.04699		0.00
			0.01663	
192.00	164.900	0.02880		0.00
			0.04098	
216.00	164.900	0.08754		0.00
			0.13410	
240.00	164.900	0.15620		0.00
			0.17830	
264.00	164.900	0.13845		0.00
			0.09859	
288.00	164.900	0.06560		0.00
			0.03262	
312.00	164.900	0.32480		0.00
			0.61698	
336.00	166.409	0.73197		0.00
			0.84696	
360.00	168.679	0.59451		0.00

Analysis Date: 9/17/2018

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Peak Flow

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
			0.34206	
384.00	166.778	0.25543		0.00
			0.16880	
408.00	165.508	0.12658		0.00
			0.08436	
424.59	164.900	0.06162		0.00
			0.03887	
456.00	164.005	0.03084		0.00
			0.02282	
480.00	163.618	0.01884		0.00
			0.01486	
504.00	163.353	0.01252		0.00
			0.01018	
528.00	163.159	0.01561		0.00
			0.02103	
552.00	163.102	0.03042		0.00
			0.03980	
576.00	163.151	0.03434		0.00
			0.02888	
600.00	163.054	0.01907		0.00
			0.00927	
624.00	162.869	0.01544		0.00
			0.02160	
648.00	162.866	0.02216		0.00
			0.02272	
672.00	162.839	0.01449		0.00
			0.00627	
696.00	162.699	0.00493		0.00

Analysis Date: 9/17/2018

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Peak Flow

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
			0.00360	
720.00	162.619	0.00309		0.00
			0.00259	
744.00	162.561	0.00232		0.00
			0.00205	
768.00	162.515	0.00192		0.00
			0.00178	
792.00	162.475	0.00164		0.00
			0.00150	
816.00	162.442			0.00

Maximum Water Elevation: 168.679 feet @ 360.00 hours Recovery @ 424.585 hours

* Time increment when there is no runoff

Maximum Infiltration Rate: 11.359 ft/day

Analysis Date: 9/17/2018

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : LIMV - Maximum Volume
HYDROGRAPH RUNOFF DATA USED
UNSATURATED ANALYSIS INCLUDED

Pond Bottom Area	6,490.64 ft²
Pond Volume between Bottom & DHWL	14,803.74 ft³
Pond Length to Width Ratio (L/W)	4.16
Elevation of Effective Aquifer Base	143.50 ft
Elevation of Seasonal High Groundwater Table	161.90 ft
Elevation of Starting Water Level	164.90 ft
Elevation of Pond Bottom	164.90 ft
Design High Water Level Elevation	168.73 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.25
Unsaturated Vertical Hydraulic Conductivity	26.67 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	120.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.25
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	0.60
Time Increment During Storm Event	24.00 hrs
Time Increment After Storm Event	24.00 hrs
Total Number of Increments After Storm Event	6.00

Runoff Hydrograph File Name: LIMV Max Volume.hyd

Time of Peak Runoff: 96.00 hrs

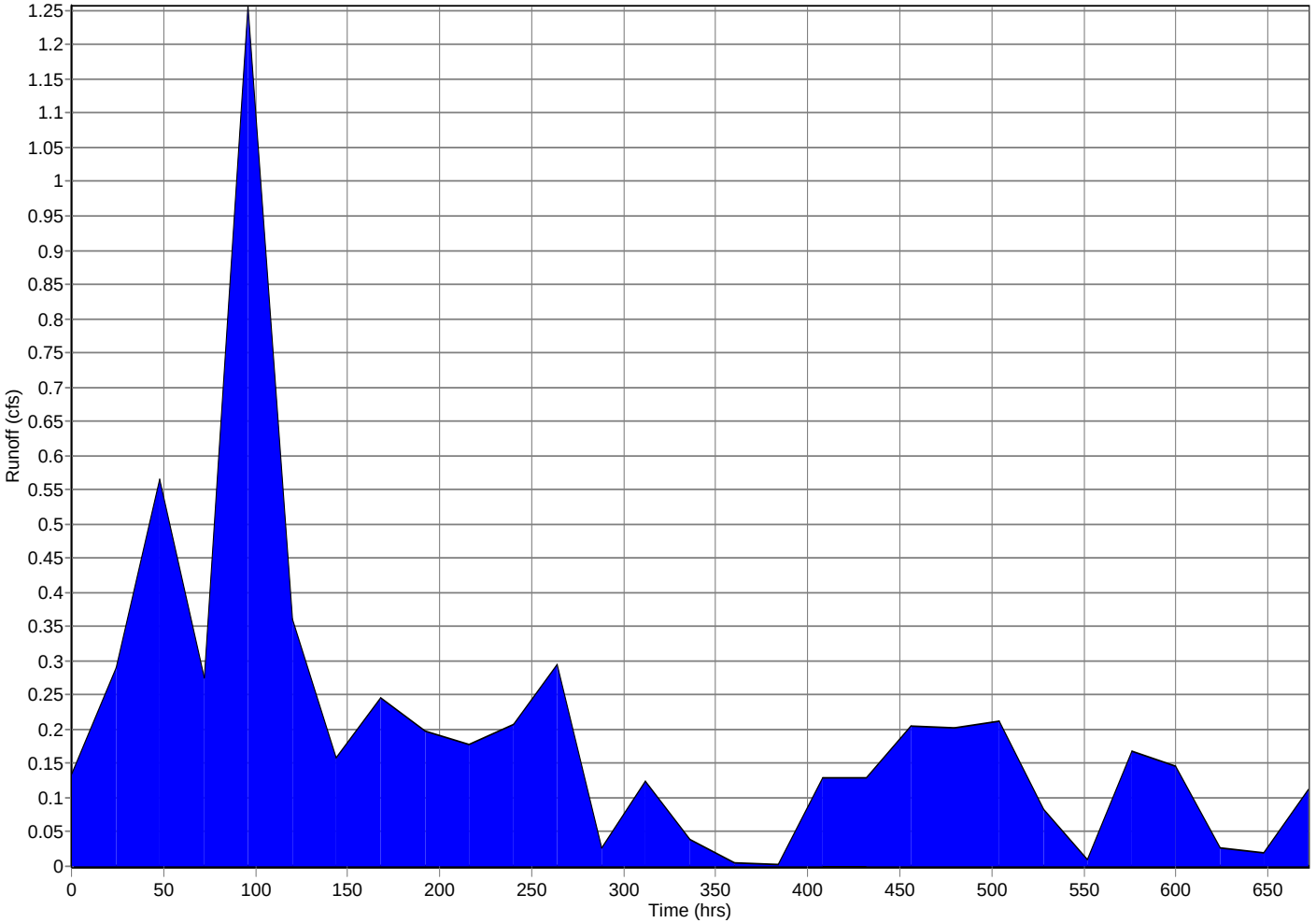
Rate of Peak Runoff: 1.26 cfs

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

Analysis Date: 9/17/2018

HYDROGRAPH : LIMV Max Volume Hydrograph



Qpeak: 1.2570 cfs Time of peak: 96.0 hrs Vtotal: 490,882 ft³

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Maximum Volume

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
00.00 - 0.00	161.900	0.000 *		
			0.00000	
0.00	161.900	0.28858		
			0.32733	
48.00	164.900	0.36607		0.00
			0.38544	
72.00	165.356	0.52918		0.00
			0.67293	
96.00	167.437	0.71381		0.00
			0.75468	
120.00	168.640	0.54585		0.00
			0.33701	
144.00	166.907	0.28827		0.00
			0.23952	
168.00	166.068	0.23663		0.00
			0.23373	
192.00	165.795	0.21796		0.00
			0.20220	
216.00	165.489	0.20037		0.00
			0.19854	
240.00	165.354	0.22008		0.00
			0.24163	
264.00	165.552	0.20943		0.00
			0.17722	
288.00	165.201	0.13929		0.00
			0.10135	
300.73	164.900	0.09720		0.00
			0.09305	
336.00	164.387	0.06794		0.00

Analysis Date: 9/17/2018

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Maximum Volume

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
			0.04284	
360.00	163.932	0.03109		0.00
			0.01934	
384.00	163.589	0.04018		0.00
			0.06103	
408.00	163.689	0.08802		0.00
			0.11502	
432.00	164.002	0.13411		0.00
			0.15320	
456.00	164.310	0.17069		0.00
			0.18819	
480.00	164.630	0.19340		0.00
			0.19862	
504.00	164.818	0.17737		0.00
			0.15613	
528.00	164.647	0.11370		0.00
			0.07127	
552.00	164.094	0.08079		0.00
			0.09030	
576.00	164.053	0.11695		0.00
			0.14360	
600.00	164.342	0.12025		0.00
			0.09690	
624.00	164.109	0.06945		0.00
			0.04200	
648.00	163.695	0.05341		0.00
			0.06483	
672.00	163.699	0.04048		0.00

Analysis Date: 9/17/2018

MODRET

SUMMARY OF RESULTS

PROJECT NAME : LIMV - Maximum Volume

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
			0.01612	
696.00	163.339	0.01225		0.00
			0.00838	
720.00	163.152	0.00698		0.00
			0.00557	
744.00	163.027	0.00486		0.00
			0.00415	
768.00	162.934	0.00373		0.00
			0.00330	
792.00	162.860	0.00303		0.00
			0.00275	
816.00	162.799			0.00

Maximum Water Elevation: 168.640 feet @ 120.00 hours Recovery @ 300.725 hours

* Time increment when there is no runoff

Maximum Infiltration Rate: 10.122 ft/day

Analysis Date: 9/17/2018

Maximum Volume Over 30-day Period				
	Day	*Volume (Ac-ft)*	*Hour*	*Average Flow (cfs)*
1	11/2/2006	0.26531	0	0.134
2	11/3/2006	0.57794	24	0.291
3	11/4/2006	1.12160	48	0.565
4	11/5/2006	0.54575	72	0.275
5	11/6/2006	2.49323	96	1.257
6	11/7/2006	0.71442	120	0.360
7	11/8/2006	0.31512	144	0.159
8	11/9/2006	0.48593	168	0.245
9	11/10/2006	0.39204	192	0.198
10	11/11/2006	0.35417	216	0.179
11	11/12/2006	0.40830	240	0.206
12	11/13/2006	0.58568	264	0.295
13	11/14/2006	0.05511	288	0.028
14	11/15/2006	0.24569	312	0.124
15	11/16/2006	0.08019	336	0.040
16	11/17/2006	0.01053	360	0.005
17	11/18/2006	0.00520	384	0.003
18	11/19/2006	0.25361	408	0.128
19	11/20/2006	0.25843	432	0.130
20	11/21/2006	0.40479	456	0.204
21	11/22/2006	0.39964	480	0.201
22	11/23/2006	0.42305	504	0.213
23	11/24/2006	0.16663	528	0.084
24	11/25/2006	0.01868	552	0.009
25	11/26/2006	0.33269	576	0.168
26	11/27/2006	0.28712	600	0.145
27	11/28/2006	0.05628	624	0.028
28	11/29/2006	0.03711	648	0.019
29	11/30/2006	0.22050	672	0.111
30	12/1/2006	0.01087	696	0.005

Maximum Flow Rate Over 30-day Period			
	Day	*Hour*	*Peak Average Flow (cfs)*
1	10/6/2003	0	0.034
2	10/7/2003	24	0.022
3	10/8/2003	48	0.067
4	10/9/2003	72	0.055
5	10/10/2003	96	0.003
6	10/11/2003	120	0.047
7	10/12/2003	144	0.158
8	10/13/2003	168	0.001
9	10/14/2003	192	0.000
10	10/15/2003	216	0.089
11	10/16/2003	240	0.236
12	10/17/2003	264	0.164
13	10/18/2003	288	0.005
14	10/19/2003	312	0.019
15	10/20/2003	336	1.532
16	10/21/2003	360	0.365
17	10/22/2003	384	0.149
18	10/23/2003	408	0.075
19	10/24/2003	432	0.015
20	10/25/2003	456	0.007
21	10/26/2003	480	0.004
22	10/27/2003	504	0.002
23	10/28/2003	528	0.001
24	10/29/2003	552	0.036
25	10/30/2003	576	0.048
26	10/31/2003	600	0.001
27	11/1/2003	624	0.001
28	11/2/2003	648	0.042
29	11/3/2003	672	0.001
30	11/4/2003	696	0.000

From: Travis Wageman
To: Curtis J. Koger; Karen Deal; Rick Tomkins; Matthew A. Miller
Cc: John Hempelmann; Bill Dempsey; Beau Willert; Sue Cook
Subject: RE: Lakeside MV Engineering support
Date: Wednesday, August 08, 2018 8:44:35 AM
Attachments: image001.png
image004.png

Curtis,

Here are the rest of the design parameters for the mounding analysis.

Pond Bottom Area: 6,490.64 sf
Pond Volume Between Bottom and DHWL: 14,803.74 cf
Length to Width Ratio: 4.16:1
Elevation of Pond Bottom: 164.90
Design High Water Elevation: 168.73
Average Effective Storage Coefficient: 0.59

Let me know if you need any more information.

Travis Wageman | Engineer, Land Development
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