APPENDIX C

Quiet Cove Data Report

Data Report

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for
Washington State Department of Ecology
on Behalf of Port of Anacortes

July 5, 2019

GeoEngineers
Earth Science + Technology

Data Report

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GeoEngineers

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Data Report

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

File No. 5147-024-07

July 5, 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Description
AET	Apparent Effects Threshold
ARI	Analytical Resources, Inc.
AST	aboveground storage tank
BETX	benzene, ethylbenzene, toluene and xylenes
bgs	below ground surface
bml	below mudline
City	City of Anacortes
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CSL	Cleanup Screening Level
Cw	groundwater concentration protective of sediment
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EDB	1,2 dibromoethane
EDC	1,2 dichloroethane
EPA	United States Environmental Protection Agency
GeoEngineers	GeoEngineers, Inc.
GPS	global positioning system
HSA	hollow-stem auger
IPG	Integrated Planning Grant
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MTCA	Model Toxics Control Act
MTBE	methyl tertiary-butyl ether
ng/kg	nanograms per kilograms
Order	Agreed Order No. DE 11346
PAHs	polycyclic aromatic hydrocarbons
Port	Port of Anacortes
ppm	parts per million

PQL	practical quantitation limit
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
RI/FS	remedial investigation/feasibility study
ROW	right-of-way
SAP	Sampling and Analysis Plan
SCO	Sediment Cleanup Objective
SCUM II	Sediment Cleanup User’s Manual II
SIM	selective ion monitoring
Site	Quiet Cove
SMS	Sediment Management Standards
SVOCs	semi-volatile organic compounds
TEQ	toxicity equivalent (refers to concentration basis)
TOC	total organic carbon
TS	total solids
TVS	total volatile solids
µg/L	micrograms per liter
µg/mg	micrograms per milligram
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1.0 INTRODUCTION

This Data Report describes sampling and analysis activities completed as part of Remedial Investigation (RI) and Supplemental Remedial Investigation (Supplemental Investigation) for the Quiet Cove Cleanup Site (Site) located in Anacortes, Washington (Figure 1). The Site refers to the area within and surrounding the Quiet Cove property that is impacted by historical contamination released to the environment. The Site is currently listed in the Washington State Department of Ecology (Ecology) database of confirmed and suspected contaminated sites under Facility/Site Number 20859 and maintains Cleanup Site ID 12482.

The RI activities were performed by the Port of Anacortes (Port) in 2017 under an Agreed Order (AO) No. DE 11346 issued by the Ecology to evaluate the nature and extent of contamination in soil, groundwater and sediment. The Supplemental Investigation activities were completed in 2018 by the Port to fill data gaps in the initial investigation and further define the nature and extent of contamination in soil and groundwater. The Port has prepared this Data Report to present the data collected to date. The data presented in this report will be used as a basis for the interim cleanup action at the Site.

In accordance with the AO, the Port is also required to prepare an RI and Feasibility Study (RI/FS) Report per Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560 addressing contamination throughout the Site. The RI/FS Report will be prepared in the future, and the data contained in this document will be used as the basis for its preparation. The RI/FS Report will define the nature and extent of contamination, establish preliminary cleanup levels, present an evaluation of potential cleanup action alternatives for addressing identified contamination and identify a preferred cleanup action alternative.

2.0 BACKGROUND

Detailed information on Site background including location, physical description, use history, and summary of previous environmental investigations are presented in the Ecology-approved RI/FS Work Plan (GeoEngineers 2017). A brief summary is included below.

2.1. Site Description and Operational History

The Site is situated along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington (Figure 1). The Site comprises three City of Anacortes (City) parcels – P55354, P55358, and P55359, totaling approximately 0.82 acres. Adjacent properties include a Port-owned storage yard (Parcel No. P55355) and a bulk fuel distribution facility owned and operated by Texaco/Reisner (Parcel No. P55357) to the west, Guemes Channel to the northwest and City streets including 2nd Street, O Avenue and 3rd Street to the north, east and south, respectively. The Site, surrounding areas and parcel boundaries are presented on Figure 2.

The Mean Higher High Water (MHHW) line of the Guemes Channel (shown on Figure 2) generally delineates the marine and upland areas of the Site. The Site is relatively flat and gently slopes to the northwest towards the Guemes Channel. The surfaces in the northern portions of the Site are generally at street level. The street level gradually climbs to the south and as a result the southern portion of the Site is approximately 5 to 6 feet below the adjacent street level. A retaining wall exists along the southern, and portions of the eastern and western perimeters of the Site to support the the elevation transition. Site topography based on a recent survey (dated 2017/2018) completed by Sound Development Group (SDG) is shown on Figure 2. The Site and surrounding areas are generally covered with buildings, concrete, gravel or asphalt. Planting strips are located on the 2nd and 3rd Street, and O Avenue Rights-Of-Way (ROWs). Currently, a combined office/warehouse building measuring approximately 100 feet long by 45 feet wide and a second warehouse building measuring approximately 50 feet long by 35 feet wide are present in the northwest portion of the Site. A chain link fence surrounds the Site limiting general public access. Vehicle and pedestrian access to the Site is through a gated entrance south of 2nd Street. The utilities known to be present within or adjacent to the Site include power, water, sewer, storm drains, telephone and gas based on SDG's survey.

The Port purchased the property comprising parts of the Site in July 2013 for the purposes of redevelopment. The Site was historically used for bulk fuel storage and auto storage as early as 1925, and included five steel oil tanks, filling shed, oil warehouse, oil staging area, and an auto shed. These structures were removed at some point, but no documentation is available on when the removal occurred. Following decommissioning of the bulk fueling facility, the Site was used for storage of various marine and auto equipment. Currently the Port leases parts of the Site to companies working in the marine fishing industry, and it is primarily used as a storage yard.

2.2. Previous Environmental Investigations

The Port performed a Focused Site Investigation in 2014 as part of an Ecology's Integrated Planning Grant (IPG) to evaluate the presence of contamination in soil and groundwater at the Site. The Focused Site Investigation was completed under an Ecology-approved Work Plan. No other environmental studies are known to have been completed at the Site prior to this investigation. The results of investigation completed in 2014 are presented in the Ecology-approved Focused Environmental Site Investigation Data Report (GeoEngineers, 2014) and summarized in Ecology-approved RI/FS Work Plan (GeoEngineers 2017). Soil and groundwater sample locations completed in 2014 as part of this investigation are shown on Figure 3. Exploration logs describing materials encountered, field screening results and sample intervals for the Focused Site Investigation are provided in Attachment 1. The findings from this investigation were reviewed for technical quality relative to the quality assurance (QA) and quality control (QC) objectives presented in the Ecology-approved RI/FS Work Plan and are considered acceptable for use in the future RI Report.

3.0 SUMMARY OF REMEDIAL INVESTIGATION FIELD ACTIVITIES

The RI activities were completed in 2017 and primarily included the following:

- Topographic survey to document existing surface conditions and utilities at the Site.
- Sampling and analysis of fill and native soil to evaluate the stratigraphy and nature and extent of contamination.
- Sampling and analysis of groundwater to evaluate water quality parameters and nature and extent of contamination.
- Sampling and analysis of surface and subsurface sediment to evaluate the stratigraphy and nature and extent of contamination.

- Tidal study and hydraulic conductivity testing to evaluate aquifer characteristics including groundwater gradient and flow direction, hydraulic connection between groundwater and adjacent marine surface water and groundwater flow velocities.

Further description of the field activities performed for the RI is presented in the following sections.

3.1. Topographic Survey, and Groundwater Seep and Curtis Wharf Visual Survey

A topographic survey completed in October 2017 by professional surveyors registered in the State of Washington at Sound Development Group (SDG) documented surface conditions and utilities at the Site and included the intertidal portions of the Site extending from the northern end of N Avenue to Curtis Wharf. A portable document format (PDF) file of the survey is presented in Attachment 2.

As requested by Ecology, a visual survey of the beach area for groundwater seeps was completed along the shoreline west of the Site. In August 2017, a visual survey was performed during low tide by GeoEngineers to investigate seeps at the apparent fill and native material contact. The results of the survey did not identify discrete seeps. The visual survey identified saturated zone of sediment at elevations between approximately 0 to 2 feet NAVD88 (elevation 0.66 to 2.66 feet mean lower low water [MLLW]) throughout the beach area, indicating a general groundwater flow towards the channel. No field evidence of contamination (e.g. petroleum sheen, staining or odor) was present. See Attachment 2 for photos collected as part of the shoreline seep visual survey.

A visual survey below Curtis Wharf was completed at low tide to confirm that any potential historical product supply lines located beneath the former pier structure were removed and capped at the bulkhead. No visual evidence of supply lines beneath the existing pier bulkhead were observed, and there was no field screening evidence of contamination (e.g. petroleum sheen, staining or odor) at the bulkhead. See Attachment 2 for visual survey photos of the bulkhead area.

3.2. Soil Investigation

Soil sampling and analysis was completed in September 2017 in general accordance with the Ecology-approved RI/FS Work Plan. Soil samples were collected using direct-push and hollow-stem auger drilling techniques. Soil boring locations for the RI are shown on Figure 3. Field data including boring coordinates, ground surface elevation, sample collection method, material descriptions encountered, field screening results and sampling intervals for the samples collected as part of the RI are presented on the boring logs provided in Attachment 1.

3.2.1. Direct-Push Borings

Direct-push (DP) borings GEI-29 through GEI-44 (16 in total) were completed in September 2017 by a Washington State licensed driller (Cascade Drilling, Inc.) using a truck mounted Geoprobe drill rig to depths ranging between 6 and 15 feet below ground surface (bgs). Continuous cores were obtained from the DP boring locations using a lined 3.5-inch-diameter and 5-foot-long sampler. The sampler was driven to this full length using a pneumatic hammer.

Soil from each core interval was visually classified in general accordance with ASTM International (ASTM) D-2488 (Standard Practice for Description and Identification of Soils [Visual Manual Procedure]) and screened in the field for the presence of contamination. In addition, the presence of wood or other debris by type and estimated quantity (i.e., observed percent by volume) were also recorded when encountered.

Field screening included visual observation of contamination (i.e., staining, discoloration, etc.), water sheen testing, and organic vapor monitoring using a photo-ionization detector (PID) as described in the Ecology-approved RI/FS Work Plan. Direct-push soil boring logs presenting this information are included in Attachment 1.

3.2.2. Hollow-Stem Auger Borings

Hollow-stem auger (HSA) borings MW-6 through MW-8 and MW-10 (5 in total) were completed in September 2017 by a Washington State licensed driller (Cascade Drilling, Inc.) using a truck mounted HSA drill rig to depths ranging between 13 and 15 feet bgs. The HSA borings were advanced for the collection of soil samples and installation of groundwater monitoring wells. Soil samples were obtained from the HSA borings using a 2.5-inch-diameter and 18-inch-long split-spoon sampler. The sampler was driven to its full length using a 140-pound hammer falling a vertical distance of approximately 30 inches. The number of blows needed to advance the sampler were recorded and are presented on the boring logs.

Soil from each sampler was visually classified and screened in the field as described in Section 3.2.1 above. HSA boring logs are presented in Attachment 1.

3.2.3. Soil Sample Collection and Analysis

After the soil samples were retrieved in cores/sampler, field personnel identified sample intervals to be collected for chemical analysis in accordance with the Ecology-approved RI/FS Work Plan. The samples for volatile organic compound (VOC) analysis were collected from the undisturbed core/sampler using Environmental Protection Agency (EPA) Method 5035A. The remainder of the soil sample interval was removed from the core/sampler for field screening and sample collection. A portion of the sample interval was used for field screening and the remaining portion was homogenized to a uniform color and texture in a stainless-steel bowl and placed into laboratory-supplied containers, lightly packed, and capped with a plastic lid.

In general, soil samples were collected from materials yielding field screening evidence of contamination and/or from materials representative of the different sampling horizons (fill, water table and native). The schedule of analysis for soil samples collected from each boring location for the Focused Environmental Investigation and the RI are identified in Table 1. Samples were submitted to an Ecology-certified laboratory – Analytical Resources Inc. (ARI) located in Tukwila, Washington. Selected samples were analyzed for a combination of the following constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc) by EPA Method 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- PAHs by EPA Method 8270D/SIM.

3.3. Groundwater Investigation

Groundwater sampling and analysis was completed in general accordance with the Ecology-approved RI/FS Work Plan. Five wells MW-6 through MW-8, MW-10 and MW-11 were constructed and developed in September 2017 as part of the RI. The groundwater investigation included two rounds of groundwater sampling and analysis completed in October 2017 and March 2018 at 10 wells MW-1 through MW-8, MW-10 and MW-11. The groundwater well locations are shown on Figure 3.

3.3.1. Monitoring Well Construction and Development

Drilling and construction of the monitoring wells was completed by Cascade Drilling, Inc., a Washington State licensed driller, in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). Monitoring well borings were drilled using a truck mounted HSA drill rig. Installation of the monitoring wells was observed by a GeoEngineers representative, who maintained a detailed log of the well construction.

Wells were constructed using a 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with a machine-slotted PVC screen (0.010-inch). The top of the well screen was positioned approximately 5 feet above the observed groundwater level at the time of drilling, or approximately 3 feet bgs, whichever was deeper. Well screened intervals ranging from 5 to 10 feet in length were positioned across the water table.

Following placement of the well screen and casing in the borehole, a filter pack was installed around the well screen from the bottom to approximately 1 to 2 feet above the top of the well screen. An approximately 1-foot thick bentonite annular seal was placed above the filter pack. Each well was completed with a an approximately 1 to 2-feet thick concrete seal that contains a flush-mount monument. Field data including sample coordinates and monitoring well construction details are presented in the exploration logs in Attachment 1.

The monitoring wells were developed in September 2017. For the well development, a decontaminated slug rod was used to create a surging effect and reduce fine sediment from caking around the installed screened intervals. The surge block was decontaminated prior to use at each well in accordance with the Ecology-approved RI/FS Work Plan. Then a low flow peristaltic pump purged a minimum of 3 well volumes of groundwater until low turbidity water was measured <25 NTU (nephelometric turbidity units). Purged water was placed in 55-gallon drums and stored at the Site.

Upon completion, a licensed surveyor (Sound Development Group) surveyed the location of each monitoring well and recorded the ground surface elevation of the well monument rim as well as top of casing elevation to the nearest 0.01 foot referencing the northern portion of the rim and casing. The survey completed by SDG is presented in Attachment 2.

3.3.2. Groundwater Sampling and Analysis

Groundwater samples from monitoring wells MW-1 through MW-8, MW-10 and MW-11 were collected for analysis and submitted to ARI located in Tukwila, Washington during two rounds of sampling (October-November 2017 and March 2018). Groundwater samples were analyzed for a combination of the following chemical constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Total and dissolved metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc) by EPA Method 200.8 and 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- cPAHs by EPA Method 8270D/SIM.

The schedule of analysis for groundwater samples collected as part of the RI is summarized in Table 2. In accordance with the Ecology-approved RI/FS Work Plan, groundwater samples were obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. Prior to sample collection, each well was purged using a peristaltic pump and disposable polyethylene tubing at a rate not to exceed draw down in the well by more than five percent or 500 millimeters per minute. A YSI Pro series water quality meter with a flow-through cell was used to monitor water quality parameters during purging including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, oxidation-reduction potential and temperature. A Hach turbidimeter was used to measure turbidity. Samples were collected from the wells after water quality parameters stabilized and varied by less than 10 percent on three consecutive measurements. Samples collected for dissolved metals analyses were filtered in the field using a disposable inline 0.45-micron filter. Samples were collected directly into laboratory provided containers in accordance with the Ecology-approved RI/FS Work Plan.

3.4. Sediment Investigation

In accordance with the Ecology-approved RI/FS Work Plan, a sediment investigation was completed in a tiered approach. Tier 1 included collection of sediment samples in conjunction with upland area soil sampling field activities. Following the analytical results of the Tier 1 sediment samples, Tier 2 sediment sampling and analysis was completed in coordination with Ecology to further investigate the nature and extent of contamination in sediment. The following sections describe both the Tier 1 and 2 sediment sampling and analysis activities:

3.4.1. Tier 1 Sediment Sampling and Analysis

The objective of the Tier 1 sediment sampling was to determine if contaminated sediment exists adjacent to the Site. If the Tier 1 sampling identified contaminated sediment, then additional characterization would be completed under a Tier 2 sediment investigation.

Tier 1 sediment sampling was completed by Cascade Drilling on September 15, 2017 using a restricted access direct push drilling rig during low tide conditions. Three sample locations SED-1A, -1B and -1C positioned in the intertidal area of the Site (Figure 3) were attempted to collect surface and subsurface samples. A surface composite grab sample was collected from SED-1A, SED-1B and SED-1C by GeoEngineers field personnel from 0 to 10 centimeters (cm) in depth. The surface composite grab sample was collected with a decontaminated stainless-steel spoon and homogenized in a decontaminated stainless-steel bowl prior to collection in laboratory provided containers.

Discrete subsurface samples were planned to be collected at the three locations (SED-1A through -1C) to depths approximately 8 to 12 feet below mudline (bml). However, refusal was encountered upon multiple attempts at SED-1A at approximately 1 to 2 feet bml due to rock and concrete and therefore, the location was abandoned and a sediment core was not completed. Sediment cores were completed at locations SED-1B and SED-1C to depths of 9 and 12 feet bml, respectively. Due to the loose nature of coarse sand and saturation of the sediment, the recovery from these core locations below approximately 5 to 6 feet bml was poor and not enough to provide the required sediment volume for the proposed sediment laboratory analyses. Ecology project managers were at the Site during the sampling and decided that subsurface sediment material from the cores in SED-1B and -1C be composited to provide sufficient sample volume for analysis. GeoEngineers and Ecology examined the sediment cores and decided to collect a total of two composite samples by combining two core intervals from SED-1B and SED-1C. These intervals were selected based on similar lithology and depths. First composite sample was collected by combining interval ranging from 1 to 3 feet bml from both location and the second composite sample was collected by combining interval ranging from 4 to 6 feet bml from both locations. The decisions for compositing these subsurface intervals was completed in the field in collaboration with Ecology personnel. Subsurface sediment samples were collected consistent with the Ecology-approved RI/FS Work Plan and as described in the soil sampling Section 3.2.3 above.

Tier 1 sediment samples were submitted for analysis to ARI located in Tukwila, Washington. Sediment samples were analyzed for a combination of the following Sediment Management Standards (SMS) constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Conventional parameters including total organic carbon (TOC), total volatile solids (TSS), total solids (TS), sulfide and ammonia.
- Grain size by PSEP 1986 or ASTM International (ASTM)-Mod.
- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc by EPA Method 200.8 and 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- SMS PAHs and semi-volatile organic hydrocarbons (SVOCs) by EPA Method 8270-SIM.

The schedule of analysis for Tier 1 sediment samples collected is summarized in Table 3. Exploration logs for the sediment cores are included in Attachment 1.

3.4.2. Tier 2 Sediment Sampling and Analysis

In accordance with the Ecology-approved RI/FS Work Plan, Tier 2 sediment sampling and analysis was triggered based on the analytical results of the Tier 1 samples. The Port and GeoEngineers developed a Quiet Cove RI Tier 2 Sampling Memorandum (GeoEngineers, 2018) to present Tier 2 sediment sampling and analysis plan utilizing the upland and Tier 1 sediment analytical results. The Quiet Cove RI Tier 2 Sampling Letter was approved by Ecology in April 2018 and is included as Attachment 3.

Tier 2 sediment sampling was completed in July 2018 with oversight by Ecology. Sediment samples were collected using both land-based and boat-mounted equipment. Land-based equipment used for sediment sampling included hand tools and rotary hammer driven core tubes. Boat-mounted equipment included power-grab and vibracore owned and operated by Gravity Environmental (Gravity). GeoEngineers personnel collected surface samples on the upper beach using hand tools and sampling using power grab, vibracore and rotary hammer methods was performed by Gravity with overisight by GeoEngineers.

Five surface sediment samples SED-5 through SED-9 were collected from 0 to 10 cm bml via beach access at low tides using stainless-steel hand trowels and placed in a stainless-steel bowl for field screening and homogenization. Four surface sediment samples SED-2 through SED-4 and SED-10 were collected from 0 to 10 cm bml by a power-grab sampler deployed from Gravity's sampling boat at higher tides These samples were also field screened and homogenized in stainless-steel bowls on the research vessel. Surface sediment samples were placed in laboratory provided jars required for analysis.

Tier 2 sediment core locations in the portions of the upper beach were not possible for the research vessel to attempt using vibracore methods due to tidal conditions. Per the contingency plan in the Quiet Cove RI Tier 2 Sampling Memorandum these cores were attempted using land-based equipment. Three subsurface core locations in the upper beach (SED-6, SED-7 and SED-9) were completed using a portable electric rotary hammer to drive a 3.5-inch-diameter Lexan core tube to depths up to 5-feet bml. The success of this coring method was variable because refusal was encountered due to debris including asphalt and concrete in portions of the beach. Upon completion of the core, the Lexan core tube was cut open, and material was field screened. Sample intervals were then selected according to the sampling plan. Samples were collected for analysis consistent with procedures in the Ecology-approved RI/FS Work Plan and described in Section 3.2.3 above. The rotary hammer sampling method in these locations did not achieve full depth to reach the native horizon for cores as proposed in the Quiet Cove RI Tier 2 Sampling Memorandum.

Six sediment core locations at lower elevations (SED-2 through SED-5, SED-8 and SED-10) were completed during high tides using vibracore methods from Gravity's research vessel during higher tidal conditions. Vibracoring was completed by using 5-inch-diameter Lexan core tube lined with a polyethlene bag. Core tubes up to 10-feet in length were equipped with a sediment catcher on the bottom to minimize sediment loss when the core was removed through the water column. The core tube was positioned on the sampling location utilizing Gravity's integrated GPS software on the research vessel and recorded by a GeoEngineers representative. Once retrieved, the core tube was transferred to an upland sample processing station for field screening and logging the sediment core. Processing the cores included first removing the polyethylene liner to view, log and field screen the core; then sample interval selection; and lastly collection of samples for analysis and archive consistent with the Ecology-approved RI/FS Work Plan and as described in Section 3.2.3 above.

Tier 2 sediment samples were submitted to ARI located in Tukwila, Washington. Sediment samples were analyzed for a combination of the following constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Conventional parameters including total organic carbon (TOC), total volatile solids (TSS), total solids (TS), sulfide and ammonia.
- Grain size by PSEP 1986 or ASTM International (ASTM)-Mod.
- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc by EPA Method 200.8 and 6000/7000 series.

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- SMS PAHs and semi-volatile organic hydrocarbons (SVOCs) by EPA Method 8270-SIM.

Following review of Tier 2 sediment sample analytical results, additional archive samples from locations SED-2 through SED-4 were submitted for analysis. These additional analyses were completed in coordination with Ecology via email exchanges in October and November 2018 with Ecology providing concurrence on the archive analysis on November 2, 2018. The schedule of analysis for Tier 2 sediment samples collected is summarized in Table 3. Exploration logs for the sediment cores are included in Attachment 1.

3.5. Hydrogeological Investigation

Hydrogeological investigation was completed in accordance with the Ecology-approved RI/FS Work Plan and included completion of a tidal study and hydraulic conductivity testing at selected monitoring well locations (Figure 4). The following sections summarize field activities completed as part of hydrogeological investigation. A more detailed description of the procedures and results of the hydrogeological investigation are provided in Attachment 4.

3.5.1. Tidal Study and Groundwater Flow

A 72-hour tidal study was completed between 8:00 am on November 7 and 8:00 am on November 9, 2017 using a subset of the Site monitoring wells to evaluate the influence of tidal variations in the level of surface water in Puget Sound/Guemes Channel on groundwater levels. Monitoring well locations adjacent to the shoreline including MW-1, MW-2, MW-3, and MW-8 and wells located at varying distances from the shoreline including MW-4, MW-5, MW-6, MW-7, MW-10, and MW-11 were selected to evaluate influence of tidal action on groundwater. The locations that were monitored as part of the tidal study are shown on Figure 4.

The tidal study recorded groundwater/potentiometric level response to tidal fluctuations using electronic water-level sensors consisting of a pressure transducer and automated datalogger temporarily installed in monitoring wells. Additionally, an electronic water-level sensor was installed in Guemes Channel to directly monitor and record the surface water level for comparison to water levels recorded in monitoring wells. The water-level sensors were removed from the monitoring locations and Guemes Channel after completion of data collection and the data was downloaded for analysis.

The data generated as part of the tidal study was analyzed using the Serfes (1991) method to identify the mean groundwater elevations and flow direction during the 72-hour tidal study, and the Ferris (1951) method to evaluate hydraulic parameters of the aquifer at the Site. The results from the tidal study are presented in Attachment 4.

Data from the 72-hour tidal study performed at monitoring well locations MW-1 through MW-8, MW-10, and MW-11 (Figure 4) in November 2017 was utilized to characterize groundwater flow characteristics and gradients at the Site. Water level elevation data was collected every 15 minutes in each monitoring well using electronic data loggers and well transducers. Electronic data measurements were confirmed by periodically obtaining manual water level measurements during the study.

3.5.2. Hydraulic Conductivity Testing

Slug testing was performed on selected monitoring locations at the Site on November 16, 2017. The purpose of the slug testing was to use the data, in combination with data gathered during the tidal study, to estimate hydraulic conductivity (*K*) within the aquifer in the vicinity of the test locations. Slug testing was performed at six locations (MW-2, MW-3, MW-4, MW-6, MW-7 and MW-11) as shown in Figure 4. Procedures for performing the slug tests and results are presented in Attachment 4.

3.6. Disposal of Investigation Derived Waste

Soil cuttings (unused soil from the explorations) from explorations completed during the RI, purge water generated during well development and groundwater sampling activities, and wash water used to decontaminate the reusable sampling equipment was placed in separate labeled and sealed 55-gallon drums pending permitted disposal. Disposable sampling equipment including gloves, sample liners, paper towels, foil, and plastic bags were disposed of as solid waste.

Upon completion of the soil and groundwater investigation, soil cuttings, purge water and decontamination water stored in drums were transferred from the property by Waste Management (WM) for permitted disposal on March 7, 2018. Six (6) 55-gallon drums of water and four (4) 55-gallon drums of soil cuttings were disposed of. See Attachment 5 for Waste Disposal records.

3.7. Quality Assurance and Quality Control

The scope of the RI field investigation and associated QA/QC procedures were defined in the Ecology-approved RI/FS Work Plan. This section includes discussion of laboratory sample handling, laboratory data quality and deviations from the Ecology-approved RI/FS Work Plan for the field activities performed.

3.7.1. Sample Handling and Shipment

Soil, groundwater and sediment samples collected during the investigation were transported to ARI, using chain-of-custody procedures described in the Ecology-approved RI/FS Work Plan. Samples were placed in laboratory-prepared containers and stored in coolers with ice following collection and during transport to the testing laboratory. Sampling and handling procedures were completed in accordance with the Ecology-approved RI/FS Work Plan.

3.7.2. Laboratory Data Quality

Laboratory data from conventional and chemical analyses underwent data quality review and validation. The laboratory data was identified to be of adequate quality for the intended use. Laboratory reports are provided in Attachment 6 and Data Validation Reports are provided in Attachment 7.

3.7.3. Deviations from the Ecology-approved RI/FS Work Plan

The following are deviations from the Ecology-approved RI/FS Work Plan:

- Drilling and soil sampling at location GEI-45 was not completed after multiple attempts because direct push explorations encountered refusal at approximately 2 feet bgs due to buried concrete debris in the subsurface.
- Installation of monitoring well MW-9 could not be completed because subsurface concrete and debris was encountered approximately 2 feet bgs at the proposed location. Multiple attempts in the vicinity of proposed MW-9 were performed without success. It is assumed that this location is underlain by a thick concrete layer adjacent to the Curtis Wharf facility. Equipment was not available on Site to core through the concrete. Ecology was on Site during the field work and concurred that this well could not be constructed as planned.
- Two monitoring wells MW-6 and MW-10 were moved from their planned location. Monitoring well MW-6 was moved approximately 20 feet to the east due to existing overhead power lines. Monitoring well MW-10 was moved approximately 25 feet to the north inside the property boundary due to conflicts with overhead utilities. Ecology was in the field during monitoring well installation activities and was in agreement with the change in location for these two wells.
- Tier 1 sediment sampling was modified in the field in collaboration with Ecology as discussed in detail in Section 3.4.1 above.
- Tier 2 sediment sampling as detailed in the Ecology-approved RI/FS Work Plan was modified as documented in Quiet Cove RI Tier 2 Sampling Memorandum that was reviewed and approved by Ecology prior to sample collection. Tier 2 Sampling was completed in accordance with the Tier 2 Sampling
- Tier 2 sediment sample locations in the upper areas of the beach (SED-5 through SED-9) were not completed to proposed depths due to refusal from subsurface rock, concrete and/or debris as described in Section 3.4.2 above. The equipment and methods available during the field activities were not sufficient to reach the proposed depths.

4.0 SUMMARY OF SUPPLEMENTAL REMEDIAL INVESTIGATION FIELD ACTIVITIES

Upon completion of the RI field activities the Port requested to complete a Supplemental Remedial Investigation (Supplemental Investigation) in the upland portion of the Site to fill identified data gaps in the Site soil and groundwater characterizatons. The RI primarily focused on defining the extent and limits of contamination, but additional information was needed for defining the nature of contaminated soil and groundwater in the most contaminated area of the Site. The Port and GeoEngineers developed a Work Plan Addendum (Work Plan Addendum; GeoEngineers 2018; Attachment 8), which presented a detailed plan for Supplemental Investigation. The Work Plan Addendum was developed in coordination with Ecology and was approved by Ecology on October 4, 2018. The Supplemental Investigation included soil borings, construction of a new monitoring well, installation of pre-pack well points, and soil and groundwater sampling and analysis. The following sections provide documentation of the Supplemental Investigation field activities.

4.1. Supplemental Investigation Soil Investigation

Soil borings were completed to further define the nature and extent of contaminated soil at the Site by sampling shallow fill, contaminated fill, water table and native soil horizons. Drilling activities were completed by Cascade Drilling, Inc. on October 17 and 18, 2018. Soil borings SD-1 through SD-10 and

MW-12 were completed to depths of 10 to 20 feet bgs using direct-push drilling methods. The objective for the supplemental soil sample collection was to collect and analyze samples at up to four (4) intervals in each core including: near surface fill, vadose zone fill with highest PID reading, water table fill and, native material. Boring locations are presented in Figure 3. Soil cores were logged and sample intervals approximately 1 to 2 ft in length were identified and collected for analysis in accordance with the Ecology-approved Work Plan Addendum using procedures consistent with the RI soil sampling activities as described in Section 3.2.3. The sample intervals collected were consistent with the intent of the Ecology-approved Work Plan Addendum. In some soil cores (SD-3, SD-4 and SD-5) the highest PID reading interval corresponded with the water table interval, and therefore only three (3) samples were collected at those boring locations.

Attachment 1 presents the boring logs and identifies the sample intervals collected. Table 4 presents samples collected from each soil boring location and the schedule of analysis.

Supplemental Investigation soil samples were submitted to ARI located in Tukwila, Washington for analysis and archival. Soil samples were analyzed for a combination of the following constituents in accordance with the Work Plan Addendum:

- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA 6000/7000;
- Gasoline-range total petroleum hydrocarbons (TPH) by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx;
- BETX by EPA 8260;
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA 8270-SIM; and/or
- Naphthalenes by EPA 8270-SIM.

4.2. Supplemental Investigation Groundwater Monitoring

The Supplemental Investigation groundwater monitoring was completed in October and November 2018 in general accordance with the Ecology-approved Work Plan Addendum and included monitoring well construction and development, pre-pack well installation, water/product level measurement and groundwater sampling and analysis. The following sections present details on the groundwater field activities for the Supplemental Investigation.

4.2.1. Monitoring Well Construction and Development

Monitoring well MW-12 was drilled and constructed on October 18, 2018 in accordance with the Ecology-approved Work Plan Addendum. Drilling and construction of the monitoring wells was conducted by a Washington State licensed driller from Cascade Drilling, Inc. in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). Monitoring well MW-12 was drilled using a truck mounted HSA drill rig. Installation of the monitoring wells was observed by a GeoEngineers representative, who maintained a detailed log of the well construction.

MW-12 was constructed using a 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with a machine-slotted PVC screen (0.010-inch). The top of the well screen was positioned approximately 3 feet above the observed groundwater level at the time of drilling. The well screen interval is 10 feet in length positioned across the water table. The well construction log is included in Attachment 1.

The monitoring well was developed on October 18, 2018. First a slug rod was used to create a surging effect and reduce fine sediment from caking around the installed screened intervals. The surge block was decontaminated prior to use at each well in accordance with the Ecology-approved RI/FS Work Plan. Then a low flow peristaltic pump purged a minimum of 3 well volumes of groundwater until low turbidity water was measured <25 NTU (nephelometric turbidity units). Purged water was deposited into 55-gallon drums that were stored at the Site.

4.2.2. Pre-Pack Well Installation

Pre-pack wells were installed at soil boring locations SD-2 and SD-8 (see Figure 3) to facilitate groundwater and/or product level measurements at these locations as further described in Section 4.2.4. These 2-inch-diameter monitoring well points were installed by Washington State licensed driller from Cascade Drilling, Inc. The pre-pack wells were installed for the purposes of measuring water and product levels and they were not developed. The pre-pack wells remain installed at the Site and may be used for future groundwater level measurements.

4.2.3. Survey

Upon completion of Supplemental Investigation field activities, a Washington State licensed surveyor (Sound Development Group) surveyed the location of each soil boring location, monitoring well and temporary pre-pack well along with the ground surface elevation of the well monument rim and the top of casing elevation to the nearest 0.01 foot referencing the northern portion of the rim and casing for monitoring wells and pre-pack wells. A copy of the survey completed by Sound Development Group is presented in Attachment 2.

4.2.4. Water and Product Level Measurements

Groundwater and product level measurements were collected on November 9, 2018 at the eleven (11) wells (MW-1 through MW-8 and MW-10 through MW-12, note that MW-9 was not completed) and the two (2) pre-pack wells that were installed at soil sample locations SD-2 and SD-8. The groundwater and product level measurements are presented in Table 5. Measurable product of 1.46 feet thick was detected in MW-11 and a minimal amount of product, 0.01 feet, was measured in MW-1.

4.2.5. Groundwater Sample Collection and Processing

Groundwater monitoring was completed at the 10 existing wells (MW-1 through MW-8, MW-10 and MW-11, note that MW-9 does not exist) and new well MW-12 on October 29 through October 31, 2018. Samples were collected consistent with the Ecology-approved Work Plan Addendum.

Supplemental Investigation groundwater samples were submitted to ARI for analysis and archive. Samples were analyzed for a combination of the following chemical constituents in accordance with the Ecology-approved Work Plan Addendum:

- Gasoline-range TPH by NWTPH-Gx.
- Heavy oil- and diesel-range TPH by NWTPH-Dx (no silica gel cleanup).
- Duplicate heavy oil- and diesel-range TPH by NWTPH-Dx with silica gel cleanup procedures.

- BETX by EPA 8260.
- Total alkalinity by SM 2420 B-97.
- Ferrous iron by SM 3500-Fe B-97.
- Nitrate and sulfate by EPA 300.0.
- Dissolved manganese by EPA 6020A.
- Dissolved methane by EPA RSK-175.

The schedule of analysis for groundwater samples collected as part of the Supplemental Investigation is presented in Table 6. In accordance with the Ecology-approved Work Plan Addendum, groundwater samples were obtained using low-flow/low-turbidity sampling techniques, as described in Section 3.3.2 above, and water quality parameters were monitored during purging including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, oxidation-reduction potential and temperature. A turbidimeter was used to measure turbidity. Samples were collected from the wells after water quality parameters stabilized and varied by less than 10 percent on three consecutive measurements.

The Ecology-approved Work Plan Addendum proposed up to three groundwater sampling events. One groundwater sampling event has been completed as of October 2018.

4.3. Disposal of Investigation Derived Waste

Soil cuttings (unused soil from the explorations) from explorations completed during the Supplemental Investigation, purge water generated during well development and groundwater sampling activities, and wash water used to decontaminate reusable sampling equipment were placed in separate labeled and sealed 55-gallon drums pending permitted disposal. Disposable sampling equipment including gloves, sample liners, paper towels, foil, and plastic bags were disposed of as solid waste.

Upon completion of the soil and groundwater investigation, soil cuttings, purge water and decontamination water stored in drums were transferred from the property by Waste Management (WM) for permitted disposal on January 24, 2019. Three (3) drums of soil cuttings and four (4) drums of water were disposed of. Note that the water drums for development and purge water from the Supplemental Investigation were combined with existing groundwater purge drums from the RI field work and disposed. See Attachment 5 for Waste Disposal records.

4.4. Quality Assurance and Quality Control

The scope of the RI field investigation and associated Quality Assurance and Quality Control (QA/QC) procedures were defined in the Work Plan Addendum and Ecology-approved RI/FS Work Plan. This section includes discussion of laboratory sample handling, laboratory data quality and deviations from the Ecology-approved Work Plan Addendum for the field activities performed.

4.4.1. Sample Handling and Shipment

Soil and groundwater samples collected during the investigation were transported to ARI, using chain-of-custody procedures described in the Ecology-approved Work Plan Addendum. Samples were placed in laboratory-prepared containers and stored in coolers with ice following collection and during transport to the testing laboratory. Sampling and handling procedures were completed in accordance with the Ecology-approved Work Plan Addendum.

4.4.2. Laboratory Data Quality

Laboratory data from conventional and chemical analyses underwent data quality review and validation. The laboratory data was identified to be of adequate quality for the intended use. Laboratory reports are provided in Attachment 6 and Data Validation Reports are provided in Attachment 7.

4.4.3. Deviations from the Work Plan Addendum

The following are deviations from the Ecology-approved Work Plan Addendum:

- Boring location SD-3 was relocated approximately 25 feet to the southwest
- Boring location SD-9 was moved approximately 15 feet to the east due to heavy equipment storage.
- Boring location SD-4 was relocated approximately 10 feet to the north to allow space for the drill rig adjacent to the buildings.
- Soil boring and monitoring well location MW-12 was relocated approximately 5 feet south to avoid being installed in the 2nd Street right-of-way.

5.0 SUMMARY OF RESULTS

This section presents the results of the RI and Supplemental Investigation activities. As discussed in Section 1.0, evaluation of these results and nature and extent of contamination at the Site will be completed as part of the RI/FS Report, which will be prepared at a later date.

5.1. Soil Stratigraphy

The general stratigraphy at the Site presented is based on observations of material encountered in soil exploration completed as part of the RI, Supplemental Investigation and previous investigations. The stratigraphy at the Site generally consists of fill soil deposits overlying native as described below:

- **Historical Fill Deposits**: The Site was originally developed in the early 1900s and this included both in the upland portion of the Site to build the bulk fuel storage and distribution facility and in the marine area to build dock(s). This fill material is generally comprised of layers of sand, silty sand and silt with variable gravel content at the depths ranging from about 4 to 17 bgs. In the southern part of the Site the fill material is shallow relative to the ground surface (approximately 4 to 6 feet bgs) because the Site is cut into the slope and the south and east property boundaries have retaining walls. Contained in the historical fill deposits are occasional debris including concrete asphalt, brick and wood fragments. Along the shoreline and beach more debris was encountered at shallower depths potentially related to the dock(s) and the adjacent Curtis Wharf.
- **Native Deposits**: Native material underlying the fill deposits at the Site include beach sands overlying glacial deposits. The beach sand deposits are typically poorly sorted and loose in nature and vary in thickness from 2 to 6 feet. Glacial deposits consist of a medium dense glaciomarine drift with varying amounts of silt, sand, and gravel. A layer of dark brown organic soil is present below the fill layer in north and northern portion of the Site. The organic layer varies in thickness from several inches to 2 feet.

5.2. Hydrogeologic Conditions

Hydrogeologic conditions including tidal influence, groundwater flow direction and gradients, hydraulic conductivity and groundwater velocities at the Site were estimated based on the results of tidal and hydraulic conductivity studies completed for the RI as described in Section 3.5. Attachment 4 presents the detailed procedures and results from the Hydrogeologic Investigation.

5.2.1. Tidal Study

Figure 4 shows the monitoring wells that were used for the tidal study. In general the tidal study indicated a relatively low degree of tidal influence on the monitoring wells at the Site. The three monitoring wells observed to be the most tidal influence during the 72-hour tidal study are MW-6, MW-7 and MW-10. The remaining monitoring wells used, including monitoring wells MW-1, MW-2, and MW-3 indicated less tidal influence. Further detail on the tidal study results are presented in Hydrogeologic Investigation (Attachment 4).

5.2.2. Hydraulic Conductivity

As stated in Section 5.2.1 the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline and the diffusivity could not be calculated, therefore the results of slug testing were used instead to estimate hydraulic parameters for the aquifer

The hydraulic conductivity for the aquifer was estimated using the results of slug testing in six monitoring wells (MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11) as shown on Figure 4. Diffusivity could not be used to estimate the hydraulic parameters due to the unproportional timing and degree of the observed tidal influence. Based on the slug test results, hydraulic conductivity for the aquifer ranges between 0.02 and 4.11 feet/day with a mean value of 1.25 feet/day. Attachment 4 has additional details on how the hydraulic conductivity was calculated.

5.2.3. Groundwater Flow Direction and Gradient

The groundwater flow direction and gradient during the tidal study was determined using the mean groundwater elevations. The mean groundwater flow direction based on the results of the tidal study is generally to the north and northwest toward Guemes Channel (see Figure 5). Mean hydraulic gradient was calculated using two monitoring well pairs (MW-10/MW-2 and MW-5/MW-4). In the western portion of the Site, the calculated hydraulic gradient is 0.013 feet per foot (ft/ft) between monitoring wells MW-10 and MW-2. In the eastern portion of the Site, the calculated hydraulic gradient is 0.023 ft/ft between monitoring wells MW-5 and MW-4. Figure 5 presents the groundwater flow direction and calculated gradients.

5.2.4. Groundwater Velocity

The average linear groundwater velocity between monitoring wells MW-10 and MW-2 is 0.07 feet per day (ft/day) with a flow direction to the northwest. The average linear groundwater velocity between monitoring locations MW-5 and MW-4 is 0.09 ft/day with a groundwater flow direction toward the north, as shown in Figure 5.

5.3. Chemical Analytical Results

This section presents soil, groundwater and sediment chemical analytical results from the RI and Supplemental Investigation. Additionally, soil chemical analytical results from Focused Site Investigation of

2014 are also incorporated to help in evaluation of the nature and extent of contamination. The results were screened against the preliminary screening levels presented in the Ecology-approved RI/FS Work Plan to identify exceedances. The results have also been uploaded to Ecology's Environmental Information Management (EIM) database in accordance with the AO.

5.3.1. Soil

The chemical analytical results for soil samples analyzed as part of the Focused Site Investigation, RI and Supplemental Investigation are presented in Table 7. The results are screened, and preliminary screening level exceedances are identified on this table. Figures 6 through 10 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively. For the purposes of summarizing the data on these figures, soil samples collected from each boring are categorized into three sampling horizons – fill, water table and native. Figures 6 through 10 summarize exceedances observed in the sampled horizons at each boring location. The following chemicals exceeded preliminary screening levels in soil:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX) and n-Hexane;
- Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) Toxicity Equivalent Quotient (TEQ);
- Various individual PAH analytes; and
- Metals including cadmium, chromium, lead and mercury.

The analytical results provide evidence of petroleum related contaminants in soil (TPH and fuel related VOCs presented in Figures 6 and 7) are located in the northern half of the Site in the vicinity of the former bulk fuel facility operations and extend north into 2nd Street and west towards the beach area. Elevated concentrations of metals and PAHs were primarily identified within the fill deposits with some isolated deeper contamination (up to approximately 8 to 12 feet bgs) found in the underlying native sand deposits (e.g., GEI-30 and GEI-39).

Fuel-related VOCs are located primarily within the historical fuel operation facility and are comingled with elevated TPH in soil. The depth of petroleum contamination ranges from approximately 4 to 12 feet bgs within the fill formation in both vadose and saturated soil. Petroleum-related contamination is bounded to the east by O Avenue and to the north by sample locations were exceedances were not detected. The extent of contamination to the south is defined by soil sample results were exceedances were not detected. There is uncertainty of the soil quality below the existing buildings in the southwest portion of the former bulk fuel operation area. To the west the data does not provide clear evidence on whether GEI-39 (at the top of the beach slope) is an isolated soil occurrence or contiguous with the upland source area.

Soil analytical results also indicate evidence of isolated areas of PAH and metals contamination in the northern part of the Site (presented in Figures 8 through 10). These results indicate that metals and PAHs contamination in soil is in isolated areas. In general metals and PAHs have a higher frequency of exceendace to the west part of the Site, closer to the shoreline area.

The laboratory data reports for the RI and Supplemental Investigation are presented in Attachment 6. The laboratory data reports for Focused Site Investigations were presented in Focused Environmental Site Investigation Data Report (GeoEngineers, 2014). EPA-defined Stage 2B data validation (EPA Document

540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

5.3.2. Groundwater

The chemical analytical results for groundwater samples analyzed as part of the RI and Supplemental Investigation are presented in Table 8 and 9, respectively. The results are screened, and preliminary screening level exceedances are identified on these tables. Figures 11 through 15 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively for two groundwater monitoring events (November 2017 and March 2018) completed as part of the RI. During the Supplemental Investigation, diesel- and heavy oil-range hydrocarbon analysis was performed with and without silica gel cleanup procedures. Note that previous groundwater monitoring events for these analytes were completed without the silica gel cleanup. Figure 16 presents groundwater results for diesel- and heavy oil-range TPH performed with and without silica gel cleanup laboratory preparation that were analyzed as part of the Supplemental Investigation in October 2018. As described in the Work Plan Addendum this data will be evaluated in the RI to determine if there is potential organic interference in the analytical method used (NWTPH-Dx). Groundwater samples for MW-8 and MW-11 were also analyzed for TPH-Gx and BETX as part of the Supplemental Investigation and the results are presented in Table 9. The following chemicals exceeded preliminary screening levels in groundwater:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene and 1,2-dibromoethane (EDB); and
- Metals including arsenic (total and dissolved) and lead (total only).

Groundwater analytical results generally indicate that petroleum-related contamination in groundwater exists within the northern area of the Site within the former bulk fuel operation footprint and in wells located downgradient to the north and west. The highest concentration of TPH and fuel-related VOCs in groundwater are at MW-11, where free product has been measured as approximately 1.5 feet thick, and is, located in the center of the historical fueling operations. Petroleum-related contamination is bounded to the north, south and east by monitoring well MW-7, MW-10 and MW-6, respectively. Wells along the shoreline indicate diesel-range TPH exceedances. Based on the groundwater flow direction, the extent of petroleum-related contamination is generally within the source area and downgradient of the source. MW-8 is located cross-gradient relative to the source area for the Site and was found to have diesel-range TPH in groundwater above preliminary screening levels during the first monitoring event with concentrations below screening levels in subsequent events. Fuel-related VOCs including benzene and EDB were detected within the Site at MW-11. Monitoring wells along the shoreline downgradient of the source area were not found to have petroleum-related VOCs in groundwater. Benzene was detected at MW-8 and is cross-gradient from the source area, and uncertainty exists as to the source of benzene contamination at this location.

As previously noted the Supplemental Investigation groundwater was analyzed for diesel- and heavy-oil TPH with and without the silica gel cleanup preparation method. Figure 16 presents these analytical results for diesel- and heavy oil-range TPH side by side. The results indicate that without the silica gel cleanup diesel-range hydrocarbons are present above screening levels throughout the source area and downgradient wells consistent with results from the RI groundwater monitoring. With the silica cleanup gel procedure the only exceedance for diesel- and/or heavy-oil range TPH is at MW-11. The results indicate that the silica gel cleanup method lowers concentration below preliminary screening levels at the majority monitoring wells sampled. Further evaluation will be completed to determine if the silica gel cleanup procedure provides accurate analysis of petroleum contamination or if the procedure removes petroleum and artificially lowers concentrations in groundwater.

Groundwater did not exceed preliminary screening levels for PAH or cPAH analytes. Isolated, low concentrations of dissolved arsenic above preliminary screening levels (exceedance ratios of approximately 2 or less) in groundwater were detected at the Site. Arsenic-contaminated soil was not identified at the Site.

As described in Section 4.2.5 groundwater samples were also submitted for laboratory analysis of natural attenuation parameters that do not have preliminary screening levels including methane, nitrate, sulfate, total alkalinity, ferrous iron and dissolved manganese at wells MW-1 through MW-12. These results are presented in Table 9 and the analytical data will be evaluated as part of the RI.

The laboratory data reports for the RI and Supplemental Investigation groundwater sample analyses are provided in Attachment 6. EPA-defined Stage 2B data validation (EPA Document 540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

5.3.3. Sediment

In accordance with the Ecology-approved RI/FS Work Plan sediment results were screened for protection of benthic organisms and protection of human health and higher trophic level (HH/HTL) receptors. Figures 6 through 10 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively. Sediment intervals sampled at each location and exceedances of both benthic and human health preliminary screening levels are shown on these figures. The chemical analytical results for sediment samples compared to preliminary screening levels for protection of benthic organisms are presented in Table 10. The results are screened, and preliminary screening level exceedances are identified in these tables. The following chemicals exceeded preliminary screening levels in sediment for protection of benthic organisms:

- Sum of Low Molecular Weight PAHs (LPAHs);
- Sum of High Molecular Weight PAHs (HPAHs);
- Various individual LPAH and HPAH analytes; and
- Pentachlorophenol.

Analytical data indicate that TPH, petroleum-related VOCs and metals in sediment are protective of benthic organisms in sediment samples collected for the RI (see Table 10). Isolated sediment samples exceeded individual PAH analyte screening levels for protection of benthic organisms in the beach area at sample locations SED-1 and SED-8 through SED-10 ranging in depth from surface to 6 feet bml. These PAH concentrations include exceedances of Sediment Cleanup Objective (SCO) and/or Cleanup Screening Level (CSL) concentrations as presented in Table 10. One isolated occurrence of pentachlorophenol above the CSL was present in sediment at composite sample SED-1 in the 4 to 6 foot bml sample interval.

The chemical analytical results for sediment samples compared to preliminary screening levels for protection of HH/HTL are presented in Table 11. The following chemicals exceeded preliminary screening levels in sediment for protection of HH/HTL receptors:

- Various individual LPAH and HPAH analytes;
- cPAH TEQ;
- Pentachlorophenol; and
- Metals including lead and mercury.

Analytical data indicate that TPH and petroleum-related VOCs in sediment are protective of HH/HTL (see Table 10). Sediment sample analytical results indicate that sediment with individual PAHs and cPAH TEQ concentrations greater than the HH/HTL screening level exist throughout the beach area that was investigated for the RI (see Figures 8 and 9). Depths of contaminatd sediment range from surface to 6 feet below mudline (bml), and the sediment sampling and analysis did not bound the extent of contamination in the vertical or horizontal directions. One isolated occurrence of pentachlorophenol above the HH/HTL was present in sediment at composite sample SED-1 in the 4 to 6 foot bml interval as presented in Table 11. Analytical results for lead in sediment was also found to exceed HH/HTL screening levels throughout the sediment area ranging in depths from surface to 6 feet bml. Similar to PAHs the data results do not define the horizontal or vertical extent of lead contamination above the HH/HTL screening levels within the investigation area. There is one isolated mercury sample at composite sample location SED-1 from 4 to 6 feet bml with mercury concentration greater than the screening level protective of HH/HTL receptors.

The laboratory data reports for the sediment samples are presented in Attachment 6. EPA-defined Stage 2B data validation (EPA Document 540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

6.0 REFERENCES

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7.0 LIMITATIONS

We have prepared this report for the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington for use by the Port of Anacortes. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

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

TABLES

GeoEngineers

Table 1

Focused Environmental Investigation and Remedial Investigation Soil Analytical Schedule

Quiet Cove

Anacortes, Washington

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Sample Type	Sample Horizon	Laboratory Analysis[2]									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
2014 Focused Environmental Investigation															
GEI-1	GEI-1-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-1-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-2	GEI-2-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-2-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-2-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-3	GEI-3-3-033114	03/30/14	4 - 6	Vadose	Fill		●	●	●						
GEI-4	GEI-4-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-4-2-040114	04/01/14	2 - 3	Vadose	Fill/Native	●	●	●	●	●	●	●		●	●
	GEI-4-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-8	GEI-8-3-033114	03/31/14	4 - 6	Saturated	Fill/Native		●	●	●						
	GEI-8-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-9	GEI-9-3-040114	04/01/14	5 - 7	Saturated	Native		●	●	●						
	GEI-9-5-040114	04/01/14	8 - 10	Saturated	Native		●	●	●						
GEI-10	GEI-10-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-10-3-033114	03/31/14	4 - 6	Saturated	Fill	●	●	●	●	●	●	●		●	●
	GEI-10-6-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-12	GEI-12-3-040114	04/01/14	5 - 7	Saturated	Fill		●	●	●						
GEI-13	GEI-13-2-040114	04/01/14	2 - 3	Vadose	Fill		●	●	●						
	GEI-13-4-040114	04/01/14	6 - 8	Saturated	Native		●	●	●						
GEI-14	GEI-14-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-16	GEI-16-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-16-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-17	GEI-17-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Saturated vs. Unsaturated	Saturated vs. Unsaturated	Laboratory Analysis[2]									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
GEI-18	GEI-18-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-18-3-033114	03/31/14	4 - 6	Saturated	Native		●	●	●						
	GEI-18-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-19	GEI-19-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-19-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-20	GEI-20-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-21	GEI-21-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-25	GEI-25-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-25-3-040114	04/01/14	4 - 6	Saturated	Fill	●	●	●	●	●	●	●		●	
	GEI-25-5-040114	04/01/14	8 - 10	Saturated	Native		●	●	●						
GEI-27	GEI-27-3-040214	04/02/14	6 - 7.5	Saturated	Fill		●	●	●						
GEI-28	GEI-28-4-040214	04/02/14	6 - 8	Saturated	Native		●	●	●						
2017 Remedial Investigation															
GEI-29	GEI-29-5-7_091217	9/12/2017	5 - 7	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-29-10-12_091217	9/12/2017	10 - 12	Saturated	Native	●	●	●	●	●		●	●	●	
	GEI-29-13-15_091217	9/12/2017	13 - 15	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-30	GEI-30-2-4_091217	9/12/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-30-6-8_091217	9/12/2017	6 - 8	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-30-9-11_091217	9/12/2017	9 - 11	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-31	GEI-31-3-5_091117	9/11/2017	3 - 5	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-31-13-15_091117	9/11/2017	13 - 15	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-31-6-8_091117	9/11/2017	6 - 8	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-32	GEI-32-3-4.5_091117	9/11/2017	3 - 4.5	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-32-10-12_091117	9/11/2017	10 - 12	Saturated	Native	●	●	●	●	●		●	●	●	
	GEI-32-7-9_091117	9/11/2017	7 - 9	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-38	GEI-38-2-4_091917	9/19/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-38-5-7_091917	9/19/2017	5 - 7	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-38-12-14_091917	9/19/2017	12 - 14	Saturated	Native	●	●	●	●	●		●	●	●	

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Saturated vs. Unsaturated	Saturated vs. Unsaturated	Laboratory Analysis[2]									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
GEI-39	GEI-39-1-3_091517	9/15/2017	1 - 3	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-39-5-7_091517	9/15/2017	5 - 7	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-39-8-10_091517	9/15/2017	8 - 10	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
GEI-40	GEI-40-2-4_091917	9/19/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-40-12-14_091917	9/19/2017	12 - 14	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-40-5-7_091917	9/19/2017	5 - 7	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-41	GEI-41-5-7_091317	9/13/2017	5 - 7	Vadose	Natvie	●	●	●	●	●		●	●	●	
GEI-42	GEI-42-1-3_091317	9/13/2017	1 - 3	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-42-6-8_091317	9/13/2017	6 - 8	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-43	GEI-43-3-5_091317	9/13/2017	3 - 5	Vadose	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-43-5-7_091317	9/13/2017	5 - 7	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-44	GEI-44-2-4_091317	9/13/2017	2 - 4	Vadose	Fill	○[3]	○[3]	○[3]	○[3]	○[3]		○[3]	○[3]	○[3]	
	GEI-44-10-12_091317	9/13/2017	10 - 12	Saturated	Fill/Native	○[3]	○[3]	○[3]	○[3]	○[3]		○[3]	○[3]	○[3]	
	GEI-44-7-9_091317	9/13/2017	7 - 9	Saturated	Native	○[3]	○[3]	○[3]	○[3]	○[3]			○[3]	○[3]	
MW-8	MW-8-2-4_091917	9/19/2017	2 - 4	Vadose	Fill		○[3]	○[3]	○[3]	○[3]					
	MW-8-5-7_091917	9/19/2017	5 - 7	Saturated	Fill		○[3]	○[3]	○[3]	○[3]					

Notes:

[1] Sample locations are shown on Figure 2.

[2] Laboratory results are summarized in Table 3.

[3] Tier 2 sample analysis based on communications with Ecology.

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

ft = feet

bgs = below ground surface

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

○ = Archive sample collected and subsequently submitted for chemical analysis.

Table 2

Focused Environmental Investigation and Remedial Investigation Groundwater Analytical Schedule

Quiet Cove

Anacortes, Washington

Sample Location[1]	Sample Identification	Date Sampled	Well Location	Tidal Influence	Laboratory Analysis[2]										
					Total Metals	Dissolved Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
2014 Focused Environmental Investigation															
MW-1	QC-MW-1-7.1.14	07/01/14	Shoreline	Indeterminate[3]			●	●	●					●	
MW-2	QC-MW-2-7.1.14	07/01/14	Shoreline	Indeterminate[3]			●	●	●					●	
MW-3	QC-MW-3-7.1.14	07/01/14	Shoreline	Indeterminate[3]	●	●	●	●	●	●	●	●	●	●	●
MW-4	QC-MW-4-7.1.14	07/01/14	Upland	Indeterminate[3]			●	●	●					●	
MW-5	QC-MW-5-7.1.14	07/01/14	Upland	Indeterminate[3]	●	●	●	●	●	●	●	●	●	●	●
2017 Remedial Investigation															
MW-1	MW-1-110917	11/09/17	Shoreline	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-1_031918	03/19/18			●	●	●	●	●	●				●	
MW-2	MW-2-110917	11/09/17	Shoreline	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-2_032018	03/20/18			●	●	●	●	●	●				●	
MW-3	MW-3_101817	10/18/17	Shoreline	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-3_032018	03/20/18			●	●	●	●	●	●				●	
MW-4	MW-4_101817	10/18/17	Upland	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-4_031918	03/19/18			●	●	●	●	●	●				●	
MW-5	MW-5_101817	10/18/17	Upland	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-5_032018	03/20/18			●	●	●	●	●	●				●	
MW-6	MW-6_101817	10/18/17	Upland	Yes	●	●	●	●	●	●				●	
	MW-6_032018	03/20/18			●	●	●	●	●	●				●	
MW-7	MW-7_101817	10/18/17	Shoreline	Yes	●	●	●	●	●	●				●	
	MW-7_032018	03/20/18			●	●	●	●	●	●				●	
MW-8	MW-8-110917	11/09/17	Shoreline	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-8_031918	03/19/18			●	●	●	●	●	●				●	

Sample Location[1]	Sample Identification	Date Sampled	Well Location	Tidal Influence	Laboratory Analysis[2]										
					Total Metals	Dissolved Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
MW-10	MW-10-110917	11/09/17	Upland	Yes	●	●	●	●	●	●				●	
	MW-10_031918	03/19/18			●	●	●	●	●	●				●	
MW-11	MW-11-110917	11/09/17	Upland	Indeterminate[3]	●	●	●	●	●	●				●	
	MW-11_032018	03/20/18			●	●	●	●	●	●				●	

Notes:

[1] Sample locations are shown on Figure 2.

[2] Laboratory results are summarized in Table 4.

[3] Tidal effects below the threshold of significance (Stage Ratio less than 3 percent).

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

Table 3

Remedial Investigation Sediment Analytical Schedule

Quiet Cove
Anacortes, Washington

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Sample Type	Sample Horizon	Laboratory Analysis[2]										
						NWTPH-Gx	NWTPH-Dx	BTEX (8260)	EDB, EDC, MTBE and n-Hexane	Grain size	TOC, TVS, TS	Sulfides & Ammonia	SMS Metals (8270D/SIM)	SMS VOCs (8270D/SIM)	PCBs (EPA 1668C)	Dioxins/Furans (1631)
2017 Sediment Tier 1 Investigation																
GEI-1	SED-COMP-1 _091517	09/15/17	0 - 0.5	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED1-1-3 _091517	09/15/17	1 - 3	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED1-4-6 _091517	09/15/17	4 - 6	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
2018 Sediment Tier 2 Investigation																
SED-2	SED-2-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	○	○	○	○	○	○	○	○	○	○	○
	SED-2-0-2 _071718	7/17/2018	0 - 2	Core	Fill	○	☒	○	○	○	○	○	☒	☒	○	○
	SED-2-2-4_071718	7/17/2018	2 - 4	Core	Native	○	☒	○	○	○	○	○	○	○	○	○
SED-3	SED-3-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	○	○	○	○	○	○	○	○	○	○	○
	SED-3-0-2_071718	7/17/2018	0 - 2	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-3-2-3.5_071718	7/17/2018	2 - 3.5	Core		○	☒	○	○	○	○	○	○	○	○	○
	SED-3-3.5-5_071718	7/17/2018	3.5 - 5	Core	Native	○	○	○	○	○	○	○	○	○	○	○
SED-4	SED-4-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-4-0-1.5_071618	7/16/2018	0 - 1.5	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-4-1.5-3_071618	7/16/2018	1.5 - 3	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-4-3-4.5_071618	7/16/2018	3 - 4.5	Core	Native	○	○	○	○	○	○	○	○	○	○	○
SED-5	SED-5-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-5-0-2_071618	7/16/2018	0 - 2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-5-2-4_071618	7/16/2018	2 - 4	Core	Native	●	●	●	●	●	●	●	●	●	○	○
SED-6	SED-6-0-0.5_071718	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-6-0-1_071718	7/17/2018	0 - 1	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-6-1-3_071718	7/17/2018	1 - 3	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-7	SED-7-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-7-0-1_071718	7/17/2018	0 - 1	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-8	SED-8-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-8-0-1.7_071618	7/16/2018	0 - 1.7	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-8-1.7-3.2_071618	7/16/2018	1.7 - 3.2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-8-3.2-4.5_071618	7/16/2018	3.2 - 4.5	Core		●	●	●	●	●	●	●	●	●	○	○

SED-9	SED-9-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-9-0-1.7_071718	7/17/2018	0 - 1.7	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-9-1.7-2.3_071718	7/17/2018	1.7 - 2.3	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-10	SED-10-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-10-0-2_071718	7/17/2018	0 - 2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-10-2-4_071718	7/17/2018	2 - 4	Core		●	●	●	●	●	●	●	●	●	○	○
	SED-10-4-5.6_071718	7/17/2018	4 - 5.6	Core	Native	○	○	○	○	○	○	○	○	○	○	○

Notes:

[1] Sample locations are shown on Figure 2.

[2] Laboratory results are summarized in Table 3.

[3] Tier 2 sample analysis based on communications with Ecology.

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

ft = feet

bgs = below ground surface

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

☒ = Archive sample collected and subsequently submitted for chemical analysis.

○ = Archive sample collected.

Table 4

Supplemental Investigation Soil Analytical Schedule

Quiet Cove Property
Anacortes, Washington

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval (feet bgs)	Sample Horizon[2]	Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)	
					Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals[4] (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)
Direct-Push (DP) Sample Location											
SD-1	SD-1-2-4	10/17/2018	2-4	S	●	●	●				
	SD-1-5-6.5	10/17/2018	5-6.5	X	●	●	●				
	SD-1-10-12	10/17/2018	10-12	W	●	●	●				
	SD-1-13-15	10/17/2018	13-15	W							
	SD-1-17-19	10/17/2018	17-19	N	●	●	●				
SD-2	SD-2-2-3	10/17/2018	2-3	S	●	●	●				
	SD-2-6-8	10/17/2018	6-8	X	●	●	●				
	SD-2-11-12	10/17/2018	11-12	W	●	●	●				
	SD-2-14-15	10/17/2018	14-15	N	●	●	●				
SD-3	SD-3-2.5-3	10/17/2018	2.5-3	S	●	●	●				
	SD-3-7-8.5	10/17/2018	7-8.5	X,W	●	●	●				
	SD-3-12-13	10/17/2018	12-13	N	●	●	●				
SD-4	SD-4-2.5-3.5	10/18/2018	2.5-3.5	S	●	●	●				
	SD-4-6.5-7.5	10/18/2018	6.5-7.5	X,W	●	●	●				
	SD-4-12-13	10/18/2018	12-13	N	●	●	●				
SD-5	SD-5-0.5-2	10/18/2018	0.5-2	S	●	●	●				
	SD-5-5.5-6	10/18/2018	5.5-6	X,W	●	●	●				
	SD-5-9-10	10/18/2018	9-10	N	●	●	●				
SD-6	SD-6-1-2	10/18/2018	1-2	S	●	●	●				
	SD-6-4-5	10/18/2018	4-5	X	●	●	●				
	SD-6-6-7	10/18/2018	6-7	W	●	●	●				
	SD-6-9-10	10/18/2018	9-10	N	●	●	●				
SD-7	SD-7-1-2	10/17/2018	1-2	S	●	●	●			●	●
	SD-7-2-3.5	10/17/2018	2-3.5	X	●	●	●			●	●
	SD-7-9-10	10/17/2018	9-10	W	●	●	●			●	●
	SD-7-15-16.5	10/17/2018	15-16.5	W							
	SD-7-18.5-20	10/17/2018	18.5-20	N	●	●	●			●	●

					Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)	
Sample Location[1]			Sample Interval (feet bgs)	Sample Horizon[2]	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals[4] (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)
SD-8	SD-8-2-4	10/17/2018	0-2	S	●	●	●				
	SD-8-6-8	10/17/2018	2-4	X	●	●	●				
	SD-8-9-11	10/17/2018	4-6	W	●	●	●				
	SD-8-13-15	10/17/2018	6-8	N	●	●	●				
SD-9	SD-9-2.5-4	10/18/2018	2.5-4	S	●	●	●	●	●	●	●
SD-10	SD-10-4-5	10/18/2018	4-5	S	●	●	●	●	●	●	●
Hollow-Stem Auger Sample Location											
MW-12	MW-12-3-4	10/18/2018	3-4	S	●	●	●			●	●
	MW-12-7.5-9.5	10/18/2018	7.5-9.5	X	●	●	●				
	MW-12-11-12	10/18/2018	11-12	W	●	●	●				
	MW-12-14-15	10/18/2018	14-15	N	●	●	●				

Notes:

[1] Sample locations are shown on Figure 1.

[2] Sample intervals may be adjusted based on observed field conditions to collect samples representative of the fill and native soil horizon, and interface between the saturated and vadose zone. Samples will be collected for analysis based on (1) shallow soil approximately 0-2 feet; (2) highest PID reading; (3) interval at the interface of the saturated and vadose zone and; (4) deepest sample in the boring (native material). If the highest PID reading and water table sample interval overlap, only 3 samples will be collected for analysis. The sample intervals for analysis are anticipated in the table. The exploration will be advanced to at least three feet into native soil or to approximately 14 feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, or until refusal.

[3] Field screening will be completed for each 2-foot interval throughout the boring in accordance with the approved RI/FS Work Plan.

[4] MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.

<u>Sample for analysis (approximate interval location in table)</u>

S = Shallow Sample

X = Highest PID Reading Sample

W = Water Table Sample

N = Selected sample for initial chemical analysis .

bgs = below ground surface

BETX = Benzene, Ethylbenzene, Toluene and Xylenes

EDB = 1,2-Dichloroethane

EDC = 1,2-Dichloroethane

EPA = Environmental Protection Agency

MTBE = Methyl t-Butyl Ether

MTCA = Model Toxics Control Act

Table 5

Supplemental Investigation Product and Groundwater Measurements

Quiet Cove Property

Anacortes, Washington

Well Identification	Date	Time	DTP (ft)	DTW (ft)	Product Thickness (ft)	Top of Casing Elevation (feet NAVD 88)	Product elevation (feet NAVD 88)	Groundwater Elevation (feet NAVD 88)	Field Notes
MW-1	11/9/18	15:02	3.45	3.46	0.01	11.91	8.46	8.45	Trace product encountered
MW-2	11/9/18	15:00	--	4.87	0	12.01	NP	7.14	
MW-3	11/9/18	14:56	--	5.66	0	12.42	NP	6.76	
MW-4	11/9/18	15:25	--	5	0	12.42	NP	7.42	
MW-5	11/9/18	15:35	--	4.54	0	14.48	NP	9.94	
MW-6	11/9/18	15:38	--	4.96	0	15.43	NP	10.47	
MW-7	11/9/18	15:15	--	6.11	0	12.62	NP	6.51	
MW-8	11/9/18	15:08	--	4.53	0	13.13	NP	8.6	
MW-10	11/9/18	14:31	--	3.84	0	14.17	NP	10.33	
MW-11	11/9/18	14:42	3.37	4.83	1.46	12.28	8.91	7.45	Product encountered
MW-12	11/9/18	15:29	--	1.83	0	11.17	NP	9.34	
SD-2	11/9/18	14:40	--	2.46	0	12.04	NP	9.58	Temporary pre-pack well
SD-8	11/9/18	14:37	--	2.64	0	12.47	NP	9.83	Temporary pre-pack well

Notes:

DTP = Depth to product

DTW = Depth to water

NA = Not Available for measurement

NP = No product observed

NAVD 88 = North American Vertical Datum of 1988

ft = feet

Table 6

Supplemental Investigation Groundwater Analytical Schedule

Quiet Cove Property

Anacortes, Washington

Sample Location[1]	Sample Identification	Sampling Date	Petroleum Hydrocarbons (TPH)			Volatile Organic Compounds (VOCs)	Geochemical Parameters					
			Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx) - with silica gel cleanup	Diesel- and Heavy Oil-Range (NWTPH-Dx) - no silica gel cleanup	BETX[2] (EPA 8260)	Total Alkalinity (SM 2420 B-97)	Ferrous Iron (SM3500-Fe B-97)	Nitrate (EPA 300.0)	Sulfate (EPA 300.0)	Dissolved Manganese (EPA 6020A)	Dissolved Methane (EPA RSK-175)
Existing Monitoring Well												
MW-1	MW-1_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-2	MW-2_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-3	MW-3_103018	10/30/2018		●	●		●	●	●	●	●	●
MW-4	MW-4_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-5	MW-5_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-6	MW-6_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-7	MW-7_103018	10/30/2018		●	●		●	●	●	●	●	●
MW-8	MW-8_102918	10/29/2018	●	●	●	●	●	●	●	●	●	●
MW-10	MW-10_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-11	MW-11_103118	10/31/2018	●	●	●	●	●	●	●	●	●	●
New Monitoring Well												
MW-12	**MW-12_103018**	**10/30/2018**		●	●		●	●	●	●	●	●

Notes:

[1] Sample locations are shown on Figure 1.

[2] BETX = Benzene, ethylbenzene, toluene, xylene

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

Sample Location[1]	**GEI-1**		**GEI-2**			**GEI-3**	**GEI-4**			**GEI-8**		**Preliminary Screening Level[2]**	
Sample Identification	**GEI-1-3-033114**	**GEI-1-5-033114**	**GEI-2-1-033114**	**GEI-2-3-033114**	**GEI-2-5-033114**	**GEI-3-3-033114**	**GEI-4-1-040114**	**GEI-4-2-040114**	**GEI-4-3-040114**	**GEI-8-3-033114**	**GEI-8-5-033114**		
Sample Date	**3/31/2014**	**3/31/2014**	**3/31/2014**	**3/31/2014**	**3/31/2014**	**3/31/2014**	**4/1/2014**	**4/2/2014**	**4/1/2014**	**3/31/2014**	**3/31/2014**		
Sample Interval (feet bgs)	**4-6 ft**	**8-10 ft**	**0-2 ft**	**4-6 ft**	**8-10 ft**	**4-6 ft**	**0-2 ft**	**2-3 ft**	**4-6 ft**	**4-6 ft**	**8-10 ft**		
Sample Type	**Vadose**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Fill**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill/Native**	**Native**	**Fill/Native**	**Native**		
Field Measured Parameters													
Sheen	HS	NS	NS	MS	NS	HS	NS	HS	NS	HS	NS	NE	NE
Headspace Vapors (ppm)	155	<1	<1	255	53	124	<1	7	<1	232	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	–	–	–	–	–	–	–	14 U	–	–	–	20	20
Cadmium	–	–	–	–	–	–	–	**2.4**	–	–	–	1.2	1
Chromium	–	–	–	–	–	–	–	**13**	–	–	–	1,000	50
Copper	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Lead	–	–	–	–	–	–	–	**79**	–	–	–	250	24
Silver	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Zinc	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Mercury	–	–	–	–	–	–	–	0.34 U	–	–	–	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	7.4 U	7.8 U	3.4 U	7.7 U	3.8 U	7.6 U	3.3 U	6.9 U	9.3 U	**260**	3.3 U	30[2]	30[2]
Diesel-range hydrocarbons	**5,800**	**540**	**48**	**2,400**	**510**	**750**	**170**	**18,000**	**730**	**1,200**	29 U	2,000	2,000
Motor Oil-range hydrocarbons	**940**	**97**	**210**	**190**	**77**	**73**	**1,200**	**21,000**	**940**	**810**	58 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	**0.055**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.048**	0.020 U	0.05	0.05
Toluene	0.074 U	0.078 U	**0.039**	0.077 U	0.038 U	0.076 U	0.033 U	0.069 U	0.093 U	0.11 U	0.033 U	3.8	0.22
Ethylbenzene	**0.24**	0.078 U	**0.21**	0.077 U	0.038 U	**0.30**	0.033 U	0.069 U	0.093 U	**0.14**	0.033 U	1.1	1.1
Total Xylenes	**0.64**	0.0780 U	**0.31**	0.0770 U	0.0380 U	**0.91**	0.0330 U	0.0690 U	0.0930 U	**0.28**	0.0330 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.044	0.003
1,1,1-Trichloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	42	2.2
1,1,2,2-Tetrachloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.017	0.002
1,1,2-Trichloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.025	0.002
1,1-Dichloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.061	0.0038
1,1-Dichloroethene	–	–	–	–	–	–	–	0.065 U	–	–	–	0.023	0.0011
1,1-Dichloropropene	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE
1,2,3-Trichlorobenzene	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE
1,2,3-Trichloropropane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.033	0.033
1,2,4-Trichlorobenzene	–	–	–	–	–	–	–	0.065 U	–	–	–	0.019	0.005
1,2-Dibromo-3-Chloropropane	–	–	–	–	–	–	–	0.33 U	–	–	–	1.3	1.3
1,2-Dibromoethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	–	–	–	–	–	–	–	0.065 U	–	–	–	30	1.7
1,2-Dichloroethane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.02	0.001
1,2-Dichloropropane	–	–	–	–	–	–	–	0.065 U	–	–	–	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE
1,3-Dichloropropane	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	–	–	–	–	–	–	–	0.065 U	–	–	–	0.08	0.067
2,2-Dichloropropane	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE
2-Chloroethyl vinyl ether	–	–	–	–	–	–	–	0.52 U	–	–	–	NE	NE
2-Chlorotoluene	–	–	–	–	–	–	–	0.065 U	–	–	–	1,600	1,600
4-Chlorotoluene	–	–	–	–	–	–	–	0.065 U	–	–	–	NE	NE

Sample Location[1]	GEI-1		GEI-2			GEI-3	GEI-4			GEI-8		Preliminary Screening Level[2]	
Sample Identification	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114	GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/2/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	4-6 ft	8-10 ft	0-2 ft	4-6 ft	8-10 ft	4-6 ft	0-2 ft	2-3 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Native	Fill/Native	Native		
Bromobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	0.065 U	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	0.065 U	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	0.33 U	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	0.065 U	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	0.42 U	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	0.065 U	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	0.065 U	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
Methyl t-butyl ether	--	--	--	--	--	--	--	0.085 U	--	--	--	2.6	0.18
Methylene Chloride	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
n-Hexane	--	--	--	--	--	--	--	0.069 U	--	--	--	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	0.065 U	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	0.065 U	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	--	--	--	--	--	**11**	--	--	--	35	35
2-Methylnaphthalene	--	--	--	--	--	--	--	**14**	--	--	--	0.77	0.04
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.32	0.02
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	NE	0.068
Anthracene	--	--	--	--	--	--	--	--	--	--	--	4.4	0.2
Benzo(a)anthracene	--	--	--	--	--	--	--	**0.77**	--	--	--	0.07	0.007
Benzo(a)pyrene	--	--	--	--	--	--	--	**0.18**	--	--	--	0.14	0.01
Benzo(b)fluoranthene	--	--	--	--	--	--	--	**0.22**	--	--	--	0.25	0.012
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--	--	NE	2
Benzo(k)fluoranthene	--	--	--	--	--	--	--	0.18 U	--	--	--	0.32	0.016
Chrysene	--	--	--	--	--	--	--	**1.2**	--	--	--	0.25	0.012
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	0.091 U	--	--	--	0.14	0.018
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--	0.091 U	--	--	--	0.69	0.035
Naphthalene	--	--	--	--	--	--	--	**2.4**	--	--	--	0.25	0.013
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	NE	0.1
Pyrene	--	--	--	--	--	--	--	--	--	--	--	20	1
Total cPAH TEQ[3] (ND=0)	--	--	--	--	--	--	--	**0.29**	--	--	--	0.22	0.011
Total cPAH TEQ[3] (ND=0.5RL)	--	--	--	--	--	--	--	**0.31**	--	--	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	GEI-1		GEI-2			GEI-3	GEI-4			GEI-8		Preliminary Screening Level[2]	
Sample Identification	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114	GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/2/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	4-6 ft	8-10 ft	0-2 ft	4-6 ft	8-10 ft	4-6 ft	0-2 ft	2-3 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Native	Fill/Native	Native		
PCB-Aroclor 1016	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	0.068 U	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

Sample Location[1]	**GEI-9**		**GEI-10**			**GEI-12**	**GEI-13**		**GEI-14**	**GEI-16**		**Preliminary Screening Level[2]**	
Sample Identification	**GEI-9-3-040114**	**GEI-9-5-040114**	**GEI-10-1-033114**	**GEI-10-3-033114**	**GEI-10-6-033114**	**GEI-12-3-04014**	**GEI-13-2-040114**	**GEI-13-4-040114**	**GEI-14-3-040114**	**GEI-16-3-033114**	**GEI-16-5-033114**		
Sample Date	**4/1/2014**	**4/1/2014**	**3/31/2014**	**3/31/2014**	**3/31/2014**	**4/1/2014**	**4/1/2014**	**4/1/2014**	**4/1/2014**	**3/31/2014**	**3/31/2014**		
Sample Interval (feet bgs)	**5-7 ft**	**8-10 ft**	**0-2 ft**	**4-6 ft**	**10-12 ft**	**5-7 ft**	**2-3 ft**	**6-8 ft**	**4-6 ft**	**4-6 ft**	**8-10 ft**		
Sample Type	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Native**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Native**	**Native**	**Fill**	**Native**		
Field Measured Parameters													
Sheen	HS	NS	NS	HS	NS	NS	HS	NS	NS	SS	NS	NE	NE
Headspace Vapors (ppm)	5	<1	<1	123	<1	<1	362	2	<1	196	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	–	–	–	12 U	–	–	–	–	–	–	–	20	20
Cadmium	–	–	–	0.62 U	–	–	–	–	–	–	–	1.2	1
Chromium	–	–	–	**52**	–	–	–	–	–	–	–	1,000	50
Copper	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Lead	–	–	–	**17**	–	–	–	–	–	–	–	250	24
Silver	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Zinc	–	–	–	–	–	–	–	–	–	–	–	NE	NE
Mercury	–	–	–	0.31 U	–	–	–	–	–	–	–	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.8 U	5.0 U	3.3 U	**420**	6.3 U	3.5 U	9.4 U	3.7 U	5.2 U	**150**	5.4 U	30[2]	30[2]
Diesel-range hydrocarbons	29 U	30 U	**1,800**	**5,600**	30 U	29 U	**1,900**	30 U	34 U	**1,600**	30 U	2,000	2,000
Motor Oil-range hydrocarbons	58 U	59 U	**3,500**	**8,100**	60 U	58 U	**80**	60 U	68 U	**440**	60 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	0.020 U	**0.043**	0.020 U	0.020 U	**0.023**	0.020 U	0.020 U	**0.11**	0.020 U	0.05	0.05
Toluene	0.048 U	0.050 U	0.033 U	0.083 U	0.063 U	0.035 U	0.094 U	0.037 U	0.052 U	0.43 U	0.054 U	3.8	0.22
Ethylbenzene	0.048 U	0.050 U	0.033 U	**0.21**	0.063 U	0.035 U	**0.99**	0.037 U	0.052 U	**0.85**	0.054 U	1.1	1.1
Total Xylenes	0.0480 U	0.0500 U	0.0330 U	**0.65**	0.0630 U	0.0350 U	**0.71**	0.0370 U	0.0520 U	**0.56**	0.0540 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.044	0.003
1,1,1-Trichloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	42	2.2
1,1,2,2-Tetrachloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.017	0.002
1,1,2-Trichloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.025	0.002
1,1-Dichloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.061	0.0038
1,1-Dichloroethene	–	–	–	0.045 U	–	–	–	–	–	–	–	0.023	0.0011
1,1-Dichloropropene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichlorobenzene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichloropropane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.033	0.033
1,2,4-Trichlorobenzene	–	–	–	0.045 U	–	–	–	–	–	–	–	0.019	0.005
1,2-Dibromo-3-Chloropropane	–	–	–	0.23 U	–	–	–	–	–	–	–	1.3	1.3
1,2-Dibromoethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	–	–	–	0.045 U	–	–	–	–	–	–	–	30	1.7
1,2-Dichloroethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.02	0.001
1,2-Dichloropropane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
1,3-Dichloropropane	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	–	–	–	0.045 U	–	–	–	–	–	–	–	0.08	0.067
2,2-Dichloropropane	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
2-Chloroethyl vinyl ether	–	–	–	0.36 U	–	–	–	–	–	–	–	NE	NE
2-Chlorotoluene	–	–	–	0.045 U	–	–	–	–	–	–	–	1,600	1,600
4-Chlorotoluene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE

Sample Location[1]	GEI-9		GEI-10			GEI-12	GEI-13		GEI-14	GEI-16		Preliminary Screening Level[2]	
Sample Identification	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-04014	GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114		
Sample Date	4/1/2014	4/1/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	5-7 ft	8-10 ft	0-2 ft	4-6 ft	10-12 ft	5-7 ft	2-3 ft	6-8 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Vadose	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Native	Fill	Fill	Native	Fill	Fill	Native	Native	Fill	Native		
Bromobenzene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
Bromochloromethane	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
Bromodichloromethane	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
Bromoform (Tribromomethane)	–	–	–	0.045 U	–	–	–	–	–	–	–	0.79	0.05
Bromomethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.06	0.0038
Carbon Tetrachloride	–	–	–	0.045 U	–	–	–	–	–	–	–	0.005	0.001
Chlorobenzene	–	–	–	0.045 U	–	–	–	–	–	–	–	2.5	0.15
Chloroethane	–	–	–	0.23 U	–	–	–	–	–	–	–	96	5.6
Chloroform	–	–	–	0.045 U	–	–	–	–	–	–	–	0.0064	0.001
Chloromethane	–	–	–	0.29 U	–	–	–	–	–	–	–	0.73	0.045
cis-1,2-Dichloroethene	–	–	–	0.045 U	–	–	–	–	–	–	–	160	160
cis-1,3-Dichloropropene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
Dibromochloromethane	–	–	–	0.045 U	–	–	–	–	–	–	–	0.024	0.002
Dibromomethane	–	–	–	0.045 U	–	–	–	–	–	–	–	800	800
Dichlorodifluoromethane (CFC-12)	–	–	–	0.045 U	–	–	–	–	–	–	–	0.17	NE
Hexachlorobutadiene	–	–	–	0.23 U	–	–	–	–	–	–	–	NE	NE
Methyl Iodide (Iodomethane)	–	–	–	0.23 U	–	–	–	–	–	–	–	NE	NE
Methyl t-butyl ether	–	–	–	0.059 U	–	–	–	–	–	–	–	2.6	0.18
Methylene Chloride	–	–	–	0.23 U	–	–	–	–	–	–	–	NE	NE
n-Hexane	–	–	–	0.083 U	–	–	–	–	–	–	–	0.27	0.01
Tetrachloroethene	–	–	–	0.045 U	–	–	–	–	–	–	–	0.094	0.0049
Trans-1,2-Dichloroethene	–	–	–	0.045 U	–	–	–	–	–	–	–	22	1.3
Trans-1,3-Dichloropropene	–	–	–	0.045 U	–	–	–	–	–	–	–	NE	NE
Trichloroethene	–	–	–	0.045 U	–	–	–	–	–	–	–	0.01	0.001
Trichlorofluoromethane (CFC-11)	–	–	–	0.045 U	–	–	–	–	–	–	–	1.4	0.04
Vinyl Chloride	–	–	–	0.045 U	–	–	–	–	–	–	–	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	–	–	–	**4.7**	–	–	–	–	–	–	–	35	35
2-Methylnaphthalene	–	–	–	**7.6**	–	–	–	–	–	–	–	0.77	0.04
Acenaphthene	–	–	–	–	–	–	–	–	–	–	–	0.32	0.02
Acenaphthylene	–	–	–	–	–	–	–	–	–	–	–	NE	0.068
Anthracene	–	–	–	–	–	–	–	–	–	–	–	4.4	0.2
Benzo(a)anthracene	–	–	–	**3.9**	–	–	–	–	–	–	–	0.07	0.007
Benzo(a)pyrene	–	–	–	**3**	–	–	–	–	–	–	–	0.14	0.01
Benzo(b)fluoranthene	–	–	–	**2.4**	–	–	–	–	–	–	–	0.25	0.012
Benzo(g,h,i)perylene	–	–	–	–	–	–	–	–	–	–	–	NE	2
Benzo(k)fluoranthene	–	–	–	**1.1**	–	–	–	–	–	–	–	0.32	0.016
Chrysene	–	–	–	**2.8**	–	–	–	–	–	–	–	0.25	0.012
Dibenzo(a,h)anthracene	–	–	–	**0.68**	–	–	–	–	–	–	–	0.14	0.018
Fluoranthene	–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
Fluorene	–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
Indeno(1,2,3-c,d)pyrene	–	–	–	**1.3**	–	–	–	–	–	–	–	0.69	0.035
Naphthalene	–	–	–	**6.2**	–	–	–	–	–	–	–	0.25	0.013
Phenanthrene	–	–	–	–	–	–	–	–	–	–	–	NE	0.1
Pyrene	–	–	–	–	–	–	–	–	–	–	–	20	1
Total cPAH TEQ[3] (ND=0)	–	–	–	**3.97**	–	–	–	–	–	–	–	0.22	0.011
Total cPAH TEQ[3] (ND=0.5RL)	–	–	–	**3.97**	–	–	–	–	–	–	–	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	GEI-9		GEI-10			GEI-12	GEI-13		GEI-14	GEI-16		Preliminary Screening Level[2]	
Sample Identification	**GEI-9-3-040114**	**GEI-9-5-040114**	**GEI-10-1-033114**	**GEI-10-3-033114**	**GEI-10-6-033114**	**GEI-12-3-04014**	**GEI-13-2-040114**	**GEI-13-4-040114**	**GEI-14-3-040114**	**GEI-16-3-033114**	**GEI-16-5-033114**		
Sample Date	**4/1/2014**	**4/1/2014**	**3/31/2014**	**3/31/2014**	**3/31/2014**	**4/1/2014**	**4/1/2014**	**4/1/2014**	**4/1/2014**	**3/31/2014**	**3/31/2014**		
Sample Interval (feet bgs)	**5-7 ft**	**8-10 ft**	**0-2 ft**	**4-6 ft**	**10-12 ft**	**5-7 ft**	**2-3 ft**	**6-8 ft**	**4-6 ft**	**4-6 ft**	**8-10 ft**		
Sample Type	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Native**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Native**	**Native**	**Fill**	**Native**		
PCB-Aroclor 1016	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	0.062 U	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

Sample Location^1	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level^2	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
Field Measured Parameters													
Sheen	HS	NS	HS	NS	NS	NS	NS	NS	SS	HS	NS	NE	NE
Headspace Vapors (ppm)	>1,000	<1	24	<1	<1	<1	<1	<1	<1	32	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	--	--	--	--	--	--	--	--	--	12 U	--	20	20
Cadmium	--	--	--	--	--	--	--	--	--	0.59 U	--	1.2	1
Chromium	--	--	--	--	--	--	--	--	--	**34**	--	1,000	50
Copper	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Lead	--	--	--	--	--	--	--	--	--	**13**	--	250	24
Silver	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Zinc	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Mercury	--	--	--	--	--	--	--	--	--	0.29 U	--	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	**9,400**	3.2 U	4.0 U	3.8 U	4.0 U	3.6 U	3.9 U	5.8 U	3.3 U	3.9 U	17 U	30^2	30^2
Diesel-range hydrocarbons	**14,000**	**270**	**2,200**	**71**	29 U	29 U	29 U	29 U	**250**	**4,300**	**76**	2,000	2,000
Motor Oil-range hydrocarbons	**2,900**	**1,300**	**2,300**	61 U	58 U	58 U	59 U	59 U	**1,100**	**1,200**	**580**	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	**62**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.033 U	0.05	0.05
Toluene	**16**	0.032 U	0.040 U	0.038 U	0.040 U	0.036 U	0.039 U	0.058 U	0.033 U	0.039 U	0.17 U	3.8	0.22
Ethylbenzene	**180**	0.032 U	**0.11**	0.038 U	0.040 U	0.036 U	0.039 U	0.058 U	0.033 U	**0.26**	0.17 U	1.1	1.1
Total Xylenes	**361**	0.0320 U	**0.23**	0.0380 U	0.0400 U	0.0360 U	0.0390 U	0.0580 U	**0.042**	**0.16**	0.170 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	0.19 U	--	1.3	1.3
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	30	1.7
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	0.29 U	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	0.037 U	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE

Sample Location[1]	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level[2]	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
Bromobenzene	–	–	–	–	–	–	–	–	–	0.037 U	–	NE	NE
Bromochloromethane	–	–	–	–	–	–	–	–	–	0.037 U	–	NE	NE
Bromodichloromethane	–	–	–	–	–	–	–	–	–	0.037 U	–	NE	NE
Bromoform (Tribromomethane)	–	–	–	–	–	–	–	–	–	0.037 U	–	0.79	0.05
Bromomethane	–	–	–	–	–	–	–	–	–	0.037 U	–	0.06	0.0038
Carbon Tetrachloride	–	–	–	–	–	–	–	–	–	0.037 U	–	0.005	0.001
Chlorobenzene	–	–	–	–	–	–	–	–	–	0.037 U	–	2.5	0.15
Chloroethane	–	–	–	–	–	–	–	–	–	0.19 U	–	96	5.6
Chloroform	–	–	–	–	–	–	–	–	–	0.037 U	–	0.0064	0.001
Chloromethane	–	–	–	–	–	–	–	–	–	0.24 U	–	0.73	0.045
cis-1,2-Dichloroethene	–	–	–	–	–	–	–	–	–	0.037 U	–	160	160
cis-1,3-Dichloropropene	–	–	–	–	–	–	–	–	–	0.037 U	–	NE	NE
Dibromochloromethane	–	–	–	–	–	–	–	–	–	0.037 U	–	0.024	0.002
Dibromomethane	–	–	–	–	–	–	–	–	–	0.037 U	–	800	800
Dichlorodifluoromethane (CFC-12)	–	–	–	–	–	–	–	–	–	0.037 U	–	0.17	NE
Hexachlorobutadiene	–	–	–	–	–	–	–	–	–	0.19 U	–	NE	NE
Methyl Iodide (Iodomethane)	–	–	–	–	–	–	–	–	–	0.19 U	–	NE	NE
Methyl t-butyl ether	–	–	–	–	–	–	–	–	–	0.048 U	–	2.6	0.18
Methylene Chloride	–	–	–	–	–	–	–	–	–	0.19 U	–	NE	NE
n-Hexane	–	–	–	–	–	–	–	–	–	**0.074**	–	0.27	0.01
Tetrachloroethene	–	–	–	–	–	–	–	–	–	0.037 U	–	0.094	0.0049
Trans-1,2-Dichloroethene	–	–	–	–	–	–	–	–	–	0.037 U	–	22	1.3
Trans-1,3-Dichloropropene	–	–	–	–	–	–	–	–	–	0.037 U	–	NE	NE
Trichloroethene	–	–	–	–	–	–	–	–	–	0.037 U	–	0.01	0.001
Trichlorofluoromethane (CFC-11)	–	–	–	–	–	–	–	–	–	0.037 U	–	1.4	0.04
Vinyl Chloride	–	–	–	–	–	–	–	–	–	0.037 U	–	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	–	–	–	–	–	–	–	–	–	**6.9**	–	35	35
2-Methylnaphthalene	–	–	–	–	–	–	–	–	–	**1.3**	–	0.77	0.04
Acenaphthene	–	–	–	–	–	–	–	–	–	–	–	0.32	0.02
Acenaphthylene	–	–	–	–	–	–	–	–	–	–	–	NE	0.068
Anthracene	–	–	–	–	–	–	–	–	–	–	–	4.4	0.2
Benzo(a)anthracene	–	–	–	–	–	–	–	–	–	**0.19**	–	0.07	0.007
Benzo(a)pyrene	–	–	–	–	–	–	–	–	–	**0.11**	–	0.14	0.01
Benzo(b)fluoranthene	–	–	–	–	–	–	–	–	–	**0.08**	–	0.25	0.012
Benzo(g,h,i)perylene	–	–	–	–	–	–	–	–	–	–	–	NE	2
Benzo(k)fluoranthene	–	–	–	–	–	–	–	–	–	**0.052**	–	0.32	0.016
Chrysene	–	–	–	–	–	–	–	–	–	**0.2**	–	0.25	0.012
Dibenzo(a,h)anthracene	–	–	–	–	–	–	–	–	–	0.039 U	–	0.14	0.018
Fluoranthene	–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
Fluorene	–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
Indeno(1,2,3-c,d)pyrene	–	–	–	–	–	–	–	–	–	**0.048**	–	0.69	0.035
Naphthalene	–	–	–	–	–	–	–	–	–	**1.1**	–	0.25	0.013
Phenanthrene	–	–	–	–	–	–	–	–	–	–	–	NE	0.1
Pyrene	–	–	–	–	–	–	–	–	–	–	–	20	1
Total cPAH TEQ[3] (ND=0)	–	–	–	–	–	–	–	–	–	**0.149**	–	0.22	0.011
Total cPAH TEQ[3] (ND=0.5RL)	–	–	–	–	–	–	–	–	–	**0.151**	–	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level[2]	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	0.059 U	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

Sample Location[1]	**GEI-27**	**GEI-28**	**GEI-29**			**GEI-30**			**GEI-31**			**Preliminary Screening Level[2]**	
Sample Identification	**GEI-27-3-040214**	**GEI-28-4-040214**	**GEI-29-5-7_091217**	**GEI-29-10-12_091217**	**GEI-29-13-15_091217**	**GEI-30-2-4_091217**	**GEI-30-6-8_091217**	**GEI-30-9-11_091217**	**GEI-31-3-5_091117**	**GEI-31-6-8_091117**	**GEI-31-13-15_091117**		
Sample Date	**4/2/2014**	**4/2/2014**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/11/2017**	**9/11/2017**	**9/11/2017**		
Sample Interval (feet bgs)	**6-7.5 ft**	**6-8 ft**	**5-7 ft**	**10-12 ft**	**13-15 ft**	**2-4 ft**	**6-8 ft**	**9-11 ft**	**3-5 ft**	**6-8 ft**	**13-15 ft**		
Sample Type	**Vadose**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Fill**	**Native**	**Fill**	**Native**	**Native**	**Fill**	**Fill/Native**	**Native**	**Fill**	**Fill/Native**	**Native**		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	SS	NS	NS	NS	NS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	–	–	**3.18**	**4.47**	**5.76**	**2.24**	**2.16**	**1.23**	**1.32**	**1.5**	**1.15**	20	20
Cadmium	–	–	**0.06 J**	**0.15**	**0.06 J**	**0.06 J**	**0.05 J**	**0.13**	**0.19**	**0.02 J**	**0.03 J**	1.2	1
Chromium	–	–	**23.7**	**31.4**	**34.5**	**25.3**	**29**	**18.8**	**12.9**	**14.5**	**30.6**	1,000	50
Copper	–	–	**12.6**	**19.1**	**34.3**	**18.4**	**14.6**	**3.52**	**8.39**	**3.56**	**5.7**	NE	NE
Lead	–	–	**18**	**3.59**	**4.31**	**3.36**	**25.7**	**1.17**	**1.7**	**1.04**	**1.13**	250	24
Silver	–	–	**0.03 J**	**0.06 J**	**0.06 J**	**0.04 J**	**0.02 J**	**0.03 J**	**0.07 J**	**0.02 J**	**0.02 J**	NE	NE
Zinc	–	–	**42.5**	**38.9**	**57.6**	**34.3**	**51.6**	**19.7**	**58.4**	**21.2**	**26.8**	NE	NE
Mercury	–	–	0.02854 U	0.02750 U	0.02525 U	**0.02407**	0.02899 U	0.02235 U	0.02671 U	0.02754 U	0.02614 U	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.9 U	4.0 U	7.53 U	6.51 U	7.03 U	6.26 U	14.7 U	7.59 U	6.28 U	6.19 U	5.74 U	30[2]	30[2]
Diesel-range hydrocarbons	32 U	29 U	**9.79**	5.85 U	5.97 U	**15.4**	**105**	6.07 U	5.51 U	5.88 U	5.53 U	2,000	2,000
Motor Oil-range hydrocarbons	**70**	58 U	**70.1**	11.7 U	11.9 U	**27.3**	**259**	**17.5**	11.0 U	11.8 U	11.1 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	0.00112 U	0.00123 U	0.00122 U	**0.00044 J**	0.00141 U	0.00116 U	**0.00266**	**0.00093 J**	0.00100 U	0.05	0.05
Toluene	0.049 U	0.040 U	0.00112 U	0.00123 U	0.00122 U	0.00104 U	**0.00040 J**	**0.00034 J**	**0.00070 J**	**0.00066 J**	0.00100 U	3.8	0.22
Ethylbenzene	0.049 U	0.040 U	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	1.1	1.1
Total Xylenes	0.0490 U	0.0400 U	0.00224 U	0.00246 U	0.00245 U	0.00209 U	0.00283 U	0.00233 U	0.00288 U	0.00249 U	0.00199 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.044	0.003
1,1,1-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	42	2.2
1,1,2,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.017	0.002
1,1,2-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.025	0.002
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.061	0.0038
1,1-Dichloroethene	–	–	–	–	–	–	–	–	–	–	–	0.023	0.0011
1,1-Dichloropropene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.033	0.033
1,2,4-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	0.019	0.005
1,2-Dibromo-3-Chloropropane	–	–	–	–	–	–	–	–	–	–	–	1.3	1.3
1,2-Dibromoethane	–	–	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	30	1.7
1,2-Dichloroethane	–	–	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	0.02	0.001
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,3-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	0.08	0.067
2,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chloroethyl vinyl ether	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	1,600	1,600
4-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	NE	NE

Sample Location[1]	GEI-27	GEI-28	GEI-29			GEI-30			GEI-31			Preliminary Screening Level[2]	
Sample Identification	GEI-27-3-040214	GEI-28-4-040214	GEI-29-5-7_091217	GEI-29-10-12_091217	GEI-29-13-15_091217	GEI-30-2-4_091217	GEI-30-6-8_091217	GEI-30-9-11_091217	GEI-31-3-5_091117	GEI-31-6-8_091117	GEI-31-13-15_091117		
Sample Date	4/2/2014	4/2/2014	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/11/2017	9/11/2017	9/11/2017		
Sample Interval (feet bgs)	6-7.5 ft	6-8 ft	5-7 ft	10-12 ft	13-15 ft	2-4 ft	6-8 ft	9-11 ft	3-5 ft	6-8 ft	13-15 ft		
Sample Type	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated		
Sample Horizon	Fill	Native	Fill	Native	Native	Fill	Fill/Native	Native	Fill	Fill/Native	Native	Vadose Zone	Saturated Zode
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	2.6	0.18
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	NE	NE
n-Hexane	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	**0.00152**	**0.00106**	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	**0.0116**	0.00478 U	0.00491 U	0.00492 U	**0.0339**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	35	35
2-Methylnaphthalene	--	--	**0.0182**	0.00478 U	0.00491 U	**0.00257 J**	**0.0667**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.77	0.04
Acenaphthene	--	--	**0.00644**	0.00478 U	0.00491 U	0.00492 U	**0.0162**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.32	0.02
Acenaphthylene	--	--	**0.00902**	0.00478 U	0.00491 U	0.00492 U	**0.376**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	NE	0.068
Anthracene	--	--	**0.0212**	0.00478 U	0.00491 U	0.00492 U	**1.03**	**0.00433 J**	0.00497 U	0.00492 U	0.00492 U	4.4	0.2
Benzo(a)anthracene	--	--	**0.058**	0.00478 U	0.00491 U	0.00492 U	**2.32**	**0.0107**	0.00497 U	0.00492 U	0.00492 U	0.07	0.007
Benzo(a)pyrene	--	--	**0.0666**	**0.00286 J**	0.00491 U	0.00492 U	**2.39**	**0.0117**	0.00497 U	0.00492 U	0.00492 U	0.14	0.01
Benzo(b)fluoranthene	--	--	**0.0427**	0.00478 U	0.00491 U	0.00492 U	**1.35**	**0.00613**	0.00497 U	0.00492 U	0.00492 U	0.25	0.012
Benzo(g,h,i)perylene	--	--	**0.0595**	0.00478 U	0.00491 U	0.00492 U	**1.58**	**0.00787**	0.00497 U	0.00492 U	0.00492 U	NE	2
Benzo(k)fluoranthene	--	--	**0.021**	0.00478 U	0.00491 U	0.00492 U	**0.792**	**0.00427 J**	0.00497 U	0.00492 U	0.00492 U	0.32	0.016
Chrysene	--	--	**0.0776**	0.00478 U	0.00491 U	0.00492 U	**2.27**	**0.0117**	0.00497 U	0.00492 U	0.00492 U	0.25	0.012
Dibenzo(a,h)anthracene	--	--	**0.0104**	0.00478 U	0.00491 U	0.00492 U	**0.338**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.14	0.018
Fluoranthene	--	--	**0.104**	**0.00344 J**	0.00491 U	**0.00380 J**	**4.21**	**0.0207**	**0.00267 J**	0.00492 U	0.00492 U	0.5	0.16
Fluorene	--	--	**0.00841**	0.00478 U	0.00491 U	0.00492 U	**0.0883**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	**0.0419**	0.00478 U	0.00491 U	0.00492 U	**1.38**	**0.00626**	0.00497 U	0.00492 U	0.00492 U	0.69	0.035
Naphthalene	--	--	**0.00834**	0.00478 U	0.00491 U	**0.00286 J**	**0.143**	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.25	0.013
Phenanthrene	--	--	**0.0792**	0.00478 U	0.00491 U	**0.00463 J**	**1.38**	**0.00553**	**0.00220 J**	0.00492 U	0.00492 U	NE	0.1
Pyrene	--	--	**0.118**	**0.00449 J**	0.00491 U	**0.00576**	**4.71**	**0.025**	**0.00264 J**	0.00492 U	0.00492 U	20	1
Total cPAH TEQ[3] (ND=0)	--	--	**0.0848**	**0.00286**	0 U	0 U	**3.03**	**0.0148**	0 U	0 U	0 U	0.22	0.011
Total cPAH TEQ[3] (ND=0.5RL)	--	--	**0.0848**	**0.00408**	0.00371 U	0.00371 U	**3.03**	**0.0146**	0.00375 U	0.00371 U	0.00371 U	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	**GEI-27**	**GEI-28**	**GEI-29**			**GEI-30**			**GEI-31**			**Preliminary Screening Level**[2]	
Sample Identification	**GEI-27-3-040214**	**GEI-28-4-040214**	**GEI-29-5-7_091217**	**GEI-29-10-12_091217**	**GEI-29-13-15_091217**	**GEI-30-2-4_091217**	**GEI-30-6-8_091217**	**GEI-30-9-11_091217**	**GEI-31-3-5_091117**	**GEI-31-6-8_091117**	**GEI-31-13-15_091117**		
Sample Date	**4/2/2014**	**4/2/2014**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/12/2017**	**9/11/2017**	**9/11/2017**	**9/11/2017**		
Sample Interval (feet bgs)	**6-7.5 ft**	**6-8 ft**	**5-7 ft**	**10-12 ft**	**13-15 ft**	**2-4 ft**	**6-8 ft**	**9-11 ft**	**3-5 ft**	**6-8 ft**	**13-15 ft**		
Sample Type	**Vadose**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Fill**	**Native**	**Fill**	**Native**	**Native**	**Fill**	**Fill/Native**	**Native**	**Fill**	**Fill/Native**	**Native**		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove

Anacortes, Washington

Sample Location[1]	GEI-32			GEI-38			GEI-39			GEI-40		Preliminary Screening Level[2]	
Sample Identification	**GEI-32-3-4.5_ 091117**	**GEI-32-7-9_ 091117**	**GEI-32-10-12_ 091117**	**GEI-38-2-4_ 091917**	**GEI-38-5-7_ 091917**	**GEI-38-12-14_ 091917**	**GEI-39-1-3_ 091517**	**GEI-39-5-7_ 091517**	**GEI-39-8-10_ 091517**	**GEI-40-2-4_ 091917**	**GEI-40-5-7_ 091917**		
Sample Date	**9/11/2017**	**9/11/2017**	**9/11/2017**	**9/19/2017**	**9/19/2017**	**9/19/2017**	**9/15/2017**	**9/15/2017**	**9/15/2017**	**9/19/2017**	**9/19/2017**		
Sample Interval (feet bgs)	**3-4.5 ft**	**7-9 ft**	**10-12 ft**	**2-4 ft**	**5-7 ft**	**12-14 ft**	**1-3 ft**	**5-7 ft**	**8-10 ft**	**2-4 ft**	**5-7 ft**		
Sample Type	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Fill**	**Native**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill/Native**	**Fill**	**Fill**		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	NS	SS	NS	NS	SS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	18	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	**1.58**	**1.41**	**1.4**	**3.49**	**1.33**	**2.82**	**3.52**	**5.92**	**1.48**	**5.18**	**2.35**	20	20
Cadmium	**0.08 J**	**0.05 J**	**0.10 J**	**0.15**	**0.04 J**	**0.06 J**	**0.1**	**0.49**	**0.04 J**	**0.13**	**0.61**	1.2	1
Chromium	**16.7**	**13.4**	**24.4**	**24.9**	**33.7**	**77.7**	**19**	**34.2**	**17.4**	**19.3**	**22.1**	1,000	50
Copper	**9.43**	**6.15**	**6.55**	**66**	**6.4**	**25.2**	**43.1**	**55.4**	**7.62**	**75**	**21.9**	NE	NE
Lead	**5.45**	**0.96**	**1.27**	**195**	**2.84**	**3.28**	**129**	**121**	**10.9**	**267**	**60.1**	250	24
Silver	**0.04 J**	**0.02 J**	**0.04 J**	**0.07 J**	**0.03 J**	**0.05 J**	**0.03 J**	**0.10 J**	**0.02 J**	**0.52**	**0.04 J**	NE	NE
Zinc	**27.3**	**24.3**	**39.7**	**110**	**25.5**	**42.9**	**91.3**	**119**	**39.7**	**99.2**	**56**	NE	NE
Mercury	0.02711 U	0.02509 U	0.02399 U	**0.115**	0.0259 U	**0.0307**	**0.05142**	**0.1407**	0.02027 U	**0.0583**	**0.0587**	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	6.38 U	7.04 U	5.44 U	5.11 U	6.16 U	6.08 U	6.34 U	**426**	6.28 U	**28.5**	**20.1**	30[2]	30[2]
Diesel-range hydrocarbons	5.37 U	6.08 U	5.62 U	**68.9**	5.75 U	5.77 U	**19.5**	**1030**	**11.5**	**69.1**	**11.5**	2,000	2,000
Motor Oil-range hydrocarbons	**13.2**	12.2 U	11.2 U	**189**	11.5 U	11.5 U	**92.9**	**2,340**	**26.3**	**150**	**19.3**	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	**0.00080 J**	**0.00033 J**	**0.00032 J**	**0.00125**	**0.00060 J**	0.00105 U	0.00114 U	**0.00174**	**0.00141**	0.00120 U	**0.00237**	0.05	0.05
Toluene	**0.00028 J**	**0.00045 J**	**0.00042 J**	**0.00257**	0.00106 U	0.00105 U	0.00114 U	**0.00179**	0.00099 U	**0.00049 J**	**0.00095 J**	3.8	0.22
Ethylbenzene	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	**0.00028 J**	1.1	1.1
Total Xylenes	0.00202 U	0.00205 U	0.00201 U	**0.00137**	0.00213 U	0.00209 U	0.00229 U	**0.00519**	0.00198 U	0.00239 U	**0.00062**	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.044	0.003
1,1,1-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	42	2.2
1,1,2,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.017	0.002
1,1,2-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.025	0.002
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.061	0.0038
1,1-Dichloroethene	–	–	–	–	–	–	–	–	–	–	–	0.023	0.0011
1,1-Dichloropropene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.033	0.033
1,2,4-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	0.019	0.005
1,2-Dibromo-3-Chloropropane	–	–	–	–	–	–	–	–	–	–	–	1.3	1.3
1,2-Dibromoethane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	30	1.7
1,2-Dichloroethane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.02	0.001
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,3-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	0.08	0.067
2,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chloroethyl vinyl ether	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	1,600	1,600
4-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	NE	NE

Sample Location^1	**GEI-32**			**GEI-38**			**GEI-39**			**GEI-40**		**Preliminary Screening Level^2**	
Sample Identification	**GEI-32-3-4.5_ 091117**	**GEI-32-7-9_ 091117**	**GEI-32-10-12_ 091117**	**GEI-38-2-4_ 091917**	**GEI-38-5-7_ 091917**	**GEI-38-12-14_ 091917**	**GEI-39-1-3_ 091517**	**GEI-39-5-7_ 091517**	**GEI-39-8-10_ 091517**	**GEI-40-2-4_ 091917**	**GEI-40-5-7_ 091917**		
Sample Date	**9/11/2017**	**9/11/2017**	**9/11/2017**	**9/19/2017**	**9/19/2017**	**9/19/2017**	**9/15/2017**	**9/15/2017**	**9/15/2017**	**9/19/2017**	**9/19/2017**		
Sample Interval (feet bgs)	**3-4.5 ft**	**7-9 ft**	**10-12 ft**	**2-4 ft**	**5-7 ft**	**12-14 ft**	**1-3 ft**	**5-7 ft**	**8-10 ft**	**2-4 ft**	**5-7 ft**		
Sample Type	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Fill**	**Native**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill/Native**	**Fill**	**Fill**		
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	2.6	0.18
Methylene Chloride												NE	NE
n-Hexane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	0.00490 U	0.00495 U	0.00467 U	**0.00898**	0.00481 U	0.00479 U	**0.00436 J**	**1.97**	**0.00422 J**	**0.0135**	**0.0115**	35	35
2-Methylnaphthalene	**0.00257 J**	0.00495 U	0.00467 U	**0.0131**	0.00481 U	0.00479 U	**0.00404 J**	**1.3**	**0.00441 J**	**0.0149**	**0.0129**	0.77	0.04
Acenaphthene	0.00490 U	0.00495 U	0.00467 U	**0.00551**	**0.00247 J**	0.00479 U	0.00466 U	**0.327**	**0.00359 J**	**0.00411 J**	**0.00532**	0.32	0.02
Acenaphthylene	0.00490 U	0.00495 U	0.00467 U	**0.0305**	0.00481 U	0.00479 U	**0.00812**	**0.717**	**0.00471 J**	**0.0395**	**0.0191**	NE	0.068
Anthracene	0.00490 U	0.00495 U	0.00467 U	**0.0516**	0.00481 U	0.00479 U	**0.00974**	**1.14**	**0.00447 J**	**0.0672**	**0.0364**	4.4	0.2
Benzo(a)anthracene	0.00490 U	0.00495 U	0.00467 U	**0.169**	**0.00313 J**	0.00479 U	**0.0371**	**3.82**	**0.0112**	**0.141**	**0.094**	0.07	0.007
Benzo(a)pyrene	0.00490 U	0.00495 U	0.00467 U	**0.183**	**0.00302 J**	0.00479 U	**0.0378**	**3.29**	**0.00879**	**0.147**	**0.0898**	0.14	0.01
Benzo(b)fluoranthene	0.00490 U	0.00495 U	0.00467 U	**0.12**	**0.00188 J**	0.00479 U	**0.0303**	**2.25**	**0.00586**	**0.126**	**0.0664**	0.25	0.012
Benzo(g,h,i)perylene	0.00490 U	0.00495 U	0.00467 U	**0.155**	**0.00306 J**	0.00479 U	**0.035**	**2.21**	**0.00573**	**0.151**	**0.0655**	NE	2
Benzo(k)fluoranthene	0.00490 U	0.00495 U	0.00467 U	**0.0737**	**0.00159 J**	0.00479 U	**0.0162**	**1.32**	**0.00358 J**	**0.0744**	**0.038**	0.32	0.016
Chrysene	0.00490 U	0.00495 U	0.00467 U	**0.168**	**0.00312 J**	0.00479 U	**0.0428**	**3.66**	**0.00993**	**0.171**	**0.113**	0.25	0.012
Dibenzo(a,h)anthracene	0.00490 U	0.00495 U	0.00467 U	**0.0372**	0.00481 U	0.00479 U	**0.00847**	**0.734**	0.00495 U	**0.0322**	**0.016**	0.14	0.018
Fluoranthene	0.00490 U	0.00495 U	0.00467 U	**0.323**	**0.0138**	0.00479 U	**0.0676**	**6.78**	**0.0345**	**0.274**	**0.318**	0.5	0.16
Fluorene	0.00490 U	0.00495 U	0.00467 U	**0.016**	0.00481 U	0.00479 U	**0.00460 J**	**0.397**	**0.00397 J**	**0.0227**	**0.0217**	0.5	0.16
Indeno(1,2,3-c,d)pyrene	0.00490 U	0.00495 U	0.00467 U	**0.12**	0.00481 U	0.00479 U	**0.0273**	**1.82**	**0.0051**	**0.107**	**0.0475**	0.69	0.035
Naphthalene	0.00490 U	0.00495 U	0.00467 U	**0.0159**	**0.00287 J**	0.00479 U	**0.00557**	**1.2**	**0.00703**	**0.0186**	**0.0159**	0.25	0.013
Phenanthrene	0.00490 U	0.00495 U	0.00467 U	**0.174**	**0.00755**	0.00479 U	**0.04**	**1.82**	**0.0134**	**0.238**	**0.212**	NE	0.1
Pyrene	0.00490 U	0.00495 U	0.00467 U	**0.342**	**0.00986**	0.00479 U	**0.0765**	**7.23**	**0.0442**	**0.313**	**0.27**	20	1
Total cPAH TEQ^3 (ND=0)	0 U	0 U	0 U	**0.237**	**0.00371**	0 U	**0.0502**	**4.32**	**0.0115**	**0.197**	**0.117**	0.22	0.011
Total cPAH TEQ^3 (ND=0.5RL)	0.00370 U	0.00374 U	0.00353 U	**0.237**	**0.00419**	0.00362 U	**0.0502**	**4.32**	**0.0117**	**0.197**	**0.117**	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	GEI-32			GEI-38			GEI-39			GEI-40		Preliminary Screening Level[2]	
Sample Identification	GEI-32-3-4.5_ 091117	GEI-32-7-9_ 091117	GEI-32-10-12_ 091117	GEI-38-2-4_ 091917	GEI-38-5-7_ 091917	GEI-38-12-14_ 091917	GEI-39-1-3_ 091517	GEI-39-5-7_ 091517	GEI-39-8-10_ 091517	GEI-40-2-4_ 091917	GEI-40-5-7_ 091917		
Sample Date	9/11/2017	9/11/2017	9/11/2017	9/19/2017	9/19/2017	9/19/2017	9/15/2017	9/15/2017	9/15/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	3-4.5 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft	12-14 ft	1-3 ft	5-7 ft	8-10 ft	2-4 ft	5-7 ft		
Sample Type	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Fill	Fill		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove

Anacortes, Washington

Sample Location[1]	**GEI-40**	**GEI-41**	**GEI-42**		**GEI-43**		**GEI-44**			**MW-8**		**Preliminary Screening Level[2]**	
Sample Identification	**GEI-40-12-14_ 091917**	**GEI-41-5-7_ 091317**	**GEI-42-1-3_ 091317**	**GEI-42-6-8_ 091317**	**GEI-43-3-5_ 091317**	**GEI-43-5-7_ 091317**	**GEI-44-2-4_ 091317**	**GEI-44-7-9_ 091317**	**GEI-44-10-12_ 091317**	**MW-8-2-4_ 091917**	**MW-8-5-7_ 091917**		
Sample Date	**9/19/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/13/2017**	**9/19/2017**	**9/19/2017**		
Sample Interval (feet bgs)	**12-14 ft**	**5-7 ft**	**1-3 ft**	**6-8 ft**	**3-5 ft**	**5-7 ft**	**2-4 ft**	**7-9 ft**	**10-12 ft**	**2-4 ft**	**5-7 ft**		
Sample Type	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Vadose**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Sample Horizon	**Native**	**Natvie**	**Fill**	**Native**	**Fill/Native**	**Native**	**Fill**	**Fill/Native**	**Native**	**Fill**	**Fill**		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	**1.32**	**5.32**	**4.24**	**3.39**	**4.01**	**5.74**	**4.73**	**1.53**	**1.34**	--	--	20	20
Cadmium	**0.02 J**	**0.12**	**0.08 J**	**0.06 J**	**0.13**	**0.09 J**	**0.24**	**0.07 J**	**0.02 J**	--	--	1.2	1
Chromium	**19.7**	**37**	**55.6**	**15.8**	**36.7**	**34.6**	**25.1**	**16.3**	**19.3**	--	--	1,000	50
Copper	**10.2**	**37**	**22.4**	**12.8**	**20.8**	**32**	**22.4**	**4.48**	**4.76**	--	--	NE	NE
Lead	**1.59**	**4.96**	**4.91**	**1.88**	**8.21**	**4.12**	**28.7**	**0.94**	**1.08**	--	--	250	24
Silver	**0.02 J**	**0.07 J**	**0.04 J**	**0.03 J**	**0.04 J**	**0.06 J**	**0.07 J**	**0.01 J**	**0.005 J**	--	--	NE	NE
Zinc	**28.6**	**66.1**	**37.8**	**27.1**	**48.1**	**57**	**72.2**	**28.9**	**25.4**	--	--	NE	NE
Mercury	0.0244 U	**0.04057**	**0.02987**	0.02543 U	**0.04283**	**0.03611**	**0.03667**	0.02592 U	0.02461 U	--	--	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.61 U	7.3 U	5.59 U	5.97 U	6.11 U	6.57 U	6.23 U	6.86 U	6.4 U	6.67 U	6.32 U	30[2]	30[2]
Diesel-range hydrocarbons	5.49 U	5.64 U	5.32 U	5.86 U	5.51 U	5.83 U	**57**	5.93 U	5.75 U	**14.6**	**9.52**	2,000	2,000
Motor Oil-range hydrocarbons	11.0 U	11.3 U	10.6 U	11.7 U	11.0 U	11.7 U	**247**	11.9 U	11.5 U	**30.9**	**44.1**	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	**0.00098 J**	0.00109 U	0.00110 U	0.00097 U	**0.00474**	0.05	0.05
Toluene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	**0.00041 J**	0.00109 U	0.00110 U	**0.00030 J**	**0.00188**	3.8	0.22
Ethylbenzene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	**0.00088 J**	1.1	1.1
Total Xylenes	0.00180 U	0.00205 U	0.00211 U	0.00197 U	0.00197 U	0.00231 U	0.00213 U	0.00219 U	0.00220 U	0.00194 U	**0.00304**	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	1.3	1.3
1,2-Dibromoethane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	30	1.7
1,2-Dichloroethane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	NE	NE

Sample Location^1	GEI-40	GEI-41	GEI-42		GEI-43		GEI-44			MW-8		Preliminary Screening Level^2	
Sample Identification	GEI-40-12-14_ 091917	GEI-41-5-7_ 091317	GEI-42-1-3_ 091317	GEI-42-6-8_ 091317	GEI-43-3-5_ 091317	GEI-43-5-7_ 091317	GEI-44-2-4_ 091317	GEI-44-7-9_ 091317	GEI-44-10-12_ 091317	MW-8-2-4_ 091917	MW-8-5-7_ 091917		
Sample Date	9/19/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	12-14 ft	5-7 ft	1-3 ft	6-8 ft	3-5 ft	5-7 ft	2-4 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Natvie	Fill	Native	Fill/Native	Native	Fill	Fill/Native	Native	Fill	Fill		
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	2.6	0.18
Methylene Chloride												NE	NE
n-Hexane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	**0.0038**	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	**0.0685**	0.00494 U	0.00479 U	--	--	35	35
2-Methylnaphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	**0.104**	0.00494 U	0.00479 U	--	--	0.77	0.04
Acenaphthene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.00479 U	0.00494 U	0.00479 U	--	--	0.32	0.02
Acenaphthylene	0.00495 U	0.00473 U	**0.00198 J**	0.00491 U	**0.00285 J**	0.00486 U	**0.0138**	0.00494 U	0.00479 U	--	--	NE	0.068
Anthracene	0.00495 U	0.00473 U	**0.00143 J**	0.00491 U	**0.00845**	0.00486 U	**0.0242**	0.00494 U	0.00479 U	--	--	4.4	0.2
Benzo(a)anthracene	0.00495 U	0.00473 U	**0.00616**	0.00491 U	**0.0323**	0.00486 U	**0.0477**	0.00494 U	0.00479 U	--	--	0.07	0.007
Benzo(a)pyrene	0.00495 U	0.00473 U	**0.00701**	0.00491 U	**0.0336**	0.00486 U	**0.0515**	0.00494 U	0.00479 U	--	--	0.14	0.01
Benzo(b)fluoranthene	0.00495 U	0.00473 U	**0.00449 J**	0.00491 U	**0.0238**	0.00486 U	**0.0469**	0.00494 U	0.00479 U	--	--	0.25	0.012
Benzo(g,h,i)perylene	0.00495 U	0.00473 U	**0.00646**	0.00491 U	**0.0265**	0.00486 U	**0.1**	0.00494 U	0.00479 U	--	--	NE	2
Benzo(k)fluoranthene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	**0.0149**	0.00486 U	**0.0248**	0.00494 U	0.00479 U	--	--	0.32	0.016
Chrysene	0.00495 U	0.00473 U	**0.00664**	0.00491 U	**0.0311**	0.00486 U	**0.0605**	0.00494 U	0.00479 U	--	--	0.25	0.012
Dibenzo(a,h)anthracene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	**0.00563**	0.00486 U	**0.0129**	0.00494 U	0.00479 U	--	--	0.14	0.018
Fluoranthene	0.00495 U	0.00473 U	**0.00949**	0.00491 U	**0.0622**	0.00486 U	**0.0937**	0.00494 U	0.00479 U	--	--	0.5	0.16
Fluorene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	**0.00363 J**	0.00494 U	0.00479 U	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	0.00495 U	0.00473 U	**0.00454 J**	0.00491 U	**0.0203**	0.00486 U	**0.0536**	0.00494 U	0.00479 U	--	--	0.69	0.035
Naphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	**0.162**	0.00494 U	0.00479 U	--	--	0.25	0.013
Phenanthrene	0.00495 U	0.00473 U	**0.00436 J**	0.00491 U	**0.0109**	0.00486 U	**0.0843**	0.00494 U	0.00479 U	--	--	NE	0.1
Pyrene	0.00495 U	0.00473 U	**0.0127**	0.00491 U	**0.0674**	0.00486 U	**0.102**	0.00494 U	0.00479 U	--	--	20	1
Total cPAH TEQ^3 (ND=0)	0 U	0 U	**0.0086**	0 U	**0.0436**	0 U	**0.0707**	0 U	0 U	--	--	0.22	0.011
Total cPAH TEQ^3 (ND=0.5RL)	0.00374 U	0.00357 U	**0.00908**	0.00371 U	**0.0436**	0.00367 U	**0.0707**	0.00373 U	0.00362 U	--	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location[1]	GEI-40	GEI-41	GEI-42		GEI-43		GEI-44			MW-8		Preliminary Screening Level[2]	
Sample Identification	GEI-40-12-14_ 091917	GEI-41-5-7_ 091317	GEI-42-1-3_ 091317	GEI-42-6-8_ 091317	GEI-43-3-5_ 091317	GEI-43-5-7_ 091317	GEI-44-2-4_ 091317	GEI-44-7-9_ 091317	GEI-44-10-12_ 091317	MW-8-2-4_ 091917	MW-8-5-7_ 091917		
Sample Date	9/19/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	12-14 ft	5-7 ft	1-3 ft	6-8 ft	3-5 ft	5-7 ft	2-4 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Natvie	Fill	Native	Fill/Native	Native	Fill	Fill/Native	Native	Fill	Fill		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

SD-01				SD-02				SD-03			Preliminary Screening Level[2]	
SD-1-2-4	**SD-1-5-6.5**	**SD-1-10-12**	**SD-1-17-19**	**SD-2-2-3**	**SD-2-6-8**	**SD-2-11-12**	**SD-2-14-15**	**SD-3-2.5-3.5**	**SD-3-7-8.5**	**SD-3-12-13**		
10/17/18	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**		
2-4 ft	**5-6.5 ft**	**10-12 ft**	**17-19 ft**	**2-3 ft**	**6-8 ft**	**11-12 ft**	**14-15 ft**	**2.5-3.5 ft**	**7-8.5 ft**	**12-13 ft**		
Vadose	**Vadose**	**Saturated**	**Saturated**	**VADOSE**	**VADOSE**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Native**		
SS	HS	HS	NS	SS	MS	NS	NS	SS	HS	NS	NE	NE
<1	315	121	<1	9	226	<1	<1	30	428	<1	NE	NE
--	--	--	--	--	--	--	--	--	--	--	20	20
--	--	--	--	--	--	--	--	--	--	--	1.2	1
--	--	--	--	--	--	--	--	--	--	--	1,000	50
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	250	24
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	0.07	0.07
6.16	**3,050**	**1,880**	4.92 U	**52.3**	**382**	4.69 U	4.73 U	**356**	**3,880**	**225**	30[2]	30[2]
218	**6,180**	**2,860**	5.71 U	**855**	**1,820**	5.72 U	5.71 U	**639**	**6,120**	**291**	2,000	2,000
1,770	**2,310**	**1,830**	11.4 U	**251**	**198**	11.4 U	11.4 U	**472**	**1,290**	**54.5**	2,000	2,000
0.00104	**0.0320 J**	0.0505 U	0.00108 U	**0.00425**	**0.0101**	**0.00081**	**0.00058 J**	**0.00336**	**0.984**	**0.00091**	0.05	0.05
0.00075	0.0459 U	0.0505 U	**0.00131**	**0.00288**	**0.00418**	**0.00044 J**	0.00072 U	**0.0488**	**0.674**	**0.00048 J**	3.8	0.22
0.00074 U	**0.0465**	0.0505 U	0.00108 U	**0.00065 J**	**0.00831**	0.00072 U	0.00072 U	**0.00084**	**0.906**	**0.00128**	1.1	1.1
0.000930	**0.148**	0.101 U	0.00217 U	**0.00300**	**0.0109**	0.00145 U	0.00144 U	**0.00592**	**0.916**	**0.000570**	2.8	0.16
--	--	--	--	--	--	--	--	--	--	--	0.044	0.003
--	--	--	--	--	--	--	--	--	--	--	42	2.2
--	--	--	--	--	--	--	--	--	--	--	0.017	0.002
--	--	--	--	--	--	--	--	--	--	--	0.025	0.002
--	--	--	--	--	--	--	--	--	--	--	0.061	0.0038
--	--	--	--	--	--	--	--	--	--	--	0.023	0.0011
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	0.033	0.033
--	--	--	--	--	--	--	--	--	--	--	0.019	0.005
--	--	--	--	--	--	--	--	--	--	--	1.3	1.3
--	--	--	--	--	--	--	--	--	--	--	0.002	0.001
--	--	--	--	--	--	--	--	--	--	--	30	1.7
--	--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	0.08	0.067
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	1,600	1,600
--	--	--	--	--	--	--	--	--	--	--	NE	NE

SD-01				SD-02				SD-03			Preliminary Screening Level^2	
SD-1-2-4	**SD-1-5-6.5**	**SD-1-10-12**	**SD-1-17-19**	**SD-2-2-3**	**SD-2-6-8**	**SD-2-11-12**	**SD-2-14-15**	**SD-3-2.5-3.5**	**SD-3-7-8.5**	**SD-3-12-13**		
10/17/18	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**		
2-4 ft	**5-6.5 ft**	**10-12 ft**	**17-19 ft**	**2-3 ft**	**6-8 ft**	**11-12 ft**	**14-15 ft**	**2.5-3.5 ft**	**7-8.5 ft**	**12-13 ft**		
Vadose	**Vadose**	**Saturated**	**Saturated**	**VADOSE**	**VADOSE**	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Native**		
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	0.79	0.05
–	–	–	–	–	–	–	–	–	–	–	0.06	0.0038
–	–	–	–	–	–	–	–	–	–	–	0.005	0.001
–	–	–	–	–	–	–	–	–	–	–	2.5	0.15
–	–	–	–	–	–	–	–	–	–	–	96	5.6
–	–	–	–	–	–	–	–	–	–	–	0.0064	0.001
–	–	–	–	–	–	–	–	–	–	–	0.73	0.045
–	–	–	–	–	–	–	–	–	–	–	160	160
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	0.024	0.002
–	–	–	–	–	–	–	–	–	–	–	800	800
–	–	–	–	–	–	–	–	–	–	–	0.17	NE
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	2.6	0.18
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	0.27	0.01
–	–	–	–	–	–	–	–	–	–	–	0.094	0.0049
–	–	–	–	–	–	–	–	–	–	–	22	1.3
–	–	–	–	–	–	–	–	–	–	–	NE	NE
–	–	–	–	–	–	–	–	–	–	–	0.01	0.001
–	–	–	–	–	–	–	–	–	–	–	1.4	0.04
–	–	–	–	–	–	–	–	–	–	–	0.006	0.001
–	–	–	–	–	–	–	–	–	–	–	35	35
–	–	–	–	–	–	–	–	–	–	–	0.77	0.04
–	–	–	–	–	–	–	–	–	–	–	0.32	0.02
–	–	–	–	–	–	–	–	–	–	–	NE	0.068
–	–	–	–	–	–	–	–	–	–	–	4.4	0.2
–	–	–	–	–	–	–	–	–	–	–	0.07	0.007
–	–	–	–	–	–	–	–	–	–	–	0.14	0.01
–	–	–	–	–	–	–	–	–	–	–	0.25	0.012
–	–	–	–	–	–	–	–	–	–	–	NE	2
–	–	–	–	–	–	–	–	–	–	–	0.32	0.016
–	–	–	–	–	–	–	–	–	–	–	0.25	0.012
–	–	–	–	–	–	–	–	–	–	–	0.14	0.018
–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
–	–	–	–	–	–	–	–	–	–	–	0.5	0.16
–	–	–	–	–	–	–	–	–	–	–	0.69	0.035
–	–	–	–	–	–	–	–	–	–	–	0.25	0.013
–	–	–	–	–	–	–	–	–	–	–	NE	0.1
–	–	–	–	–	–	–	–	–	–	–	20	1
–	–	–	–	–	–	–	–	–	–	–	0.22	0.011
–	–	–	–	–	–	–	–	–	–	–	0.22	0.011

SD-01				SD-02				SD-03			Preliminary Screening Level[2]	
SD-1-2-4	SD-1-5-6.5	SD-1-10-12	SD-1-17-19	SD-2-2-3	SD-2-6-8	SD-2-11-12	SD-2-14-15	SD-3-2.5-3.5	SD-3-7-8.5	SD-3-12-13		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18		
2-4 ft	5-6.5 ft	10-12 ft	17-19 ft	2-3 ft	6-8 ft	11-12 ft	14-15 ft	2.5-3.5 ft	7-8.5 ft	12-13 ft		
Vadose	Vadose	Saturated	Saturated	VADOSE	VADOSE	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill	Native		
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

SD-04			SD-05			SD-06				Preliminary Screening Level^{2}	
SD-4-2.5-3.5	SD-4-6.5-7.5	SD-4-12-13	SD-5-0.5-2	SD-5-5-6	SD-5-9-10	SD-6-1-2	SD-6-4-5	SD-6-6-7	SD-6-9-10		
10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18		
2.5-3.5 ft	6.5-7.5 ft	12-13 ft	0.5-2 ft	5-6 ft	9-10 ft	1-2 ft	4-5 ft	6-7 ft	9-10 ft		
Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill	Native		
MS	HS	NS	NS	SS	NS	NS	NS	NS	NS	NE	NE
74	290	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
--	--	--	--	--	--	--	--	--	--	20	20
--	--	--	--	--	--	--	--	--	--	1.2	1
--	--	--	--	--	--	--	--	--	--	1,000	50
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	250	24
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.07	0.07
723	**3,040**	**20.7**	5.04 U	**8.61**	4.45 U	5.6 U	7.22 U	6.42 U	**10**	30^{2}	30^{2}
974	**5,150**	**17.9**	**14.4**	**31.2**	5.59 U	**15.5**	5.61 U	6.42 U	**138**	2,000	2,000
4,280	**4,210**	**12.5**	**22.5**	**27.5**	11.2 U	**58.1**	11.2 U	12.8 U	**289**	2,000	2,000
0.0522 U	0.0692 U	0.00081 U	**0.00076 J**	**0.00067 J**	0.00088 U	**0.00260**	**0.00088 J**	**0.00064 J**	0.00092 U	0.05	0.05
8.57	**7.32**	**0.00059 J**	**0.00068 J**	0.00080 J	0.00088 U	**0.00204**	0.00119 U	0.00092 U	0.00092 U	3.8	0.22
0.0907	**0.0943**	0.00081 U	0.00097 U	0.00112 U	0.00088 U	0.00096 U	0.00119 U	0.00092 U	0.00092 U	1.1	1.1
0.493	**0.492**	0.00161 U	0.00194 U	0.00224 U	0.00176 U	**0.00105**	0.00238 U	0.00184 U	0.00183 U	2.8	0.16
--	--	--	--	--	--	--	--	--	--	0.044	0.003
--	--	--	--	--	--	--	--	--	--	42	2.2
--	--	--	--	--	--	--	--	--	--	0.017	0.002
--	--	--	--	--	--	--	--	--	--	0.025	0.002
--	--	--	--	--	--	--	--	--	--	0.061	0.0038
--	--	--	--	--	--	--	--	--	--	0.023	0.0011
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.033	0.033
--	--	--	--	--	--	--	--	--	--	0.019	0.005
--	--	--	--	--	--	--	--	--	--	1.3	1.3
--	--	--	--	--	--	--	--	--	--	0.002	0.001
--	--	--	--	--	--	--	--	--	--	30	1.7
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.08	0.067
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	1,600	1,600
--	--	--	--	--	--	--	--	--	--	NE	NE

SD-04			SD-05			SD-06				Preliminary Screening Level^2	
SD-4-2.5-3.5	SD-4-6.5-7.5	SD-4-12-13	SD-5-0.5-2	SD-5-5-6	SD-5-9-10	SD-6-1-2	SD-6-4-5	SD-6-6-7	SD-6-9-10		
10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18		
2.5-3.5 ft	6.5-7.5 ft	12-13 ft	0.5-2 ft	5-6 ft	9-10 ft	1-2 ft	4-5 ft	6-7 ft	9-10 ft		
Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill	Native		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.79	0.05
--	--	--	--	--	--	--	--	--	--	0.06	0.0038
--	--	--	--	--	--	--	--	--	--	0.005	0.001
--	--	--	--	--	--	--	--	--	--	2.5	0.15
--	--	--	--	--	--	--	--	--	--	96	5.6
--	--	--	--	--	--	--	--	--	--	0.0064	0.001
--	--	--	--	--	--	--	--	--	--	0.73	0.045
--	--	--	--	--	--	--	--	--	--	160	160
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.024	0.002
--	--	--	--	--	--	--	--	--	--	800	800
--	--	--	--	--	--	--	--	--	--	0.17	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	2.6	0.18
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.27	0.01
--	--	--	--	--	--	--	--	--	--	0.094	0.0049
--	--	--	--	--	--	--	--	--	--	22	1.3
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.01	0.001
--	--	--	--	--	--	--	--	--	--	1.4	0.04
--	--	--	--	--	--	--	--	--	--	0.006	0.001
--	--	--	--	--	--	--	--	--	--	35	35
--	--	--	--	--	--	--	--	--	--	0.77	0.04
--	--	--	--	--	--	--	--	--	--	0.32	0.02
--	--	--	--	--	--	--	--	--	--	NE	0.068
--	--	--	--	--	--	--	--	--	--	4.4	0.2
--	--	--	--	--	--	--	--	--	--	0.07	0.007
--	--	--	--	--	--	--	--	--	--	0.14	0.01
--	--	--	--	--	--	--	--	--	--	0.25	0.012
--	--	--	--	--	--	--	--	--	--	NE	2
--	--	--	--	--	--	--	--	--	--	0.32	0.016
--	--	--	--	--	--	--	--	--	--	0.25	0.012
--	--	--	--	--	--	--	--	--	--	0.14	0.018
--	--	--	--	--	--	--	--	--	--	0.5	0.16
--	--	--	--	--	--	--	--	--	--	0.5	0.16
--	--	--	--	--	--	--	--	--	--	0.69	0.035
--	--	--	--	--	--	--	--	--	--	0.25	0.013
--	--	--	--	--	--	--	--	--	--	NE	0.1
--	--	--	--	--	--	--	--	--	--	20	1
--	--	--	--	--	--	--	--	--	--	0.22	0.011
--	--	--	--	--	--	--	--	--	--	0.22	0.011

SD-04			SD-05			SD-06				Preliminary Screening Level[2]	
SD-4-2.5-3.5	**SD-4-6.5-7.5**	**SD-4-12-13**	**SD-5-0.5-2**	**SD-5-5-6**	**SD-5-9-10**	**SD-6-1-2**	**SD-6-4-5**	**SD-6-6-7**	**SD-6-9-10**		
10/18/18	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**	**10/18/18**		
2.5-3.5 ft	**6.5-7.5 ft**	**12-13 ft**	**0.5-2 ft**	**5-6 ft**	**9-10 ft**	**1-2 ft**	**4-5 ft**	**6-7 ft**	**9-10 ft**		
Vadose	**Saturated**	**Saturated**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Native**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill**	**Native**		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

SD-07				SD-08				SD-09	SD-10		
SD-7-1-2	**SD-7-2-3.5**	**SD-7-9-10**	**SD-7-18.5-20**	**SD-8-2-4**	**SD-8-6-8**	**SD-8-9-11**	**SD-8-13-15**	**SD-9-2.5-4**	**SD-10-4-5**	**Preliminary Screening Level^2**	
10/17/18	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/18/18**	**10/18/18**		
1-2 ft	**2-3.5 ft**	**9-10 ft**	**18.5-20 ft**	**2-4 ft**	**6-8 ft**	**9-11 ft**	**13-15 ft**	**2.5-4 ft**	**4-5 ft**		
Vadose	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**		
SS	SS	NS	NS	HS	HS	NS	NS	MS	HS	NE	NE
<1	<1	<1	<1	336	98	30	<1	4	293	NE	NE
--	--	--	--	--	--	--	--	**2.96**	**5.53**	20	20
--	--	--	--	--	--	--	--	**0.75**	**6.62**	1.2	1
--	--	--	--	--	--	--	--	**24.3**	**30.3**	1,000	50
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	**154**	**2,050**	250	24
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	**0.0529**	**3.25**	0.07	0.07
81.7	**23.4**	8.9 U	**33.7**	**5,350**	**1,430**	**95.5**	**46.6**	**142**	**1,820**	30^2	30^2
315	**349**	6.32 U	5.86 U	**6,760**	**681**	**58.3**	**33.2**	**1,780**	**5,730**	2,000	2,000
760	**531**	12.6 U	11.7 U	**423**	**87.1**	11.6 U	11.5 U	**1,950**	**433**	2,000	2,000
0.00121	0.00168	0.00133 U	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00118	0.0305	0.05	0.05
0.00105 J	**0.00091 J**	**0.00080 J**	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00144	0.0403	3.8	0.22
0.00106 U	0.00135 U	0.00133 U	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00031 J	0.107	1.1	1.1
0.00179	**0.00142**	**0.00140**	0.00225 U	0.0908 U	0.0803 U	0.00131 U	0.00145 U	0.00117	0.526	2.8	0.16
--	--	--	--	--	--	--	--	--	--	0.044	0.003
--	--	--	--	--	--	--	--	--	--	42	2.2
--	--	--	--	--	--	--	--	--	--	0.017	0.002
--	--	--	--	--	--	--	--	--	--	0.025	0.002
--	--	--	--	--	--	--	--	--	--	0.061	0.0038
--	--	--	--	--	--	--	--	--	--	0.023	0.0011
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.033	0.033
--	--	--	--	--	--	--	--	--	--	0.019	0.005
--	--	--	--	--	--	--	--	--	--	1.3	1.3
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	0.002	0.001
--	--	--	--	--	--	--	--	--	--	30	1.7
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	0.02	0.001
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.08	0.067
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	1,600	1,600
--	--	--	--	--	--	--	--	--	--	NE	NE

SD-07				SD-08				SD-09	SD-10	Preliminary Screening Level^2	
SD-7-1-2	SD-7-2-3.5	SD-7-9-10	SD-7-18.5-20	SD-8-2-4	SD-8-6-8	SD-8-9-11	SD-8-13-15	SD-9-2.5-4	SD-10-4-5		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/18/18	10/18/18		
1-2 ft	2-3.5 ft	9-10 ft	18.5-20 ft	2-4 ft	6-8 ft	9-11 ft	13-15 ft	2.5-4 ft	4-5 ft		
Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.79	0.05
--	--	--	--	--	--	--	--	--	--	0.06	0.0038
--	--	--	--	--	--	--	--	--	--	0.005	0.001
--	--	--	--	--	--	--	--	--	--	2.5	0.15
--	--	--	--	--	--	--	--	--	--	96	5.6
--	--	--	--	--	--	--	--	--	--	0.0064	0.001
--	--	--	--	--	--	--	--	--	--	0.73	0.045
--	--	--	--	--	--	--	--	--	--	160	160
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.024	0.002
--	--	--	--	--	--	--	--	--	--	800	800
--	--	--	--	--	--	--	--	--	--	0.17	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	2.6	0.18
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.27	0.01
--	--	--	--	--	--	--	--	--	--	0.094	0.0049
--	--	--	--	--	--	--	--	--	--	22	1.3
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.01	0.001
--	--	--	--	--	--	--	--	--	--	1.4	0.04
--	--	--	--	--	--	--	--	--	--	0.006	0.001
0.659	**0.234**	**0.0126**	**0.00128 J**	--	--	--	--	**0.0856**	**2.24**	35	35
0.911	**0.526**	**0.00729**	**0.00129 J**	--	--	--	--	**0.0603**	**3.23**	0.77	0.04
0.1	**0.0215**	0.00498 U	0.00498 U	--	--	--	--	0.0483 U	0.0518 U	0.32	0.02
0.706	**0.272**	**0.0177**	**0.00165 J**	--	--	--	--	**0.0268**	**0.655**	NE	0.068
0.106	**0.0134**	**0.00121 J**	**0.00167**	--	--	--	--	0.0483 U	**0.164**	4.4	0.2
0.209	**0.0247**	0.00498 U	0.00498 U	--	--	--	--	**0.0193**	**0.0793**	0.07	0.007
0.2	**0.0300**	0.00498 U	0.00498 U	--	--	--	--	**0.0551**	**0.0486**	0.14	0.01
0.202	**0.0356**	0.00498 U	0.00498 U	--	--	--	--	**0.0409**	**0.0457**	0.25	0.012
0.459	**0.0354**	0.00498 U	0.00498 U	--	--	--	--	**0.0378**	**0.0397**	NE	2
0.188	**0.0465**	0.00498 U	0.00498 U	--	--	--	--	**0.0968**	**0.0472**	0.32	0.016
0.141	**0.0133**	0.00498 U	0.00498 U	--	--	--	--	**0.0175**	**0.0185**	0.25	0.012
0.376	**0.0531**	0.00498 U	0.00498 U	--	--	--	--	**0.137**	**0.104**	0.14	0.018
0.0449	**0.00605**	0.00498 U	0.00498 U	--	--	--	--	0.0483 U	0.0518 U	0.5	0.16
0.617	**0.0648**	**0.00151 J**	**0.00143 J**	--	--	--	--	**0.0797**	**0.211**	0.5	0.16
0.0257	**0.00871**	0.00297 J	0.00498 U	--	--	--	--	**0.103**	**0.582**	0.69	0.035
0.171	**0.0349**	0.00498 U	0.00498 U	--	--	--	--	**0.0211**	**0.0254**	0.25	0.013
0.852	**0.195**	**0.00267 J**	**0.00124 J**	--	--	--	--	**0.267**	**1.21**	NE	0.1
0.423	**0.0687**	**0.00177 J**	**0.00110 J**	--	--	--	--	**0.212**	**0.31**	20	1
0.307	**0.0481**	0 U	0 U	--	--	--	--	**0.0554**	**0.0600**	0.22	0.011
0.307	**0.0481**	0.00376 U	0.00376 U	--	--	--	--	**0.0578**	**0.0626**	0.22	0.011

SD-07				SD-08				SD-09	SD-10	Preliminary Screening Level[2]	
SD-7-1-2	**SD-7-2-3.5**	**SD-7-9-10**	**SD-7-18.5-20**	**SD-8-2-4**	**SD-8-6-8**	**SD-8-9-11**	**SD-8-13-15**	**SD-9-2.5-4**	**SD-10-4-5**		
10/17/18	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/17/18**	**10/18/18**	**10/18/18**		
1-2 ft	**2-3.5 ft**	**9-10 ft**	**18.5-20 ft**	**2-4 ft**	**6-8 ft**	**9-11 ft**	**13-15 ft**	**2.5-4 ft**	**4-5 ft**		
Vadose	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Saturated**	**Saturated**	**Vadose**	**Vadose**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**	**Fill**	**Fill**	**Fill**	**Native**	**Fill**	**Fill**		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7

Remedial Investigation and Supplemental Investigation Soil Analytical Results

Quiet Cove
Anacortes, Washington

MW_12				Preliminary Screening Level^2	
MW-12-3-4	**MW-12-7.5-9.5**	**MW-12-11-12**	**MW-12-14-15**		
10/18/18	**10/18/18**	**10/18/18**	**10/18/18**		
3-4 ft	**7.5-9.5 ft**	**11-12 ft**	**14-15 ft**		
Vadose	**Saturated**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**		
NS	HS	SS	NS	NE	NE
<1	125	243	<1	NE	NE
--	--	--	--	20	20
--	--	--	--	1.2	1
--	--	--	--	1,000	50
--	--	--	--	NE	NE
--	--	--	--	250	24
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.07	0.07
5.23 U	**3,010**	**762**	6.08 U	30^{2}	30^{2}
36.4	**1,300**	**220**	5.75 U	2,000	2,000
69.9	**200**	**57.6**	11.5 U	2,000	2,000
0.00057 J	0.0475 U	0.00134	0.00086 U	0.05	0.05
0.00246	0.0475 U	0.00391	0.00086 U	3.8	0.22
0.00075 U	0.0475 U	0.00098 U	0.00086 U	1.1	1.1
0.000380	0.0362	0.00161	0.00172 U	2.8	0.16
--	--	--	--	0.044	0.003
--	--	--	--	42	2.2
--	--	--	--	0.017	0.002
--	--	--	--	0.025	0.002
--	--	--	--	0.061	0.0038
--	--	--	--	0.023	0.0011
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.033	0.033
--	--	--	--	0.019	0.005
--	--	--	--	1.3	1.3
--	--	--	--	0.002	0.001
--	--	--	--	30	1.7
--	--	--	--	0.02	0.001
--	--	--	--	0.02	0.001
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.08	0.067
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	1,600	1,600
--	--	--	--	NE	NE

MW_12				Preliminary Screening Level^2	
MW-12-3-4	**MW-12-7.5-9.5**	**MW-12-11-12**	**MW-12-14-15**		
10/18/18	**10/18/18**	**10/18/18**	**10/18/18**		
3-4 ft	**7.5-9.5 ft**	**11-12 ft**	**14-15 ft**		
Vadose	**Saturated**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**		
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.79	0.05
--	--	--	--	0.06	0.0038
--	--	--	--	0.005	0.001
--	--	--	--	2.5	0.15
--	--	--	--	96	5.6
--	--	--	--	0.0064	0.001
--	--	--	--	0.73	0.045
--	--	--	--	160	160
--	--	--	--	NE	NE
--	--	--	--	0.024	0.002
--	--	--	--	800	800
--	--	--	--	0.17	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	2.6	0.18
--	--	--	--	NE	NE
--	--	--	--	0.27	0.01
--	--	--	--	0.094	0.0049
--	--	--	--	22	1.3
--	--	--	--	NE	NE
--	--	--	--	0.01	0.001
--	--	--	--	1.4	0.04
--	--	--	--	0.006	0.001
0.0110	**1.77**	**0.223**	0.00307 J	35	35
0.0205	**1.89**	**0.134**	0.00180 J	0.77	0.04
0.00566	**0.0737**	**0.0118**	0.00481 U	0.32	0.02
0.0154	**0.146**	**0.0190**	0.00481 U	NE	0.068
0.00208 J	--	--	--	4.4	0.2
0.00998	--	--	--	0.07	0.007
0.0140	--	--	--	0.14	0.01
0.0161	--	--	--	0.25	0.012
0.0170	--	--	--	NE	2
0.0204	--	--	--	0.32	0.016
0.00844	--	--	--	0.25	0.012
0.0231	--	--	--	0.14	0.018
0.00268 J	--	--	--	0.5	0.16
0.0378	--	--	--	0.5	0.16
0.0112	--	--	--	0.69	0.035
0.0124	--	--	--	0.25	0.013
0.0286	--	--	--	NE	0.1
0.0390	--	--	--	20	1
0.0218	--	--	--	0.22	0.011
0.0218	--	--	--	0.22	0.011

MW_12				Preliminary Screening Level[2]	
MW-12-3-4	**MW-12-7.5-9.5**	**MW-12-11-12**	**MW-12-14-15**		
10/18/18	**10/18/18**	**10/18/18**	**10/18/18**		
3-4 ft	**7.5-9.5 ft**	**11-12 ft**	**14-15 ft**		
Vadose	**Saturated**	**Saturated**	**Saturated**	**Vadose Zone**	**Saturated Zode**
Fill	**Fill**	**Fill**	**Native**		
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.062	0.05

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[3] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Tabl

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RL = Reporting Limit

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Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 8

Remedial Investigation Groundwater Analytical Results

Quiet Cove

Anacortes, Washington

Sample Location[1]	Preliminary Screening Level[2]	MW_1		MW_2		MW_3		MW_4		MW_5	
Sample Identification		**MW-1-110917**	**MW-1-031918**	**MW-2-110917**	**MW-2-032018**	**MW-3-101817**	**MW-3-032018**	**MW-4-101817**	**MW-4-031918**	**MW-5-101817**	**MW-5-032018**
Date Sampled		**11/09/17**	**03/19/18**	**11/09/17**	**03/20/18**	**10/18/17**	**03/20/18**	**10/18/17**	**03/19/18**	**10/18/17**	**03/20/18**
Well Location		**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Upland**	**Upland**	**Upland**	**Upland**
Field Measured Parameters											
Top of Casing Elevation[3] (feet)	NE	11.91	11.91	12.01	12.01	12.42	12.42	12.43	12.43	14.96	14.96
Depth to Groundwater (feet)	NE	3.93	4.56	5.12	5.48	6.32	5.82	5.68	5.62	5.54	4.82
Groundwater Elevation (feet)	NE	7.98	7.35	6.89	6.53	6.10	6.60	6.75	6.81	9.42	10.14
pH	NE	7.46	5.89	7.41	6.21	6.36	6.21	6.15	6.05	6.14	5.79
Conductivity (µS/cm)	NE	195	132	493	362	740	520	860	367	384	141
Turbidity[5] (NTU)	NE	4.0	3.3	3.8	4.8	9.3	6.8	5.0	8.5	17.8	21.4
Dissolved Oxygen (mg/l)	NE	1.27	1.53	0.28	2.02	0.40	0.11	0.06	0.16	0.10	0.89
Temperature (°C)	NE	11.5	8.0	13.5	9.8	15.0	10.9	15.4	11.1	15.4	9.7
Total Dissolved Solids (mg/l)	NE	171.0	126.7	411.5	332.8	591.5	468.0	682.5	324.6	298.9	128.1
Oxidation Reduction Potential (mV)	NE	113.9	39.2	93.2	70.1	75.6	64.9	66.5	76.9	72.1	79.6
Salinity (ppt)	NE	0.13	0.09	0.31	0.24	0.45	0.35	0.52	0.24	0.23	0.09
Total Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	**2.42 J**	**0.86**	**7.69**	**5.69**	**1.84**	**2.51**	**1.5**	**1.97**	**4.55**	**2.13**
Cadmium	8.8	**0.0420 J**	**0.100 U**	**0.0410 J**	**0.0350 J**	**0.0710 J**	**0.0470 J**	0.500 U	0.118	0.200 U	0.104
Chromium	50	**0.520 J**	**0.323 J**	**2.23**	**1.28**	**7.32**	**4.9**	**3.29**	**0.394 J**	**1.6**	**6.22**
Copper	NE	**1.63 J**	**1.24**	**2.46**	**2.15**	**1.92**	**1.36**	2.50 U	1.42	**1.85**	**6.23**
Lead	2.1	**0.403 J**	**0.361**	**0.261**	**0.204**	**0.227**	**0.276**	**3.75**	**0.0850 J**	**0.408**	**1.66**
Silver	NE	0.200 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U	1.00 UJ	0.200 U	0.400 UJ	0.0260 J
Zinc	NE	**4.56 J**	**2.80 J**	**2.56 J**	**2.42 J**	**27.7**	**5.66**	**78.5**	**3.01 J**	**2.37 J**	**10.2**
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Dissolved Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	**1.2**	**0.614**	**7.57**	**4.66**	**1.13**	**1.42**	**1.53**	**1.71**	**4.6**	**0.648**
Cadmium	8.8	**0.0360 J**	**0.100 U**	0.100 U	0.100 U	0.100 U	0.100 U	0.200 U	0.0660 J	**0.0620 J**	**0.0450 J**
Chromium	50	**0.228 J**	**0.333 J**	**1.58**	**0.99**	**6.28**	**4.55**	**4.45**	**0.355 J**	**0.606 J**	**0.375 J**
Copper	NE	**1.1**	**0.931**	**1.75**	**1.7**	**0.719**	**0.525**	**0.948 J**	**1.21**	**0.980 J**	**1.23**
Lead	2.1	0.100 U	0.209	0.100 U	0.0860 J	**0.0950 J**	**0.113**	0.200 U	0.100 U	0.200 U	0.100 U
Silver	NE	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.400 U	0.200 U	0.400 U	0.200 U
Zinc	NE	**4.43**	**2.14 J**	**2.86 J**	**5.29**	**15.9**	**2.41 J**	**2.01 J**	**2.90 J**	8.00 U	0.835 J
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Petroleum Hydrocarbons by NWTPH-G/Dx (µg/L)											
Gasoline-range hydrocarbons	800[4]	100 U	100 U	100 U	100 U	**234**	100 U	**447**	100 U	**112**	100 U
Diesel-range hydrocarbons	500	**665 J**	**388**	**3,530**	**1,600**	**1,940**	**1,270**	**1,460**	**293**	**637**	100 U
Motor Oil-range hydrocarbons	500	200 UJ	200 U	**1,080**	**700**	**461**	**279**	**285**	200 U	200 U	200 U

Sample Location[1]	**Preliminary Screening Level**[2]	**MW_1**		**MW_2**		**MW_3**		**MW_4**		**MW_5**	
Sample Identification		**MW-1-110917**	**MW-1-031918**	**MW-2-110917**	**MW-2-032018**	**MW-3-101817**	**MW-3-032018**	**MW-4-101817**	**MW-4-031918**	**MW-5-101817**	**MW-5-032018**
Date Sampled		**11/09/17**	**03/19/18**	**11/09/17**	**03/20/18**	**10/18/17**	**03/20/18**	**10/18/17**	**03/19/18**	**10/18/17**	**03/20/18**
Well Location		**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Upland**	**Upland**	**Upland**	**Upland**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/L)											
Benzene	2.4	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.11 J**	0.20 U	0.20 U	0.20 U
Toluene	520	0.20 U	0.20 U	0.20 U	0.20 U	**0.04 J**	0.20 U	**0.09 J**	0.20 U	0.20 U	0.20 U
Ethylbenzene	130	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Xylenes	310	0.40 U	0.40 U	0.40 U	0.40 U	**0.25**	0.40 U	**0.21**	0.40 U	**0.07**	0.40 U
1,2-Dibromoethane (EDB)	0.01	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane (EDC)	5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methyl t-butyl ether (MTBE)	610	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Hexane	7.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270 SIM (µg/L)											
Benzo(a)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	**0.001 J**	0.010 U	**0.006 J**	**0.002 J**	**0.0009 J**	**0.001 J**
Benzo(a)pyrene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	**0.003 J**	0.010 U	0.010 U
Benzo(b)fluoranthene	0.01	**0.0007 J**	0.010 U	**0.0008 J**	0.010 U	**0.001 J**	0.010 U	**0.004 J**	**0.002 J**	0.010 U	**0.002 J**
Benzo(k)fluoranthene	0.013	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.010 U	0.010 U	0.010 U
Chrysene	0.031	**0.002 J**	0.010 U	0.010 U	0.010 U	**0.003 J**	0.010 U	**0.012 J**	**0.003 J**	**0.0009 J**	**0.004 J**
Dibenzo(a,h)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.010 U	0.010 U	0.010 U
Indeno(1,2,3-c,d)pyrene	0.01	**0.001 J**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	**0.008 J**	0.010 U	0.010 U
Total cPAH TEQ[5] (ND = 0)	0.011	**0.0002 J**	0 U	**0.0001 J**	0 U	**0.0002 J**	0 U	**0.0074 J**	**0.0042 J**	**0.0001 J**	**0.0003 J**
Total cPAH TEQ[5] (ND = 0.5 RL)	0.011	**0.0067 J**	0.0076 U	**0.0071 J**	0.0076 U	**0.0067 J**	0.0076 U	**0.0084 J**	**0.0052 J**	**0.0071 J**	**0.0068 J**

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 12 through 17.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.

[4] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 µg/l.

[5] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

µS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Unit

mV = millivolt

C = Celsius

ppt = parts per thousand

mg/L = milligram per liter

µg/L = microgram per liter

-- = not analyzed

NE = Not Established

ND = Not Detected

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 8

Remedial Investigation Groundwater Analytical Results

Quiet Cove
Anacortes, Washington

Sample Location[1]	Preliminary Screening Level[2]	MW_6		MW_7		MW_8		MW_10		MW_11	
Sample Identification		MW-6-101817	MW-6-032018	MW-7-101817	MW-7-032018	MW-8-110917	MW-8-031918	MW-10-110917	MW-10-031918	MW-11-110917	MW-11-032018
Date Sampled		10/18/17	03/20/18	10/18/17	03/20/18	11/09/17	03/19/18	11/09/17	03/19/18	11/09/17	03/20/18
Well Location		Upland	Upland	Shoreline	Shoreline	Shoreline	Shoreline	Upland	Upland	Upland	Upland
Field Measured Parameters											
Top of Casing Elevation[3] (feet)	NE	15.43	15.43	12.62	12.62	13.13	13.13	14.17	14.17	12.28	12.28
Depth to Groundwater (feet)	NE	5.68	4.54	6.69	6.38	4.60	4.89	4.49	3.46	3.58	
Groundwater Elevation (feet)	NE	9.75	10.89	5.93	6.24	8.53	8.24	9.68	10.71	8.70	12.28
pH	NE	7.08	6.39	6.20	6.01	7.26	6.49	6.90	6.96	6.24	--
Conductivity (µS/cm)	NE	314	229	1470	710	567	283	406	301	830	--
Turbidity[5] (NTU)	NE	5.8	3.0	5.0	0.0	5.7	2.7	4.4	0.4	8.4	--
Dissolved Oxygen (mg/l)	NE	5.47	6.31	1.66	5.67	0.28	0.22	3.83	0.37	0.10	--
Temperature (°C)	NE	14.3	9.6	15.9	10.0	15.0	10.3	16.1	8.9	15.5	--
Total Dissolved Solids (mg/l)	NE	256.8	211.2	1168.0	637.0	294.5	260.0	318.5	282.7	656.5	--
Oxidation Reduction Potential (mV)	NE	78.0	114.1	86.5	69.5	30.8	19.4	77.2	251.1	65.4	--
Salinity (ppt)	NE	0.19	0.16	0.91	0.48	0.22	0.19	0.25	0.21	0.50	--
Total Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	**1.59**	**0.705**	**4.16**	**0.974**	**5.96**	**6.75**	**1.71**	**1.33**	**10.4**	**7.01**
Cadmium	8.8	**0.0510 J**	**0.100 U**	0.500 U	0.100 U	0.100 U	0.100 U	**0.0360 J**	**0.0340 J**	**0.0820 J**	0.100 U
Chromium	50	**0.483 J**	**1.17**	**2.04 J**	**0.398 J**	**1.92**	**1.09**	**0.265 J**	**0.500 U**	**1.12**	**0.932**
Copper	NE	**1.2**	**2.73**	2.50 U	0.692	**0.805**	**0.884**	**1.25**	**0.879**	0.500 U	0.500 U
Lead	2.1	**0.526**	**0.339**	0.500 U	0.0830 J	**0.164**	**0.143**	**0.231**	**0.100 U**	**0.278**	**0.0780 J**
Silver	NE	0.200 UJ	0.200 U	1.00 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U
Zinc	NE	**1.55 J**	**5.41**	20.0 U	2.69 J	**2.09 J**	**2.71 J**	**2.11 J**	**2.31 J**	**4.45**	**0.978 J**
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Dissolved Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	**1.47**	**0.64**	**1.71**	**0.989**	**6.29**	**3.91**	**1.67**	**1.32**	**11.6**	**6.74**
Cadmium	8.8	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U	0.100 U	**0.0320 J**	**0.0730 J**	0.100 U	0.100 U
Chromium	50	**0.402 J**	**1.07**	**1.42 J**	**0.356 J**	**1.41**	**1.13**	0.500 U	0.500 U	**1.18**	**1.05**
Copper	NE	**0.931**	**2.91**	2.50 U	1.29	0.500 U	0.500 U	**0.96**	**0.963**	0.500 U	0.500 U
Lead	2.1	0.100 U	0.100 U	0.500 U	0.251	0.100 U	0.100 U	0.100 U	0.100 U	**0.111**	**0.133**
Silver	NE	0.200 U	0.200 U	1.00 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Zinc	NE	**1.01 J**	**1.58 J**	20.0 U	3.08 J	**1.90 J**	**1.42 J**	**2.51 J**	**2.18 J**	**3.99 J**	4.00 U
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Petroleum Hydrocarbons by NWTPH-G/Dx (µg/L)											
Gasoline-range hydrocarbons	800[4]	100 U	100 U	100 U	100 U	**251**	**109**	100 U	100 U	**2,030**	**3,120**
Diesel-range hydrocarbons	500	100 U	100 U	100 U	100 U	**828**	**455**	100 U	100 U	**4,780**	**5,440**
Motor Oil-range hydrocarbons	500	200 U	200 U	200 U	200 U	**342**	200 U	200 U	200 U	**723**	**739**

Sample Location[1]	Preliminary Screening Level[2]	MW_6		MW_7		MW_8		MW_10		MW_11	
Sample Identification		**MW-6-101817**	**MW-6-032018**	**MW-7-101817**	**MW-7-032018**	**MW-8-110917**	**MW-8-031918**	**MW-10-110917**	**MW-10-031918**	**MW-11-110917**	**MW-11-032018**
Date Sampled		**10/18/17**	**03/20/18**	**10/18/17**	**03/20/18**	**11/09/17**	**03/19/18**	**11/09/17**	**03/19/18**	**11/09/17**	**03/20/18**
Well Location		**Upland**	**Upland**	**Shoreline**	**Shoreline**	**Shoreline**	**Shoreline**	**Upland**	**Upland**	**Upland**	**Upland**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/L)											
Benzene	2.4	0.20 U	0.20 U	0.20 U	0.20 U	**5.83**	**3.03**	0.20 U	0.20 U	**30.5**	**25.1**
Toluene	520	0.20 U	0.20 U	0.20 U	0.20 U	**0.54**	**0.12 J**	0.20 U	0.20 U	**2.29**	**2.05**
Ethylbenzene	130	0.20 U	0.20 U	0.20 U	0.20 U	**0.24**	0.20 U	0.20 U	0.20 U	**1.17**	**1.21**
Total Xylenes	310	0.40 U	0.40 U	0.40 U	0.40 U	**0.64**	**0.11**	0.40 U	0.40 U	**2.8**	**3.2**
1,2-Dibromoethane (EDB)	0.01	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.08 J**
1,2-Dichloroethane (EDC)	5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.15 J**	0.20 U	0.20 U	0.20 U	0.20 U
Methyl t-butyl ether (MTBE)	610	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Hexane	7.8	0.20 U	0.20 U	0.20 U	0.20 U	**4.4**	**1.32**	0.20 U	0.20 U	0.20 U	**5.86**
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270 SIM (µg/L)											
Benzo(a)anthracene	0.01	**0.001 J**	**0.002 J**	**0.0009 J**	**0.002 J**	0.010 U	0.010 U	0.010 U	0.010 U	**0.001 J**	**0.002 J**
Benzo(a)pyrene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Benzo(b)fluoranthene	0.01	**0.0008 J**	**0.001 J**	**0.0008 J**	**0.001 J**	0.010 U	0.010 U	**0.0006 J**	0.010 U	**0.001 J**	0.010 U
Benzo(k)fluoranthene	0.013	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Chrysene	0.031	**0.002 J**	**0.002 J**	**0.001 J**	**0.002 J**	0.010 U	0.010 U	**0.001 J**	0.010 U	**0.004 J**	**0.005 J**
Dibenzo(a,h)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Indeno(1,2,3-c,d)pyrene	0.01	0.010 U	0.001 J	0.010 U	**0.001 J**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Total cPAH TEQ[5] (ND = 0)	0.011	**0.0002 J**	**0.0004 J**	**0.0002 J**	**0.0004 J**	0 U	0 U	**0.0001 J**	0 U	**0.0002 J**	**0.0003 J**
Total cPAH TEQ[5] (ND = 0.5 RL)	0.011	**0.0067 J**	**0.0064 J**	**0.0067 J**	**0.0064 J**	0.0076 U	0.0076 U	**0.0071 J**	0.0076 U	**0.0067 J**	**0.0073 J**

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 12 through 17.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.

[4] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 µg/l.

[5] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

µS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Unit

mV = millivolt

C = Celsius

ppt = parts per thousand

mg/L = milligram per liter

µg/L = microgram per liter

-- = not analyzed

NE = Not Established

ND = Not Detected

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates exceedance of the preliminary groundwater screening level.

Blue shading indicated non-detect result exceedance of the preliminary groundwater screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 9

Supplemental Investigation Groundwater Analytical Results

Quiet Cove
Anacortes, Washington

Monitoring Well Location[1]	Preliminary Screening Level[2]	MW_1	MW_2	MW_3	MW_4	MW_5	MW_6	MW_7	MW_8	MW_10	MW_11	MW_12	MW_12
Sample Identification		**MW-1_103118**	**MW-2_103118**	**MW-3_103018**	**MW-4_102918**	**MW-5_103118**	**MW-6_102918**	**MW-7_103018**	**MW-8_102918**	**MW-10_102918**	**MW-11_103118**	**MW-12_103018**	**DUP-1_103018**
Date Sampled		**10/31/18**	**10/31/18**	**10/30/18**	**10/29/18**	**10/31/18**	**10/29/18**	**10/30/18**	**10/29/18**	**10/29/18**	**10/31/18**	**10/30/18**	**10/30/18**
Field Measured Parameters													
Top of Casing Elevation[3] (feet)	NE	11.91	12.01	12.42	12.43	14.96	15.43	12.62	13.13	14.17	12.28	11.17	--
Depth to Groundwater (feet)	NE	4.35	5.7	6.21	5.71	6.59	5.31	6.47	5.97	6.72	6.12	2.85	--
Groundwater Elevation (feet)	NE	7.56	6.31	6.21	6.72	8.37	10.12	6.15	7.16	7.45	6.16	8.32	--
pH	NE	6.33	6.55	6.61	6.04	6.41	6.92	6.4	6.78	7.03	6.48	6.23	--
Conductivity (mS/cm)	NE	162.9	452.7	1457	528	320.8	278.9	1583	324.6	347.4	789	436.1	--
Turbidity[3] (NTU)	NE	10.03	7.63	8.54	10.54	10.47	6.72	9.47	120.61	27.33	5.43	9.78	--
Dissolved Oxygen (mg/L)	NE	2.99	1.07	0.76	0.9	1.03	1.17	1.4	0.87	1.02	0.76	0.86	--
Temperature (°C)	NE	13.3	14.1	15.3	15.2	15.1	14	15.5	16	14.2	15	14.8	--
Total Dissolved Solids (mg/L)	NE	136	367	1170	423	257	227	1256	259	277	627	352	--
Oxidation Reduction Potential (mV)	NE	31.4	-22.4	-78.7	-82.6	17.7	139	100.9	-65	161.9	-80.3	-75.5	--
Salinity (%)	NE	0.1	0.27	0.92	0.32	0.19	0.17	0.99	0.19	0.2	0.48	0.26	--
Geochemical Parameters[4]													
Methane (μg/L)	NE	**264**	**2,830**	**9,880**	**7,560**	**794**	0.65 U	**14.7**	**1,000**	0.65 U	**14,000**	**16,900**	**17,500**
Nitrate (mg/L)	NE	**0.501**	**1.73**	0.100 U	**0.454**	0.100 U	**0.199**	**2.74**	**0.242**	0.100 U	0.100 U	0.100 U	0.100 U
Sulfate (mg/L)	NE	**25.8**	**20.7**	**24.2**	**72.2**	**1.01**	**15.8**	**22.4**	**10.5**	**19.2**	0.100 U	**7.93**	**9.98**
Total Alkalinity (mg/L)	NE	**69.0**	**253**	**406**	**168**	**187**	**150**	**249**	**185**	**184**	**426**	**233**	**242**
Iron, Ferrous, Fe+2 (mg/L)	NE	**0.598**	**4.21**	**3.05**	**16.7**	**1.49**	**0.040**	0.040 U	**5.61**	0.040 U	**32.0**	**25.5**	**25.6**
Dissolved Manganese (μg/L)	NE	**48.1**	**156**	**292**	**2,570**	**1,240**	**8.36**	**203**	**1,130**	**573**	**3,350**	**3,010**	**2,950**
Petroleum Hydrocarbons by NWTPH-Gx (μg/L)													
Gasoline-range hydrocarbons	800[5]	--	--	--	--	--	--	--	**117**	--	**3,220**	--	--
Petroleum Hydrocarbons by NWTPH-Dx (μg/L) without silica gel cleanup													
Diesel-range hydrocarbons	500	**1,090**	**1,210**	**1,420**	**584**	**454**	100 U	100 U	**415**	100 U	**5,850**	**1,750**	**1,890**
Motor Oil	500	**359**	**616**	200 U	200 U	200 U	200 U	200 U	200 U	200 U	**977**	200 U	200 U
Petroleum Hydrocarbons by NWTPH-Dx (μg/L) with silica gel cleanup													
Diesel-range hydrocarbons	500	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**1,110**	**188**	**202**
Motor Oil	500	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Volatile Organic Compounds (VOCs) by EPA 8360 (μg/L)													
Benzene	2.4	--	--	--	--	--	--	--	**2.19**	--	**29.1**	--	--
Toluene	520	--	--	--	--	--	--	--	**0.16 J**	--	**2.45**	--	--
Ethylbenzene	130	--	--	--	--	--	--	--	**0.06 J**	--	**1.39**	--	--
Total Xylenes	310	--	--	--	--	--	--	--	**0.190**	--	**3.30**	--	--

Notes:

[1] Sample locations are shown on Figure 1.

[2] Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

[3] Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.

[4] Geochemical methods include: Methane by EPA RSK-175; Nitrate and Sulfate by EPA 300.0; Total Alkalinity by SM2420 B-97; Ferrous Iron by SM 3500-Fe; and Manganese by EPA 6020A

[5] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 μg/l.

μS/cm = microsiemens per centimeter	mg/L = milligram per liter
NTU = Nephelometric Turbidity Unit	μg/L = microgram per liter
mV = millivolt	-- = not analyzed
C = Celsius	NE = Not Established
ppt = parts per thousand	ND = Not Detected

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates exceedance of the preliminary groundwater screening level.

Blue shading indicated non-detect result exceedance of the preliminary groundwater screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 10

Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms

Quiet Cove
Anacortes, Washington

Sample Location[1]	Preliminary Screening Level[3]		GEI-SED-1[2]			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification			SED-COMP-1 _091517	SED1-1-3 _091517	SED1-4-6 _091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/ LAET[4]	CSL/ 2LAET[4]	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)			0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Field Measured Parameters											
Sheen	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1
Conventionals											
Total Organic Carbon (TOC)	NE	NE	**0.14 J**	**0.85 J**	**0.39 J**	--	--	--	--	--	--
Total Volatile Solids (TVS)	NE	NE	**0.803**	**1.44**	**2.21**	--	--	--	--	--	--
Total Solids (TS)	NE	NE	**87.8**	**93.01**	**87.29**	--	--	--	--	--	--
Sulfide	NE	NE	1.05 U	0.910 U	**99.6**	--	--	--	--	--	--
Ammonia (Total as N)	NE	NE	0.44 U	0.40 U	**1.13**	--	--	--	--	--	--
Grain Size (Percent)											
Gravel	NE	NE	**34.6**	**40.5**	**35.2**	--	--	--	--	--	--
Very coarse sand	NE	NE	**8.9**	**11.8**	**7.7**	--	--	--	--	--	--
Coarse sand	NE	NE	**19**	**15.1**	**7.8**	--	--	--	--	--	--
Medium sand	NE	NE	**18.3**	**16.9**	**9.6**	--	--	--	--	--	--
Fine sand	NE	NE	**18.8**	**12.4**	**27.2**	--	--	--	--	--	--
Very fine sand	NE	NE	**0.4**	**1.3**	**7.8**	--	--	--	--	--	--
Coarse silt	NE	NE	0.1 U	2.1 U	**1.4**	--	--	--	--	--	--
Medium silt	NE	NE	0.1 U	2.1 U	**1.2**	--	--	--	--	--	--
Fine silt	NE	NE	0.1 U	2.1 U	**0.8**	--	--	--	--	--	--
Very fine silt	NE	NE	0.1 U	2.1 U	**0.4**	--	--	--	--	--	--
Coarse clay	NE	NE	0.1 U	2.1 U	**0.2**	--	--	--	--	--	--
Medium clay	NE	NE	0.1 U	2.1 U	**0.5**	--	--	--	--	--	--
Total Fines	NE	NE	**0.1**	**2.1**	**4.7**	--	--	--	--	--	--
Metals by EPA 6000/7000 Series (mg/kg)											
Arsenic	57	93	**3.45**	**3.62**	**6.83**	--	--	--	--	--	--
Cadmium	5.1	6.7	0.03 UJ	0.08 UJ	**0.56 J**	--	--	--	--	--	--
Chromium	260	270	**16.3**	**17**	**18.1**	--	--	--	--	--	--
Copper	390	390	**21.2 J**	**30.4 J**	**58.6 J**	--	--	--	--	--	--
Lead	450	530	**56.4 J**	**60.8 J**	**97.1 J**	**69.9**	--	**19.8**	--	**125**	**55.8**
Silver	6.1	6.1	**0.02 J**	**0.02 J**	**0.14 J**	--	--	--	--	--	--
Zinc	410	960	**166**	**68.2**	**98.7**	--	--	--	--	--	--
Mercury	0.41	0.59	0.0212 UJ	**0.0334 J**	**0.235 J**	--	--	--	--	--	--
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)											
Gasoline-range hydrocarbons	30[5]	NE	5.95 U	5.36 U	8.59 U	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	**8.58**	**17.6**	**580**	**107**	**41.1**	**8.08**	5.65 U	**78**	**40**
Motor Oil-range hydrocarbons	2,000	NE	**46.9**	**69.4**	**688**	**171**	**76.6**	**13.8**	11.3 U	**129**	**67.9**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)											
Benzene	370	780	**1.34 J**	**1.17**	1.20 U	--	--	--	--	--	--
Toluene	38	64	**1.82**	**1.77**	1.20 U	--	--	--	--	--	--
Ethylbenzene	16	57	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
Total Xylenes	66	66	3.26 U	**1.63**	2.40 U	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	220	1200	1.63 U	1.03 U	1.20 UJ	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	23	79	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
Methyl t-butyl ether (MTBE)	99	170	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
n-Hexane	100	480	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--

Sample Location[1]	Preliminary Screening Level[3]		GEI-SED-1[2]			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification			SED-COMP-1 _091517	SED1-1-3 _091517	SED1-4-6 _091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/ LAET[4]	CSL/ 2LAET[4]	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)			0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)											
Sum of LPAHs[6]	370	780	**221**	**146**	**4,050**	--	--	--	--	--	--
2-Methylnaphthalene	38	64	**2.42**	**1.66**	**23.8**	--	--	--	--	--	--
Acenaphthene	16	57	**2.51**	**0.733**	**38**	--	--	--	--	--	--
Acenaphthylene	66	66	**11.1**	**2.98**	**54.1**	--	--	--	--	--	--
Anthracene	220	1200	**17**	**6.59**	**196**	--	--	--	--	--	--
Fluorene	23	79	**9.79**	**2.72**	**58.2**	--	--	--	--	--	--
Naphthalene	99	170	**3.48**	**2.12**	**90.8**	--	--	--	--	--	--
Phenanthrene	100	480	**137**	**25.2**	**554**	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)											
Sum of LPAHs[6]	5,200	5,200	**309**	**1,240**	**15,800**	--	--	--	--	--	--
2-Methylnaphthalene	670	670	**3.39 J**	**14.1**	**93**	--	--	--	--	--	--
Acenaphthene	500	500	**3.52 J**	**6.23**	**150**	--	--	--	--	--	--
Acenaphthylene	1,300	1,300	**15.5**	**25.3**	**211**	--	--	--	--	--	--
Anthracene	960	960	**23.8**	**56**	**765**	--	--	--	--	--	--
Fluorene	540	540	**13.7**	**23.1**	**227**	--	--	--	--	--	--
Naphthalene	2,100	2,100	**4.87 J**	**18**	**354**	--	--	--	--	--	--
Phenanthrene	1,500	1,500	**192**	**214**	**2,160**	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)											
Sum of HPAHs[7]	960	5,300	**930**	**514**	**14,700**	--	--	--	--	--	--
Benzo(a)anthracene	110	270	**55.1**	**19.8**	**451**	--	--	--	--	--	--
Benzo(a)pyrene	99	210	**57.3**	**17.3**	**372**	--	--	--	--	--	--
Benzofluoranthenes (Total)[8]	230	450	**69.6**	**24.4**	**300**	--	--	--	--	--	--
Benzo(g,h,i)perylene	31	78	**51.5**	**13.4**	**236**	--	--	--	--	--	--
Chrysene	110	460	**65.6**	**22.8**	**441**	--	--	--	--	--	--
Dibenzo(a,h)anthracene	12	33	**8.5**	**3.49**	**49**	--	--	--	--	--	--
Fluoranthene	160	1,200	**148**	**41**	**910**	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	34	88	**37.8**	**10.7**	**202**	--	--	--	--	--	--
Pyrene	1,000	1,400	**161**	**42.6**	**1,100**	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)											
Sum of HPAHs[7]	12,000	17,000	**1,300**	**4,370**	**57,500**	--	--	--	--	--	--
Benzo(a)anthracene	1,300	1,600	**77.1**	**168**	**1,760**	**0.449**	--	**0.0368**	--	**0.617**	**0.164**
Benzo(a)pyrene	1,600	1,600	**80.2**	**147**	**1,450**	**0.515**	--	**0.0386**	--	**0.701**	**0.186**
Benzo(g,h,i)perylene	3,200	3,600	**97.4**	**207**	**1,170**	**0.815**	--	**0.0611**	--	**1.09**	**0.295**
Benzofluoranthenes (Total)[8]	670	720	**72.1**	**114**	**921**	--	--	--	--	--	--
Chrysene	1,400	2,800	**91.9**	**194**	**1,720**	**0.48**	--	**0.0379**	--	**0.683**	**0.175**
Dibenzo(a,h)anthracene	230	230	**11.9**	**29.7**	**190**	**0.078**	--	**0.00984**	--	**0.101**	**0.0293**
Fluoranthene	1,700	2,500	**207**	**350**	**3,550**	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	600	690	**52.9**	**91.2**	**789**	**0.308**	--	**0.0195**	--	**0.381**	**0.114**
Pyrene	2,600	3,300	**225**	**362**	**4,100**	--	--	--	--	--	--
Chlorinated Hydrocarbons (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)											
1,2,4-Trichlorobenzene	0.81	1.8	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	3.50 U	**0.34**	**2.1**	--	--	--	--	--	--
Hexachlorobenzene	0.38	2.3	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)											
1,2,4-Trichlorobenzene	31	51	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.9 U	**2.9 J**	**8**	--	--	--	--	--	--
Hexachlorobenzene	22	70	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--

Sample Location[1]	Preliminary Screening Level[3]		GEI-SED-1[2]			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification			SED-COMP-1 _091517	SED1-1-3 _091517	SED1-4-6 _091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/	CSL/	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)	LAET[4]	2LAET[4]	0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Phthalates (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)											
Bis(2-Ethylhexyl) Phthalate	47	78	**22.4**	5.51 U	12.7 U	--	--	--	--	--	--
Butyl benzyl Phthalate	4.9	64	3.50 U	**4.69**	1.30 U	--	--	--	--	--	--
Dibutyl Phthalate	220	1,700	14.0 U	**1.1**	5.10 U	--	--	--	--	--	--
Diethyl Phthalate	61	110	14.0 U	2.20 U	5.10 U	--	--	--	--	--	--
Dimethyl Phthalate	53	53	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	58	4,500	14.0 U	2.20 U	5.10 U	--	--	--	--	--	--
Phthalates by EPA 8270 (µg/kg)											
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	**31.3 J**	46.8 U	49.7 U	--	--	--	--	--	--
Butyl benzyl Phthalate	63	900	4.9 U	**39.9**	5.0 U	--	--	--	--	--	--
Dibutyl Phthalate	1,400	1,400	19.6 U	**9.4 J**	19.9 U	--	--	--	--	--	--
Diethyl Phthalate	200	200	14.0 U	**2.20 U**	5.10 U	--	--	--	--	--	--
Dimethyl Phthalate	71	160	3.50 U	**0.550 U**	1.30 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	6,200	6,200	19.6 U	18.7 U	19.9 U	--	--	--	--	--	--
Phenols by EPA 8270 (µg/kg)											
2,4-Dimethylphenol	29	29	24.4 U	23.4 U	**23.6 J**	--	--	--	--	--	--
2-methylphenol (o-Cresol)	63	63	19.6 U	18.7 U	**15.8 J**	--	--	--	--	--	--
4-methylphenol (p-Cresol)	670	670	19.6 U	18.7 U	**187**	--	--	--	--	--	--
Pentachlorophenol	360	690	97.8 U	93.5 U	**1,110**	--	--	--	--	--	--
Phenol	420	1,200	19.6 U	18.7 U	**42.6**	--	--	--	--	--	--
Miscellaneous Extractables (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)											
Dibenzofuran	15	58	**6.08**	**1.21**	**35.6**	--	--	--	--	--	--
Hexachlorobutadiene	3.9	6.2	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	11	11	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Miscellaneous Extractables by EPA 8270 (mg/kg)											
Dibenzofuran	540	540	**8.51**	**10.3**	**139**	--	--	--	--	--	--
Hexachlorobutadiene	11	120	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
Benzoic Acid	650	650	97.8 U	93.5 U	99.4 U	--	--	--	--	--	--
Benzyl Alcohol	57	730	19.6 U	18.7 U	19.9 U	--	--	--	--	--	--

Table 10 (Continued)

Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms

Quiet Cove
Anacortes, Washington

Sample Location[1]	**Preliminary Screening Level[3]**		**GEI-SED-5**		**GEI-SED-6**		**GEI-SED-7**		**GEI-SED-8**	
Sample Identification			**SED-5-0-0.5**	**SED-5-2-4**	**SED-6-0-0.5**	**SED-6-1-3**	**SED-7-0-0.5**	**SED-7-0-1**	**SED-8-0-0.5**	**SED-8-3.2-4.5**
Sample Date	**SCO/**	**CSL/**	**07/16/18**	**07/16/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)	**LAET[4]**	**2LAET[4]**	**0-0.5 ft**	**2-4 ft**	**0-0.5 ft**	**1-3 ft**	**0-0.5 ft**	**0-1 ft**	**0-0.5 ft**	**3.2-4.5 ft**
Field Measured Parameters										
Sheen	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	<1	<1	<1	<1	<1	3.3	1.8
Conventionals										
Total Organic Carbon (TOC)	NE	NE	0.33	**0.20**	**0.25**	**0.22**	**0.12**	**0.12**	**0.18**	**0.74**
Total Volatile Solids (TVS)	NE	NE	1.00	**0.88**	**1.10**	**0.80**	**0.91**	**0.72**	**1.14**	**1.75**
Total Solids (TS)	NE	NE	94.18	**90.57**	**96.05**	**94.72**	**97.04**	**97.11**	**81.80**	**82.13**
Sulfide	NE	NE	1.04 U	**8.28**	0.990 U	0.962 U	1.06 U	1.01 U	1.14 U	**2.31**
Ammonia (Total as N)	NE	NE	1.36	0.40 U	0.39 U	0.38 U	0.40 U	0.39 U	**3.97**	**2.00**
Grain Size (Percent)										
Gravel	NE	NE	**79.9**	**69.8**	**49.3**	**46.2**	**52.5**	**43.7**	**60.1**	**75.4**
Very coarse sand	NE	NE	**9.2**	**12.1**	**16.7**	**12.2**	**9.3**	**7.8**	**6.7**	**3.9**
Coarse sand	NE	NE	**4.5**	**6.5**	**18.6**	**17.6**	**22.1**	**21.8**	**5.0**	**3.5**
Medium sand	NE	NE	**2.9**	**4.2**	**8.7**	**13.9**	**11.3**	**20.7**	**11.6**	**5.3**
Fine sand	NE	NE	**3.1**	**5.2**	**5.9**	**8.2**	**4.3**	**5.5**	**14.7**	**10.0**
Very fine sand	NE	NE	**0.2**	**0.4**	**0.1**	**0.4**	**0.1**	**0.1**	**0.5**	**1.7**
Coarse silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Medium silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Fine silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Very fine silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Coarse clay	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Medium clay	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Total Fines	NE	NE	**0.2**	**1.8**	**0.7**	**1.5**	**0.4**	**0.3**	**1.4**	**0.2**
Metals by EPA 6000/7000 Series (mg/kg)										
Arsenic	57	93	**3.73**	**3.30**	**7.16**	**5.55**	**3.05**	**3.20**	**3.72**	**3.57**
Cadmium	5.1	6.7	**0.08 J**	**0.12**	**0.07 J**	**0.09 J**	**0.06 J**	**0.06 J**	**0.04 J**	**0.42**
Chromium	260	270	**19.5**	**14.5**	**13.6**	**27.2**	**17.8**	**14.3**	**15.2**	**15.3**
Copper	390	390	**21.0**	**38.6**	**14.5**	**43.4**	**187**	**165**	**22.2**	**47.8**
Lead	450	530	**31.3**	**70.1**	**34.8**	**78.8**	**53.3**	**40.8**	**44.4**	**240**
Silver	6.1	6.1	**0.03 J**	**0.06 J**	**0.05 J**	**0.05 J**	**0.04 J**	**0.04 J**	**0.05 J**	**0.11 J**
Zinc	410	960	**51.2**	**81.8**	**108**	**75.7**	**112**	**53.8**	**41.6**	**132**
Mercury	0.41	0.59	0.0219 U	**0.0427**	0.0238 U	0.0234 U	0.0200 U	0.0230 U	0.0244 U	**0.168**
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)										
Gasoline-range hydrocarbons	30[5]	NE	--	--	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	--	--	--	--	--	--	--	--
Motor Oil-range hydrocarbons	2,000	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)										
Benzene	370	780	**1.21**	**0.93 J**	**0.43 J**	**2.05**	**0.80 J**	**0.28 J**	1.13 U	**1.69**
Toluene	38	64	**1.47**	**0.41 J**	1.22 U	**1.62**	**0.52 J**	**0.23 J**	1.13 U	**0.49 J**
Ethylbenzene	16	57	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
Total Xylenes	66	66	**0.810**	2.10 U	2.43 U	**0.440**	2.28 U	1.82 U	2.25 U	1.91 U
1,2-Dibromoethane (EDB)	220	1200	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
1,2-Dichloroethane (EDC)	23	79	**0.47 J**	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	**0.54 J**
Methyl t-butyl ether (MTBE)	99	170	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
n-Hexane	100	480	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U

Sample Location[1]	Preliminary Screening Level[3]		GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification			SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Date	SCO/	CSL/	07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)	LAET[4]	2LAET[4]	0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)										
Sum of LPAHs[6]	370	780	**98.2**	**71.0**	**12.8**	**34.9**	**9.42**	**60.8**	**107**	**99.0**
2-Methylnaphthalene	38	64	**2.83**	**1.73**	**1.00**	**1.81**	3.87 U	**3.45**	**2.27**	**3.97**
Acenaphthene	16	57	**2.19**	**1.39**	1.87 U	2.16 U	3.87 U	3.89 U	**3.51**	**5.27**
Acenaphthylene	66	66	**7.76**	**4.99**	**0.936**	**8.95**	3.87 U	**5.39**	**5.89**	**8.04**
Anthracene	220	1200	**15.3**	**13.4**	**2.31**	**9.18**	**2.25**	**7.09**	**19.3**	**15.9**
Fluorene	23	79	**8.06**	**5.35**	1.87 U	**1.51**	3.87 U	**3.38**	**7.17**	**7.54**
Naphthalene	99	170	**9.76**	**2.49**	**2.10**	**1.52**	**1.98**	**4.68**	**4.80**	**10.0**
Phenanthrene	100	480	**55.2**	**43.6**	**7.44**	**13.7**	**5.18**	**40.3**	**66.1**	**51.8**
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)										
Sum of LPAHs[6]	5,200	5,200	**324**	**142**	**32.0**	**76.8**	**11.3**	**73.0**	**192**	**730**
2-Methylnaphthalene	670	670	**9.35**	**3.45 J**	**2.50 J**	**3.99 J**	4.64 U	**4.14 J**	**4.09 J**	**29.4**
Acenaphthene	500	500	**7.23**	**2.77 J**	4.67 U	4.76 U	4.64 U	4.67 U	**6.31**	**39.0**
Acenaphthylene	1,300	1,300	**25.6**	**9.97**	**2.34 J**	**19.7**	4.64 U	**6.47**	**10.6**	**59.5**
Anthracene	960	960	**50.5**	**26.7**	**5.78**	**20.2**	**2.70 J**	**8.51**	**34.8**	**118**
Fluorene	540	540	**26.6**	**10.7**	4.67 U	**3.32 J**	4.64 U	**4.06 J**	**12.9**	**55.8**
Naphthalene	2,100	2,100	**32.2**	**4.97**	**5.26**	**3.35 J**	**2.38 J**	**5.61**	**8.64**	**74.2**
Phenanthrene	1,500	1,500	**182**	**87.1**	**18.6**	**30.2**	**6.22**	**48.4**	**119**	**383**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)										
Sum of HPAHs[7]	960	5,300	**409**	**280**	**116**	**326**	**102**	**370**	**487**	**509**
Benzo(a)anthracene	110	270	**36.0**	**22.8**	**10.9**	**25.0**	**7.03**	**29.0**	**40.1**	**43.9**
Benzo(a)pyrene	99	210	**34.2**	**25.4**	**10.3**	**24.2**	**6.78**	**32.8**	**48.3**	**45.7**
Benzofluoranthenes (Total)[8]	230	450	**62.1**	**36.4**	**18.3**	**75.0**	**17.9**	**27.2**	**37.1**	**34.1**
Benzo(g,h,i)perylene	31	78	**23.7**	**19.5**	**8.04**	**23.8**	**6.55**	**58.0**	**67.0**	**68.2**
Chrysene	110	460	**64.2**	**27.4**	**12.0**	**43.3**	**10.3**	**38.3**	**47.3**	**43.9**
Dibenzo(a,h)anthracene	12	33	**8.24**	**8.30**	**5.72**	**8.59**	**10.1**	**13.3**	**11.4**	**8.23**
Fluoranthene	160	1,200	**83.6**	**58.0**	**19.4**	**51.8**	**13.7**	**68.3**	**95.6**	**110**
Indeno(1,2,3-c,d)pyrene	34	88	**20.2**	**17.4**	**9.36**	**20.9**	**12.3**	**25.7**	**29.5**	**25.0**
Pyrene	1,000	1,400	**75.2**	**65.0**	**21.6**	**53.6**	**16.8**	**73.8**	**100**	**127**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)										
Sum of HPAHs[7]	12,000	17,000	**1,350**	**560**	**289**	**718**	**122**	**440**	**877**	**3,770**
Benzo(a)anthracene	1,300	1,600	**120**	**45.5**	**27.2**	**55.0**	**8.44**	**34.8**	**72.2**	**325**
Benzo(a)pyrene	1,600	1,600	**113**	**50.7**	**25.7**	**53.3**	**8.13**	**39.3**	**86.9**	**338**
Benzo(g,h,i)perylene	3,200	3,600	**205**	**72.7**	**45.8**	**165**	**21.5**	**32.6**	**66.8**	**252**
Benzofluoranthenes (Total)[8]	670	720	**78.3**	**38.9**	**20.1**	**52.4**	**7.86**	**69.6**	**120**	**505**
Chrysene	1,400	2,800	**212**	**54.8**	**30.0**	**95.2**	**12.3**	**45.9**	**85.1**	**325**
Dibenzo(a,h)anthracene	230	230	**27.2**	**16.6**	**14.3**	**18.9**	**12.1**	**15.9**	**20.6**	**60.9**
Fluoranthene	1,700	2,500	**276**	**116**	**48.5**	**114**	**16.4**	**82.0**	**172**	**840**
Indeno(1,2,3-c,d)pyrene	600	690	**66.8**	**34.8**	**23.4**	**46.0**	**14.7**	**30.8**	**53.1**	**185**
Pyrene	2,600	3,300	**248**	**130**	**53.9**	**118**	**20.1**	**88.6**	**200**	**938**
Chlorinated Hydrocarbons (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)										
1,2,4-Trichlorobenzene	0.81	1.8	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	**0.540**
Hexachlorobenzene	0.38	2.3	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)										
1,2,4-Trichlorobenzene	31	51	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	**4.0 J**
Hexachlorobenzene	22	70	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U

Sample Location[1]	**Preliminary Screening Level[3]**		**GEI-SED-5**		**GEI-SED-6**		**GEI-SED-7**		**GEI-SED-8**	
Sample Identification			**SED-5-0-0.5**	**SED-5-2-4**	**SED-6-0-0.5**	**SED-6-1-3**	**SED-7-0-0.5**	**SED-7-0-1**	**SED-8-0-0.5**	**SED-8-3.2-4.5**
Sample Date	**SCO/**	**CSL/**	**07/16/18**	**07/16/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)	**LAET[4]**	**2LAET[4]**	**0-0.5 ft**	**2-4 ft**	**0-0.5 ft**	**1-3 ft**	**0-0.5 ft**	**0-1 ft**	**0-0.5 ft**	**3.2-4.5 ft**
Phthalates (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)										
Bis(2-Ethylhexyl) Phthalate	47	78	14.2 U	23.8 U	18.6 U	**21.6**	38.8 U	39.0 U	26.6 U	6.74 U
Butyl benzyl Phthalate	4.9	64	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Dibutyl Phthalate	220	1,700	5.67 U	9.50 U	7.44 U	8.59 U	15.5 U	15.6 U	10.7 U	2.69 U
Diethyl Phthalate	61	110	**3.70**	**6.35**	**4.08**	**9.32**	**11.6**	**15.0**	**6.56**	**2.54**
Dimethyl Phthalate	53	53	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Di-N-Octyl Phthalate	58	4,500	5.67 U	9.50 U	7.44 U	8.59 U	15.5 U	15.6 U	10.7 U	2.69 U
Phthalates by EPA 8270 (µg/kg)										
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	46.9 U	47.6 U	46.6 U	**47.5**	46.6 U	46.8 U	47.9 U	49.9 U
Butyl benzyl Phthalate	63	900	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
Dibutyl Phthalate	1,400	1,400	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Diethyl Phthalate	200	200	**12.2 J**	**12.7 J**	**10.2 J**	**20.5**	**13.9 J**	**18.0 J**	**11.8 J**	**18.8 J**
Dimethyl Phthalate	71	160	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
Di-N-Octyl Phthalate	6,200	6,200	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Phenols by EPA 8270 (µg/kg)										
2,4-Dimethylphenol	29	29	23.4 U	23.8 U	23.3 U	23.7 U	23.3 U	23.4 U	24.0 U	**3.1 J**
2-methylphenol (o-Cresol)	63	63	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
4-methylphenol (p-Cresol)	670	670	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	**47.9**
Pentachlorophenol	360	690	93.7 U	95.2 U	93.2 U	94.6 U	93.2 U	93.5 U	95.8 U	**57.4 J**
Phenol	420	1,200	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Miscellaneous Extractables (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)										
Dibenzofuran	15	58	**3.42**	**2.83**	1.87 U	2.16 U	3.87 U	3.89 U	**3.28**	**4.24**
Hexachlorobutadiene	3.9	6.2	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
N-Nitrosodiphenylamine (as diphenylamine)	11	11	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	**2.61**
Miscellaneous Extractables by EPA 8270 (mg/kg)										
Dibenzofuran	540	540	**11.3**	**5.65**	4.67 U	4.76 U	4.64 U	4.67 U	**5.90**	**31.4**
Hexachlorobutadiene	11	120	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	**19.3**
Benzoic Acid	650	650	93.7 U	95.2 U	**28.2 J**	94.6 U	93.2 U	**21.0 J**	95.8 U	**39.6 J**
Benzyl Alcohol	57	730	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U

Table 10 (Continued)

Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms

Quiet Cove
Anacortes, Washington

Sample Location[1]	**Preliminary Screening Level[3]**		**GEI-SED-9**		**GEI-SED-10**	
Sample Identification			**SED-9-0-0.5**	**SED-9-1.7-2.3**	**SED-10-0-0.5**	**SED-10-2-4**
Sample Date	**SCO/ LAET[4]**	**CSL/ 2LAET[4]**	**07/16/18**	**07/17/18**	**07/18/18**	**07/17/18**
Sample Interval (feet bgs)			**0-0.5 ft**	**1.7-2.3 ft**	**0-0.5 ft**	**2-4 ft**
Field Measured Parameters						
Sheen	NE	NE	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	2.2	<1	<1
Conventionals						
Total Organic Carbon (TOC)	NE	NE	**0.42**	**0.19**	**0.19**	**0.62**
Total Volatile Solids (TVS)	NE	NE	**1.10**	**0.39**	**0.84**	**1.05**
Total Solids (TS)	NE	NE	**87.58**	**89.60**	**82.88**	**77.21**
Sulfide	NE	NE	1.07 U	1.09 U	1.05 U	**1.62**
Ammonia (Total as N)	NE	NE	**0.89**	0.42 U	0.36 U	**1.46**
Grain Size (Percent)						
Gravel	NE	NE	**60.7**	**60.2**	**38.7**	**30.0**
Very coarse sand	NE	NE	**6.1**	**4.3**	**17.9**	**3.4**
Coarse sand	NE	NE	**6.4**	**8.9**	**23.1**	**2.0**
Medium sand	NE	NE	**15.1**	**16.2**	**8.9**	**6.1**
Fine sand	NE	NE	**9.8**	**8.3**	**8.6**	**32.4**
Very fine sand	NE	NE	**0.7**	**0.2**	**0.4**	**22.3**
Coarse silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Medium silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Fine silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Very fine silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Coarse clay	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Medium clay	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Total Fines	NE	NE	**1.2**	**1.8**	**2.3**	**3.8**
Metals by EPA 6000/7000 Series (mg/kg)						
Arsenic	57	93	**3.93**	**0.75**	**2.71**	**4.01**
Cadmium	5.1	6.7	**0.06 J**	**0.009 J**	**0.05 J**	**0.37**
Chromium	260	270	**15.4**	**15.9**	**21.6**	**15.2**
Copper	390	390	**47.9**	**4.49**	**16.0**	**17.1**
Lead	450	530	**101**	**0.87**	**24.5**	**23.5**
Silver	6.1	6.1	**0.05 J**	**0.03 J**	**0.04 J**	**0.07 J**
Zinc	410	960	**68.4**	**20.0**	**47.7**	**54.3**
Mercury	0.41	0.59	**0.0353**	0.0253 U	0.0291 U	**0.0844**
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)						
Gasoline-range hydrocarbons	30[5]	NE	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	--	--	--	--
Motor Oil-range hydrocarbons	2,000	NE	--	--	--	--
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)						
Benzene	370	780	**0.65 J**	**0.73 J**	1.09 U	**0.42 J**
Toluene	38	64	**0.53 J**	**0.34 J**	1.09 U	**0.46 J**
Ethylbenzene	16	57	1.04 U	1.05 U	1.09 U	1.23 U
Total Xylenes	66	66	2.08 U	2.11 U	2.18 U	2.47 U
1,2-Dibromoethane (EDB)	220	1200	1.04 U	1.05 U	1.09 U	1.23 U
1,2-Dichloroethane (EDC)	23	79	1.04 U	1.05 U	1.09 U	1.23 U
Methyl t-butyl ether (MTBE)	99	170	1.04 U	1.05 U	1.09 U	1.23 U
n-Hexane	100	480	1.04 U	1.05 U	1.09 U	1.23 U

Sample Location[1]	Preliminary Screening Level[3]		GEI-SED-9		GEI-SED-10	
Sample Identification			SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date	SCO/ LAET[4]	CSL/ 2LAET[4]	07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)			0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)						
Sum of LPAHs[6]	370	780	**165**	2.48 U	**13.6**	**63.9**
2-Methylnaphthalene	38	64	**2.71**	2.48 U	5.94 U	**2.39**
Acenaphthene	16	57	**3.86**	2.48 U	5.94 U	**2.40**
Acenaphthylene	66	66	**8.67**	2.48 U	**3.65**	**5.66**
Anthracene	220	1200	**29.0**	2.48 U	5.94 U	**10.4**
Fluorene	23	79	**9.79**	2.48 U	5.94 U	**4.87**
Naphthalene	99	170	**6.79**	2.48 U	5.94 U	**6.65**
Phenanthrene	100	480	**108**	2.48 U	**9.98**	**34.0**
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)						
Sum of LPAHs[6]	5,200	5,200	**694**	4.72 U	**10.9**	**396**
2-Methylnaphthalene	670	670	**11.4**	4.72 U	4.75 U	**14.8**
Acenaphthene	500	500	**16.2**	4.72 U	4.75 U	**14.9**
Acenaphthylene	1,300	1,300	**36.4**	4.72 U	**2.92 J**	**35.1**
Anthracene	960	960	**120**	4.72 U	4.75 U	**64.7**
Fluorene	540	540	**41.1**	4.72 U	4.75 U	**30.2**
Naphthalene	2,100	2,100	**28.5**	4.72 U	4.75 U	**41.2**
Phenanthrene	1,500	1,500	**452**	4.72 U	**7.98**	**210**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)						
Sum of HPAHs[7]	960	5,300	**745**	4.97 U	**129**	**250**
Benzo(a)anthracene	110	270	**51.9**	2.48 U	**8.80**	**19.7**
Benzo(a)pyrene	99	210	**57.9**	2.48 U	**11.4**	**23.2**
Benzofluoranthenes (Total)[8]	230	450	**41.2**	2.48 U	**9.21**	**18.1**
Benzo(g,h,i)perylene	31	78	**93.6**	4.97 U	**22.4**	**33.2**
Chrysene	110	460	**70.5**	2.48 U	**11.2**	**21.8**
Dibenzo(a,h)anthracene	12	33	**9.21**	2.48 U	**14.5**	**7.68**
Fluoranthene	160	1,200	**207**	2.48 U	**15.8**	**46.9**
Indeno(1,2,3-c,d)pyrene	34	88	**31.0**	2.48 U	**17.5**	**15.7**
Pyrene	1,000	1,400	**184**	2.48 U	**17.6**	**63.2**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)						
Sum of HPAHs[7]	12,000	17,000	**3,130**	9.44 U	**103**	**1,550**
Benzo(a)anthracene	1,300	1,600	**218**	4.72 U	**7.04**	**122**
Benzo(a)pyrene	1,600	1,600	**243**	4.72 U	**9.08**	**144**
Benzo(g,h,i)perylene	3,200	3,600	**173**	4.72 U	**7.37**	**112**
Benzofluoranthenes (Total)[8]	670	720	**393**	9.44 U	**17.9**	**206**
Chrysene	1,400	2,800	**296**	4.72 U	**8.96**	**135**
Dibenzo(a,h)anthracene	230	230	**38.7**	4.72 U	**11.6**	**47.6**
Fluoranthene	1,700	2,500	**871**	4.72 U	**12.6**	**291**
Indeno(1,2,3-c,d)pyrene	600	690	**130**	4.72 U	**14.0**	**97.1**
Pyrene	2,600	3,300	**771**	4.72 U	**14.1**	**392**
Chlorinated Hydrocarbons (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)						
1,2,4-Trichlorobenzene	0.81	1.8	1.10 U	2.50 U	5.90 U	0.770 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	1.10 U	2.50 U	5.90 U	0.770 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	1.10 U	2.50 U	5.90 U	0.770 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	1.10 U	2.50 U	5.90 U	0.770 U
Hexachlorobenzene	0.38	2.3	1.10 U	2.50 U	5.90 U	0.770 U
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)						
1,2,4-Trichlorobenzene	31	51	4.7 U	4.7 U	4.7 U	4.8 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.7 U	4.7 U	4.7 U	4.8 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.7 U	4.7 U	4.7 U	4.8 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.7 U	4.7 U	4.7 U	4.8 U
Hexachlorobenzene	22	70	4.7 U	4.7 U	4.7 U	4.8 U

Sample Location[1]	**Preliminary Screening Level[3]**		**GEI-SED-9**		**GEI-SED-10**	
Sample Identification			**SED-9-0-0.5**	**SED-9-1.7-2.3**	**SED-10-0-0.5**	**SED-10-2-4**
Sample Date	**SCO/ LAET[4]**	**CSL/ 2LAET[4]**	**07/16/18**	**07/17/18**	**07/18/18**	**07/17/18**
Sample Interval (feet bgs)			**0-0.5 ft**	**1.7-2.3 ft**	**0-0.5 ft**	**2-4 ft**
Phthalates (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)						
Bis(2-Ethylhexyl) Phthalate	47	78	**18.8**	24.7 U	59.0 U	7.77 U
Butyl benzyl Phthalate	4.9	64	1.10 U	2.50 U	5.90 U	**0.970**
Dibutyl Phthalate	220	1,700	4.48 U	9.89 U	23.6 U	3.11 U
Diethyl Phthalate	61	110	**3.24**	**9.53**	**17.9**	**2.55**
Dimethyl Phthalate	53	53	**1.80**	2.50 U	5.90 U	0.770 U
Di-N-Octyl Phthalate	58	4,500	4.48 U	9.89 U	23.6 U	3.11 U
Phthalates by EPA 8270 (µg/kg)						
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	**79.1**	46.9 U	47.2 U	48.2 U
Butyl benzyl Phthalate	63	900	4.7 U	4.7 U	4.7 U	**6.0**
Dibutyl Phthalate	1,400	1,400	18.8 U	18.8 U	18.9 U	19.3 U
Diethyl Phthalate	200	200	**13.6 J**	**18.1 J**	**14.3 J**	**15.8 J**
Dimethyl Phthalate	71	160	**7.5**	4.7 U	4.7 U	4.8 U
Di-N-Octyl Phthalate	6,200	6,200	18.8 U	18.8 U	18.9 U	19.3 U
Phenols by EPA 8270 (µg/kg)						
2,4-Dimethylphenol	29	29	23.5 U	23.5 U	23.6 U	**4.6 J**
2-methylphenol (o-Cresol)	63	63	18.8 U	18.8 U	18.9 U	19.3 U
4-methylphenol (p-Cresol)	670	670	18.8 U	18.8 U	18.9 U	19.3 U
Pentachlorophenol	360	690	93.8 U	93.8 U	94.3 U	96.5 U
Phenol	420	1,200	18.8 U	18.8 U	18.9 U	19.3 U
Miscellaneous Extractables (OC Normalized[2]) by EPA 8270 SIM (mg/kg OC)						
Dibenzofuran	15	58	**3.76**	2.48 U	5.94 U	**2.76**
Hexachlorobutadiene	3.9	6.2	1.10 U	2.50 U	5.90 U	0.770 U
N-Nitrosodiphenylamine (as diphenylamine)	11	11	1.10 U	2.50 U	5.90 U	0.770 U
Miscellaneous Extractables by EPA 8270 (mg/kg)						
Dibenzofuran	540	540	**15.8**	4.72 U	4.75 U	**17.1**
Hexachlorobutadiene	11	120	4.7 U	4.7 U	4.7 U	4.8 U
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.7 U	4.7 U	4.7 U	4.8 U
Benzoic Acid	650	650	93.8 U	93.8 U	94.3 U	96.5 U
Benzyl Alcohol	57	730	18.8 U	18.8 U	18.9 U	19.3 U

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

[2] SED-1 was completed by compositing sediment surface samples and cores from 2 locations (SED-1B and SED-1C).

[3] Screening levels are referenced from Ecology's Sediment Cleanup Users Manual II (SCUM II; Ecology, 2017).

sediment with a total organic carbon (TOC) concentration

[5] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

of the following LPAH compounds: acenaphthene,

of the following HPAH compounds: benzo[a]anthracene,

[8] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

SCO = Sediment Cleanup Objective
CSL = Cleanup Screening Level
LAET = Lowest Apparent Effects Threshold
2LAET = Second Lowest Apparent Effects Threshold
mg/L = milligram per liter
µg/L = microgram per liter
NE = not established
NA = not applicable
-- = not analyzed
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
µg/kg = microgram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.
J = The analyte was detected and the detected concentration is considered an estimate.
cm = centimeters
Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the SCO/LAET screening level.
Orange shading indicates exceedance of the CSL/2LAET screening level.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL is above screening level.
Grey shading indicates that the shaded value is not compared to the screening levels because the TOC concentration of the sample is outside the specified range for application of screening levels to the shaded value.

Table 11

Remedial Investigation Sediment Analytical Results for Protection of Human Health

Quiet Cove
Anacortes, Washington

Sample Location[1]	**Preliminary Screening Level**[3]	**GEI-SED-1**[2]			**GEI-SED-2**		**GEI-SED-3**		**GEI-SED-4**	
Sample Identification		**GEI-SED-COMP-1 _ 091517**	**GEI-SED1-1-3 _ 091517**	**GEI-SED1-4-6 _ 091517**	**SED-2-0-2**	**SED-2-2-4**	**SED-3-0-2**	**SED-3-2-3.5**	**SED-4-0-1.5**	**SED-4-1.5-3**
Sample Date		**9/15/2017**	**9/15/2017**	**9/15/2017**	**07/17/18**	**07/17/18**	**07/17/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)		**0-10 cm**	**1 - 3 ft**	**4 - 6 ft**	**0-2 ft**	**2-4 ft**	**0-2 ft**	**2-3.5 ft**	**0-1.5 ft**	**1.5-3 ft**
Field Measured Parameters										
Sheen	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals by EPA 6000/7000 Series (mg/kg)										
Arsenic	11	**3.45**	**3.62**	**6.83**	--	--	--	--	--	--
Cadmium	0.8	0.03 UJ	0.08 UJ	**0.56**	--	--	--	--	--	--
Chromium	230,000	**16.3**	**17**	**18.1**	--	--	--	--	--	--
Copper	26,000	**21.2**	**30.4**	**58.6**	--	--	--	--	--	--
Lead	21	**56.4**	**60.8**	**97.1**	**69.9**	--	**19.8**	--	**125**	**55.8**
Silver	3,200	**0.02 J**	**0.02 J**	**0.14 J**	--	--	--	--	--	--
Zinc	190,000	**166**	**68.2**	**98.7**	--	--	--	--	--	--
Mercury	0.2	0.0212 UJ	**0.0334**	**0.235**	--	--	--	--	--	--
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)										
Gasoline-range hydrocarbons	30[4]	5.95 U	5.36 U	8.59 U	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	**8.58**	**17.6**	**580**	**107**	**41.1**	**8.08**	5.65 U	**78**	**40**
Motor Oil-range hydrocarbons	2,000	**46.9**	**69.4**	**688**	**171**	**76.6**	**13.8**	11.3 U	**129**	**67.9**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)										
Benzene	0.05	**0.00134 J**	**0.00117**	0.00120 U	--	--	--	--	--	--
Toluene	3.78	**0.00182**	**0.00177**	0.00120 U	--	--	--	--	--	--
Ethylbenzene	1.12	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Total Xylenes	2.83	0.00326 U	**0.00163**	0.00240 U	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	NA	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	0.02	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Methyl t-butyl ether (MTBE)	2.59	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
n-Hexane	0.27	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)										
2-Methylnaphthalene	1,600	**0.00339 J**	**0.0141**	**0.093**	--	--	--	--	--	--
Acenaphthene	25,000	**0.00352 J**	**0.00623**	**0.15**	--	--	--	--	--	--
Acenaphthylene	25,000	**0.0155**	**0.0253**	**0.211**	--	--	--	--	--	--
Anthracene	120,000	**0.0238**	**0.056**	**0.765**	--	--	--	--	--	--
Fluorene	16,000	**0.0137**	**0.0231**	**0.227**	--	--	--	--	--	--
Naphthalene	8,200	**0.00487 J**	**0.018**	**0.354**	--	--	--	--	--	--
Phenanthrene	120,000	**0.192**	**0.214**	**2.16**	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)										
Benzo(a)anthracene	0.600	**0.0771**	**0.168**	**1.76**	**0.449**	--	**0.0368**	--	**0.617**	**0.164**
Benzo(a)pyrene	0.0600	**0.0802**	**0.147**	**1.45**	**0.515**	--	**0.0386**	--	**0.701**	**0.186**
Benzo(g,h,i)perylene	12,000	**0.0721**	**0.114**	**0.921**	--	--	--	--	--	--
Benzofluoranthenes (Total)	NE	**0.0974**	**0.207**	**1.17**	**0.815**	--	**0.0611**	--	**1.09**	**0.295**
Chrysene	6.00	**0.0919**	**0.194**	**1.72**	**0.48**	--	**0.0379**	--	**0.683**	**0.175**
Dibenzo(a,h)anthracene	0.600	**0.0119**	**0.0297**	**0.19**	**0.078**	--	**0.00984**	--	**0.101**	**0.0293**
Fluoranthene	16,000	**0.207**	**0.35**	**3.55**	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	0.600	**0.0529**	**0.0912**	**0.789**	**0.308**	--	**0.0195**	--	**0.381**	**0.114**
Pyrene	12,000	**0.225**	**0.362**	**4.1**	--	--	--	--	--	--

Sample Location[1]	Preliminary Screening Level[3]	GEI-SED-1[2]			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification		**GEI-SED-COMP-1 _ 091517**	**GEI-SED1-1-3 _ 091517**	**GEI-SED1-4-6 _ 091517**	**SED-2-0-2**	**SED-2-2-4**	**SED-3-0-2**	**SED-3-2-3.5**	**SED-4-0-1.5**	**SED-4-1.5-3**
Sample Date		**9/15/2017**	**9/15/2017**	**9/15/2017**	**07/17/18**	**07/17/18**	**07/17/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)		**0-10 cm**	**1 - 3**	**4 - 6**	**0-2 ft**	**2-4 ft**	**0-2 ft**	**2-3.5 ft**	**0-1.5 ft**	**1.5-3 ft**
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)										
Total cPAH TEQ[5] (ND=0)	0.0210	**0.105**	**0.199**	**1.89**	**0.662**	**--**	**0.0501**	**--**	**0.9**	**0.24**
Total cPAH TEQ[5] (ND=0.5RL)	0.0210	**0.105**	**0.199**	**1.89**	**0.662**	**--**	**0.0501**	**--**	**0.9**	**0.24**
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)										
1,2,4-Trichlorobenzene	19.0	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0049 U	**0.0029 J**	**0.008**	**--**	**--**	**--**	**--**	**--**	**--**
Hexachlorobenzene	0.340	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Phthalates by EPA 8270 (mg/kg)										
Bis(2-Ethylhexyl) Phthalate	39.0	**0.0313 J**	0.0468 U	0.0497 U	--	--	--	--	--	--
Butyl benzyl Phthalate	290	0.0049 U	**0.0399**	0.0050 U	--	--	--	--	--	--
Dibutyl Phthalate	49,000	0.0196 U	**0.0094 J**	0.0199 U	--	--	--	--	--	--
Diethyl Phthalate	400,000	**0.0196 U**	**0.0187 U**	**0.0199 U**	**--**	**--**	**--**	**--**	**--**	**--**
Dimethyl Phthalate	NE	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	4,900	0.0196 U	0.0187 U	0.0199 U	--	--	--	--	--	--
Phenols by EPA 8270 (mg/kg)										
2,4-Dimethylphenol	9,900	0.0244 U	0.0234 U	**0.0236 J**	**--**	**--**	**--**	**--**	**--**	**--**
2-methylphenol (o-Cresol)	25,000	0.0196 U	0.0187 U	**0.0158 J**	**--**	**--**	**--**	**--**	**--**	**--**
4-methylphenol (p-Cresol)	49,000	0.0196 U	0.0187 U	**0.187**	**--**	**--**	**--**	**--**	**--**	**--**
Pentachlorophenol	0.62	0.0978 U	0.0935 U	**1.11**	**--**	**--**	**--**	**--**	**--**	**--**
Phenol	150,000	0.0196 U	0.0187 U	**0.0426**	**--**	**--**	**--**	**--**	**--**	**--**
Miscellaneous Extractables by EPA 8270 (mg/kg)										
Dibenzofuran	490	**0.00851**	**0.0103**	**0.139**	**--**	**--**	**--**	**--**	**--**	**--**
Hexachlorobutadiene	7.00	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Benzoic Acid	NE	0.0978 U	0.0935 U	0.0994 U	--	--	--	--	--	--
Benzyl Alcohol	49,000,000	0.0196 U	0.0187 U	0.0199 U	--	--	--	--	--	--

Table 11 (Continued)

Remedial Investigation Sediment Analytical Results for Protection of Human Health

Quiet Cove
Anacortes, Washington

Sample Location[1]	**Preliminary Screening Level[3]**	**GEI-SED-5**		**GEI-SED-6**		**GEI-SED-7**		**GEI-SED-8**	
Sample Identification		**SED-5-0-0.5**	**SED-5-2-4**	**SED-6-0-0.5**	**SED-6-1-3**	**SED-7-0-0.5**	**SED-7-0-1**	**SED-8-0-0.5**	**SED-8-3.2-4.5**
Sample Date		**07/16/18**	**07/16/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)		**0-0.5 ft**	**2-4 ft**	**0-0.5 ft**	**1-3 ft**	**0-0.5 ft**	**0-1 ft**	**0-0.5 ft**	**3.2-4.5 ft**
Field Measured Parameters									
Sheen	NE	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	<1	<1	<1	<1	<1	3.3	1.8
Metals by EPA 6000/7000 Series (mg/kg)									
Arsenic	11	**3.73**	**3.30**	**7.16**	**5.55**	**3.05**	**3.20**	**3.72**	**3.57**
Cadmium	0.8	**0.08 J**	**0.12**	**0.07 J**	**0.09 J**	**0.06 J**	**0.06 J**	**0.04 J**	**0.42**
Chromium	230,000	**19.5**	**14.5**	**13.6**	**27.2**	**17.8**	**14.3**	**15.2**	**15.3**
Copper	26,000	**21.0**	**38.6**	**14.5**	**43.4**	**187**	**165**	**22.2**	**47.8**
Lead	21	**31.3**	**70.1**	**34.8**	**78.8**	**53.3**	**40.8**	**44.4**	**240**
Silver	3,200	**0.03 J**	**0.06 J**	**0.05 J**	**0.05 J**	**0.04 J**	**0.04 J**	**0.05 J**	**0.11 J**
Zinc	190,000	**51.2**	**81.8**	**108**	**75.7**	**112**	**53.8**	**41.6**	**132**
Mercury	0.2	0.0219 U	**0.0427**	0.0238 U	0.0234 U	0.0200 U	0.0230 U	0.0244 U	**0.168**
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)									
Gasoline-range hydrocarbons	30[4]	5.26 U	6.6 U	7.66 U	4.64 U	7.44 U	5.54 U	7.07 U	5.96 U
Diesel-range hydrocarbons	2,000	**18.1**	**24.1**	**10.5**	**6.39**	5.12 U	5.11 U	**10.1**	**135**
Motor Oil-range hydrocarbons	2,000	**40.6**	**94.6**	**43.2**	**35.1**	**22.2**	**24.2**	**26.7**	**248**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)									
Benzene	0.05	**0.00121**	**0.00093 J**	**0.00043 J**	**0.00205**	**0.00080 J**	**0.00028 J**	0.00113 U	**0.00169**
Toluene	3.78	**0.00147**	**0.00041 J**	0.00122 U	**0.00162**	**0.00052 J**	**0.00023 J**	0.00113 U	**0.00049 J**
Ethylbenzene	1.12	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
Total Xylenes	2.83	**0.000810**	0.00210 U	0.00243 U	**0.000440**	0.00228 U	0.00182 U	0.00225 U	0.00191 U
1,2-Dibromoethane (EDB)	NA	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
1,2-Dichloroethane (EDC)	0.02	**0.00047 J**	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	**0.00054 J**
Methyl t-butyl ether (MTBE)	2.59	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
n-Hexane	0.27	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)									
2-Methylnaphthalene	1,600	**0.00935**	**0.00345 J**	**0.00250 J**	**0.00399 J**	0.00464 U	**0.00414 J**	**0.00409 J**	**0.0294**
Acenaphthene	25,000	**0.00723**	**0.00277 J**	0.00467 U	0.00476 U	0.00464 U	0.00467 U	**0.00631**	**0.0390**
Acenaphthylene	25,000	**0.0256**	**0.00997**	**0.00234 J**	**0.0197**	0.00464 U	**0.00647**	**0.0106**	**0.0595**
Anthracene	120,000	**0.0505**	**0.0267**	**0.00578**	**0.0202**	**0.00270 J**	**0.00851**	**0.0348**	**0.118**
Fluorene	16,000	**0.0266**	**0.0107**	0.00467 U	**0.00332 J**	0.00464 U	**0.00406 J**	**0.0129**	**0.0558**
Naphthalene	8,200	**0.0322**	**0.00497**	**0.00526**	**0.00335 J**	**0.00238 J**	**0.00561**	**0.00864**	**0.0742**
Phenanthrene	120,000	**0.182**	**0.0871**	**0.0186**	**0.0302**	**0.00622**	**0.0484**	**0.119**	**0.383**
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)									
Benzo(a)anthracene	0.600	**0.12**	**0.0455**	**0.0272**	**0.0550**	**0.00844**	**0.0348**	**0.0722**	**0.325**
Benzo(a)pyrene	0.0600	**0.113**	**0.0507**	**0.0257**	**0.0533**	**0.00813**	**0.0393**	**0.0869**	**0.338**
Benzo(g,h,i)perylene	12,000	**0.0783**	**0.0389**	**0.0201**	**0.0524**	**0.00786**	**0.0326**	**0.0668**	**0.252**
Benzofluoranthenes (Total)	NE	**0.205**	**0.0727**	**0.0458**	**0.165**	**0.0215**	**0.0696**	**0.12**	**0.505**
Chrysene	6.00	**0.212**	**0.0548**	**0.0300**	**0.0952**	**0.0123**	**0.0459**	**0.0851**	**0.325**
Dibenzo(a,h)anthracene	0.600	**0.0272**	**0.0166**	**0.0143**	**0.0189**	**0.0121**	**0.0159**	**0.0206**	**0.0609**
Fluoranthene	16,000	**0.276**	**0.116**	**0.0485**	**0.114**	**0.0164**	**0.0820**	**0.172**	**0.84**
Indeno(1,2,3-c,d)pyrene	0.600	**0.0668**	**0.0348**	**0.0234**	**0.0460**	**0.0147**	**0.0308**	**0.0531**	**0.185**
Pyrene	12,000	**0.248**	**0.13**	**0.0539**	**0.118**	**0.0201**	**0.0886**	**0.2**	**0.938**

Sample Location[1]	**Preliminary Screening Level[3]**	**GEI-SED-5**		**GEI-SED-6**		**GEI-SED-7**		**GEI-SED-8**	
Sample Identification		**SED-5-0-0.5**	**SED-5-2-4**	**SED-6-0-0.5**	**SED-6-1-3**	**SED-7-0-0.5**	**SED-7-0-1**	**SED-8-0-0.5**	**SED-8-3.2-4.5**
Sample Date		**07/16/18**	**07/16/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/17/18**	**07/16/18**	**07/16/18**
Sample Interval (feet bgs)		**0-0.5 ft**	**2-4 ft**	**0-0.5 ft**	**1-3 ft**	**0-0.5 ft**	**0-1 ft**	**0-0.5 ft**	**3.2-4.5 ft**
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)									
Total cPAH TEQ[5] (ND=0)	0.0210	**0.157**	**0.0682**	**0.0371**	**0.0827**	**0.0139**	**0.0549**	**0.114**	**0.449**
Total cPAH TEQ[5] (ND=0.5RL)	0.0210	**0.157**	**0.0682**	**0.0371**	**0.0827**	**0.0139**	**0.0549**	**0.114**	**0.449**
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)									
1,2,4-Trichlorobenzene	19.0	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0040 J
Hexachlorobenzene	0.340	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Phthalates by EPA 8270 (mg/kg)									
Bis(2-Ethylhexyl) Phthalate	39.0	0.0469 U	0.0476 U	0.0466 U	0.0475	0.0466 U	0.0468 U	0.0479 U	0.0499 U
Butyl benzyl Phthalate	290	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Dibutyl Phthalate	49,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Diethyl Phthalate	400,000	**0.0122 J**	**0.0127 J**	**0.0102 J**	**0.0205**	**0.0139 J**	**0.0180 J**	**0.0118 J**	**0.0188 J**
Dimethyl Phthalate	NE	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Di-N-Octyl Phthalate	4,900	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Phenols by EPA 8270 (mg/kg)									
2,4-Dimethylphenol	9,900	0.0234 U	0.0238 U	0.0233 U	0.0237 U	0.0233 U	0.0234 U	0.0240 U	**0.0031 J**
2-methylphenol (o-Cresol)	25,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
4-methylphenol (p-Cresol)	49,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0479
Pentachlorophenol	0.62	0.0937 U	0.0952 U	0.0932 U	0.0946 U	0.0932 U	0.0935 U	0.0958 U	**0.0574 J**
Phenol	150,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Miscellaneous Extractables by EPA 8270 (mg/kg)									
Dibenzofuran	490	**0.0113**	**0.00565**	0.00467 U	0.00476 U	0.00464 U	0.00467 U	**0.00590**	**0.0314**
Hexachlorobutadiene	7.00	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	**0.0193**
Benzoic Acid	NE	0.0937 U	0.0952 U	**0.0282 J**	0.0946 U	0.0932 U	**0.0210 J**	0.0958 U	**0.0396 J**
Benzyl Alcohol	49,000,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U

Table 11 (Continued)

Remedial Investigation Sediment Analytical Results for Protection of Human Health

Quiet Cove
Anacortes, Washington

Sample Location[1]	**Preliminary Screening Level[3]**	**GEI-SED-9**		**GEI-SED-10**	
Sample Identification		**SED-9-0-0.5**	**SED-9-1.7-2.3**	**SED-10-0-0.5**	**SED-10-2-4**
Sample Date		**07/16/18**	**07/17/18**	**07/18/18**	**07/17/18**
Sample Interval (feet bgs)		**0-0.5 ft**	**1.7-2.3 ft**	**0-0.5 ft**	**2-4 ft**
Field Measured Parameters					
Sheen	NE	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	2.2	<1	<1
Metals by EPA 6000/7000 Series (mg/kg)					
Arsenic	11	**3.93**	**0.75**	**2.71**	**4.01**
Cadmium	0.8	**0.06 J**	**0.009 J**	**0.05 J**	**0.37**
Chromium	230,000	**15.4**	**15.9**	**21.6**	**15.2**
Copper	26,000	**47.9**	**4.49**	**16.0**	**17.1**
Lead	21	**101**	**0.87**	**24.5**	**23.5**
Silver	3,200	**0.05 J**	**0.03 J**	**0.04 J**	**0.07 J**
Zinc	190,000	**68.4**	**20.0**	**47.7**	**54.3**
Mercury	0.2	**0.0353**	0.0253 U	0.0291 U	**0.0844**
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)					
Gasoline-range hydrocarbons	30[4]	6.6 U	6.28 U	6.32 U	7.16 U
Diesel-range hydrocarbons	2,000	**20.7**	5.54 U	5.69 U	**29.0**
Motor Oil-range hydrocarbons	2,000	**51.6**	11.1 U	**28.2**	**52.7**
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)					
Benzene	0.05	**0.00065 J**	**0.00073 J**	0.00109 U	**0.00042 J**
Toluene	3.78	**0.00053 J**	**0.00034 J**	0.00109 U	**0.00046 J**
Ethylbenzene	1.12	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Total Xylenes	2.83	0.00208 U	0.00211 U	0.00218 U	0.00247 U
1,2-Dibromoethane (EDB)	NA	0.00104 U	0.00105 U	0.00109 U	0.00123 U
1,2-Dichloroethane (EDC)	0.02	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Methyl t-butyl ether (MTBE)	2.59	0.00104 U	0.00105 U	0.00109 U	0.00123 U
n-Hexane	0.27	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)					
2-Methylnaphthalene	1,600	**0.0114**	0.00472 U	0.00475 U	**0.0148**
Acenaphthene	25,000	**0.0162**	0.00472 U	0.00475 U	**0.0149**
Acenaphthylene	25,000	**0.0364**	0.00472 U	0.00292 J	**0.0351**
Anthracene	120,000	**0.12**	0.00472 U	0.00475 U	**0.0647**
Fluorene	16,000	**0.0411**	0.00472 U	0.00475 U	**0.0302**
Naphthalene	8,200	**0.0285**	0.00472 U	0.00475 U	**0.0412**
Phenanthrene	120,000	**0.452**	0.00472 U	**0.00798**	**0.21**
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)					
Benzo(a)anthracene	0.600	**0.218**	0.00472 U	**0.00704**	**0.122**
Benzo(a)pyrene	0.0600	**0.243**	0.00472 U	**0.00908**	**0.144**
Benzo(g,h,i)perylene	12,000	**0.173**	0.00472 U	**0.00737**	**0.112**
Benzofluoranthenes (Total)	NE	**0.393**	0.00944 U	**0.0179**	**0.206**
Chrysene	6.00	**0.296**	0.00472 U	**0.00896**	**0.135**
Dibenzo(a,h)anthracene	0.600	**0.0387**	0.00472 U	**0.0116**	**0.0476**
Fluoranthene	16,000	**0.871**	0.00472 U	**0.0126**	**0.291**
Indeno(1,2,3-c,d)pyrene	0.600	**0.13**	0.00472 U	**0.0140**	**0.0971**
Pyrene	12,000	**0.771**	0.00472 U	**0.0141**	**0.392**

Sample Location[1]	Preliminary Screening Level[3]	GEI-SED-9		GEI-SED-10	
Sample Identification		SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date		07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)		0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)					
Total cPAH TEQ[5] (ND=0)	0.0210	**0.324**	0 U	**0.0142**	**0.193**
Total cPAH TEQ[5] (ND=0.5RL)	0.0210	**0.324**	0.00360 U	**0.0142**	**0.193**
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)					
1,2,4-Trichlorobenzene	19.0	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Hexachlorobenzene	0.340	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Phthalates by EPA 8270 (mg/kg)					
Bis(2-Ethylhexyl) Phthalate	39.0	**0.0791**	0.0469 U	0.0472 U	0.0482 U
Butyl benzyl Phthalate	290	0.0047 U	0.0047 U	0.0047 U	**0.0060**
Dibutyl Phthalate	49,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Diethyl Phthalate	400,000	**0.0136 J**	**0.0181 J**	**0.0143 J**	**0.0158 J**
Dimethyl Phthalate	NE	**0.0075**	0.0047 U	0.0047 U	0.0048 U
Di-N-Octyl Phthalate	4,900	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Phenols by EPA 8270 (mg/kg)					
2,4-Dimethylphenol	9,900	0.0235 U	0.0235 U	0.0236 U	**0.0046 J**
2-methylphenol (o-Cresol)	25,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
4-methylphenol (p-Cresol)	49,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Pentachlorophenol	0.62	0.0938 U	0.0938 U	0.0943 U	0.0965 U
Phenol	150,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Miscellaneous Extractables by EPA 8270 (mg/kg)					
Dibenzofuran	490	**0.0158**	0.00472 U	0.00475 U	**0.0171**
Hexachlorobutadiene	7.00	0.0047 U	0.0047 U	0.0047 U	0.0048 U
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Benzoic Acid	NE	0.0938 U	0.0938 U	0.0943 U	0.0965 U
Benzyl Alcohol	49,000,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U

Notes:

[1] Sample locations and summary of remedial investigation results are shown on Figure 3 through 8.

[2] SED-1 was completed by compositing sediment surface samples and cores from 2 locations (SED-1B and SED-1C).

[3] Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) consistent with the RI/FS Work Plan.

[4] Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

[5] Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

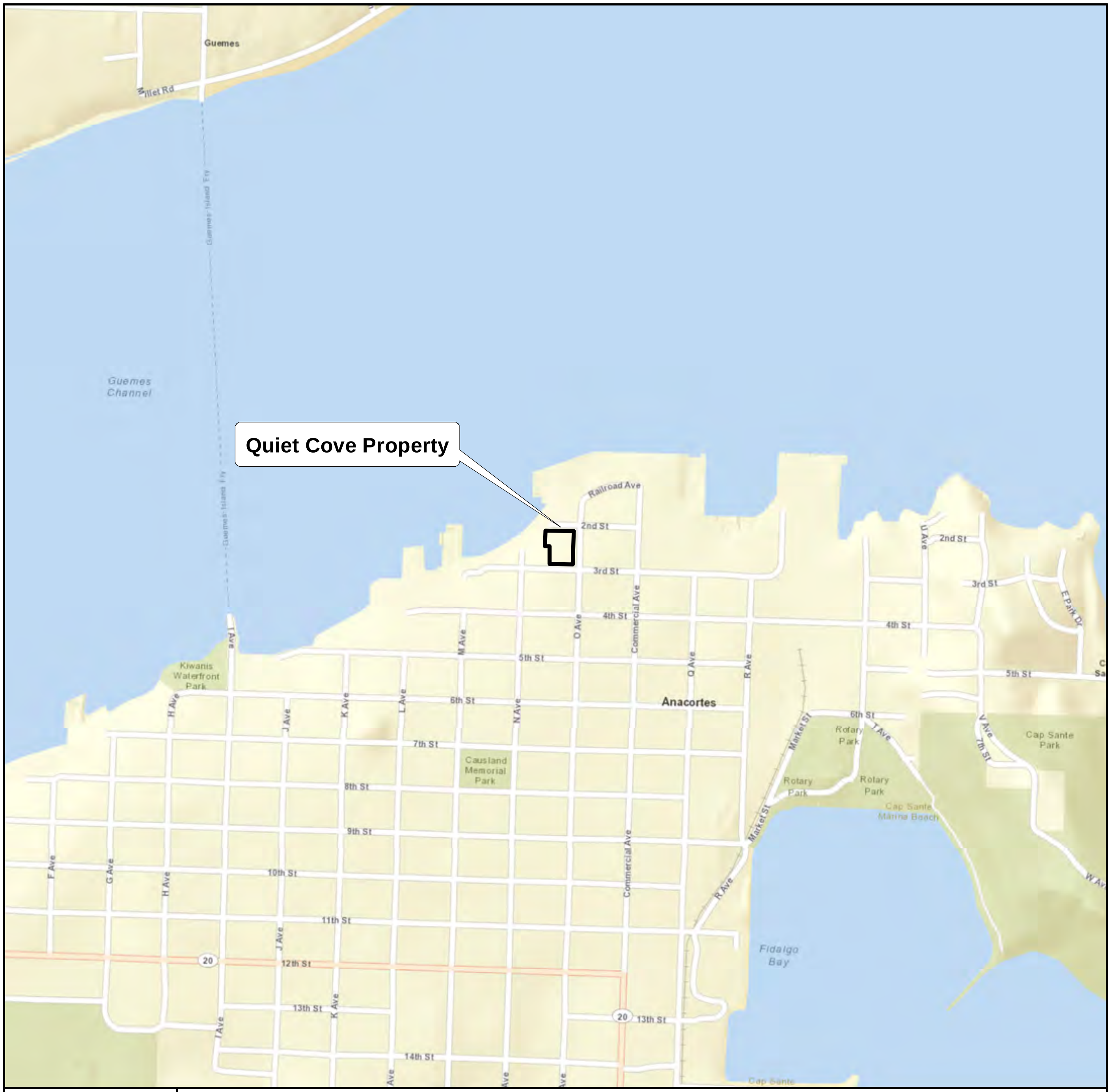
U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Bold font type indicates the analyte was detected at the reported concentration.

GeoEngineers



Office: Redmond Path:C:\Users\maugust\Desktop\xxxxxxxx_F1_VicinityMap.mxd Map Revised: 1/28/2014 MSA

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Data 2013.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Quiet Cove Property
Anacortes, Washington

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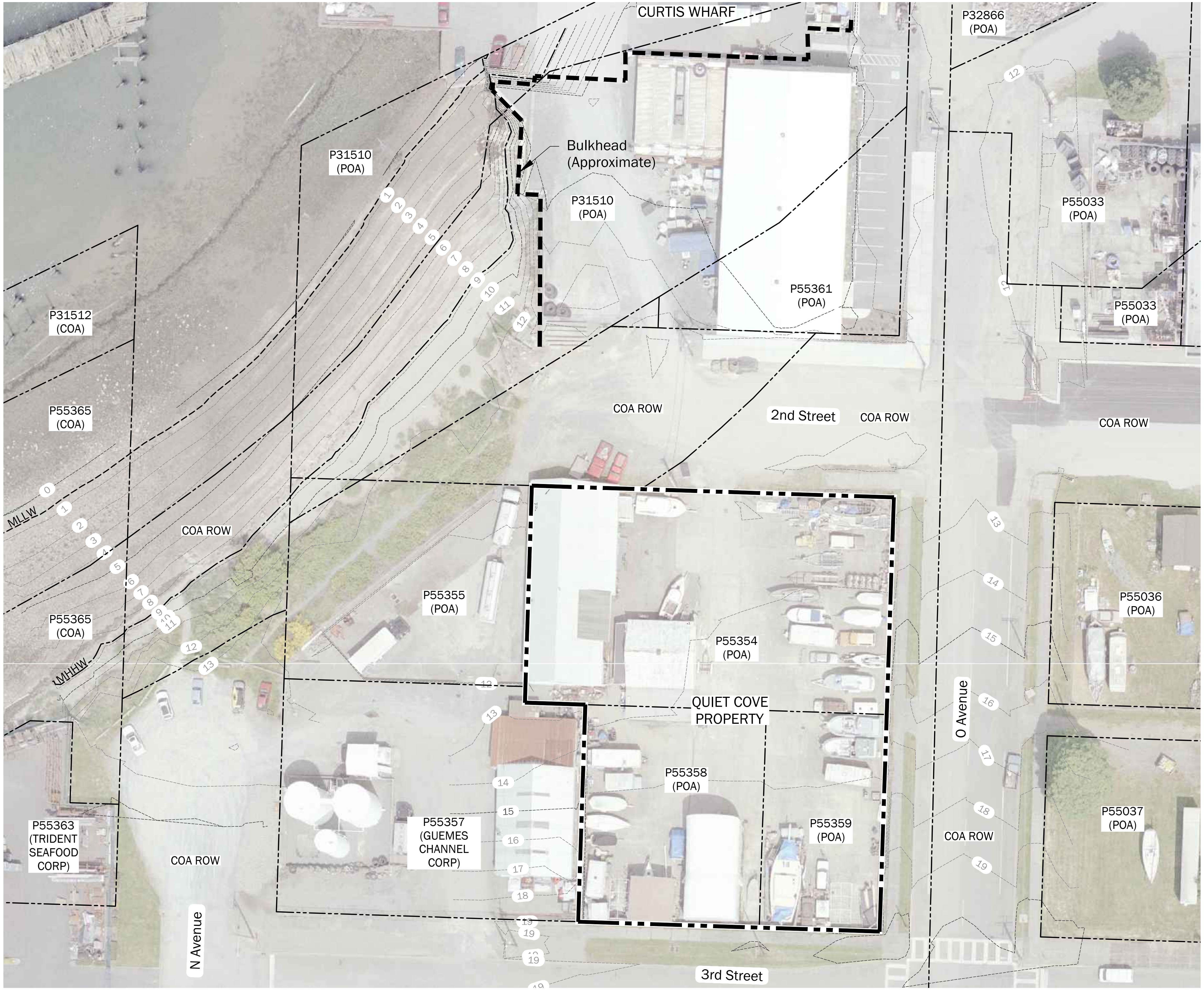
Figure 1



Legend

— · —	Quiet Cove Property Boundary
— · — · —	Skagit County Parcel Boundary
------10------	Contour (Feet, NAVD 88)
— — — —	Mean Lower Low Water (MLLW) Line (0.66 Feet NAVD 88)
—·—·—	Mean Higher High Water (MHHW) Line (8.86 Feet NAVD 88)
P55365 (COA)	Parcel Number (Owner)
POA =	Port of Anacortes
COA =	City of Anacortes
ROW =	Right-of-Way

Notes:

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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

N
W
E
S

50 0 50
Feet

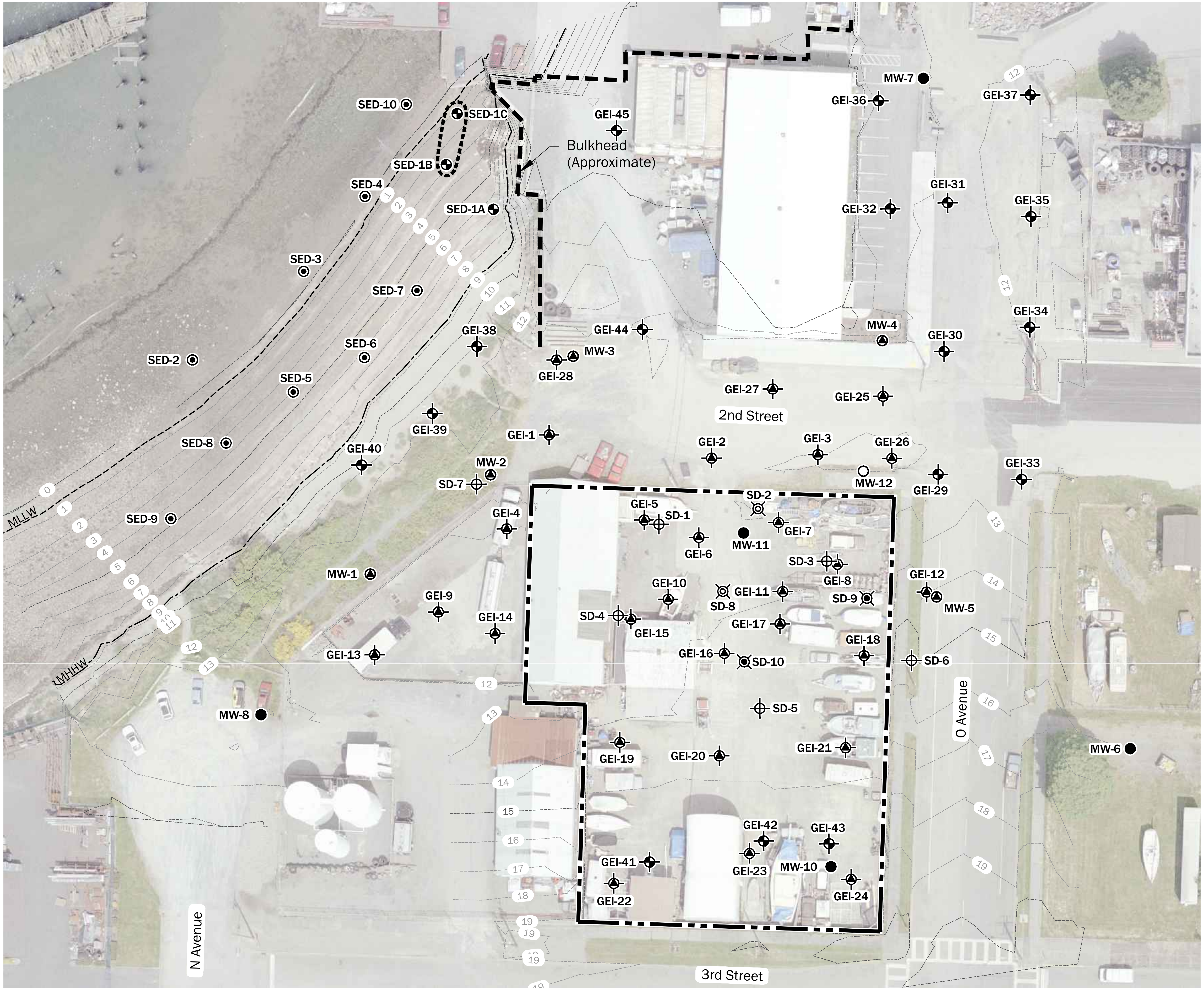
Current Property Layout

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 2

P:\5\5147024\CAD\07\RI Data Report\514702407_F02_Site Plan.dwg TAB:F02 Date Exported: 05/13/19 - 15:41 by hmara



Legend

▬ · ▬ Quiet Cove Property Boundary

--10-- Contour (Feet, NAVD 88)

Mean Lower Low Water (MLLW) Line (0.66 Feet NAVD 88)

Mean Higher High Water (MHHW) Line (8.86 Feet NAVD 88)

Supplemental RI Sample Locations

SD-1 Supplemental RI Soil Boring Location, 2018

SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen, 2018

SD-9 Supplemental RI Shallow Soil Boring Location, 2018

MW-12 ○ Supplemental RI Monitoring Well, 2018

RI Sample Locations

GEI-31 RI Soil Boring Location, 2017

SED-1A RI Tier 1 Sediment Sample, September 2017

SED-2 RI Tier 2 Sediment Sample, July 2018

MW-6 ● RI Monitoring Well, 2017

Composite Sediment Sample Grab Area (SED-1)

Focused Site Investigation

GEI-1 Focused Site Investigation Soil Boring Location, 2014

MW-1 Focused Site Investigation Monitoring Well, 2014

Notes:

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Projection: NAD83 WA State Planes, N Zone, US Foot

N
W E
S

50 0 50
Feet

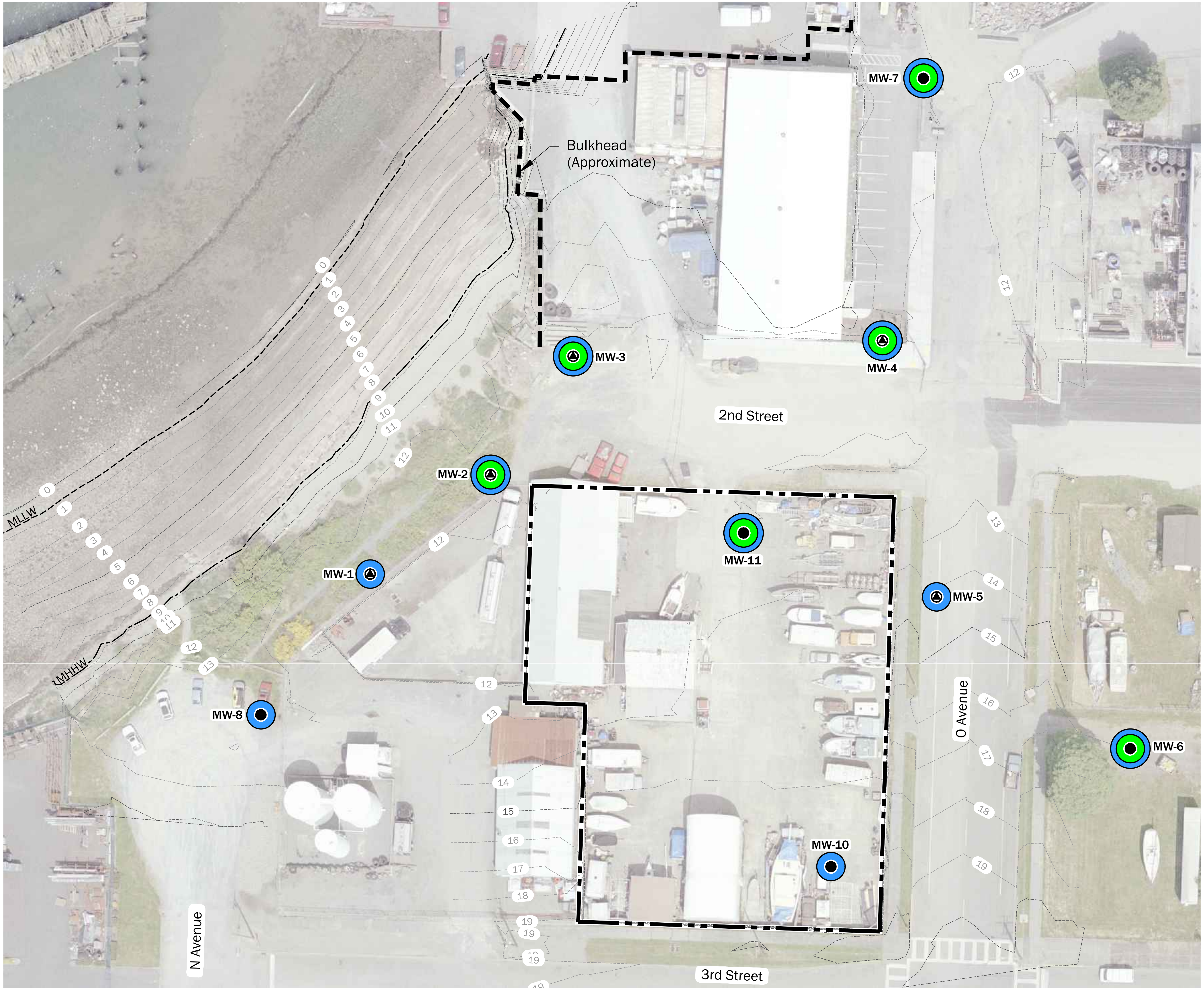
Site Plan and Sampling Locations

Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 3

P:\5\5147024\CAD\07\RI Data Report\514702407_F03_Site Plan and Sampling Locations.dwg TAB:F03 Date Exported: 05/13/19 - 15:41 by hmara



Legend

━ ‧ ━	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
MW-6 ●	RI Monitoring Well
MW-1 ◬	Focused Site Investigation Monitoring Well
🟢	Slug Test Location
🔵	72-Hour Tidal Study Location

Notes:

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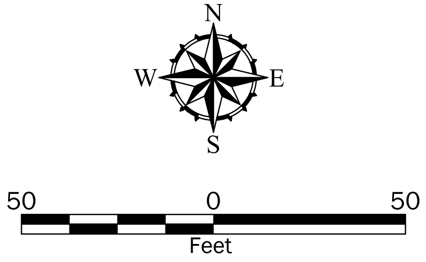
Projection: NAD83 WA State Planes, N Zone, US Foot



Hydrogeologic Investigation Locations

Quiet Cove Property
Anacortes, Washington

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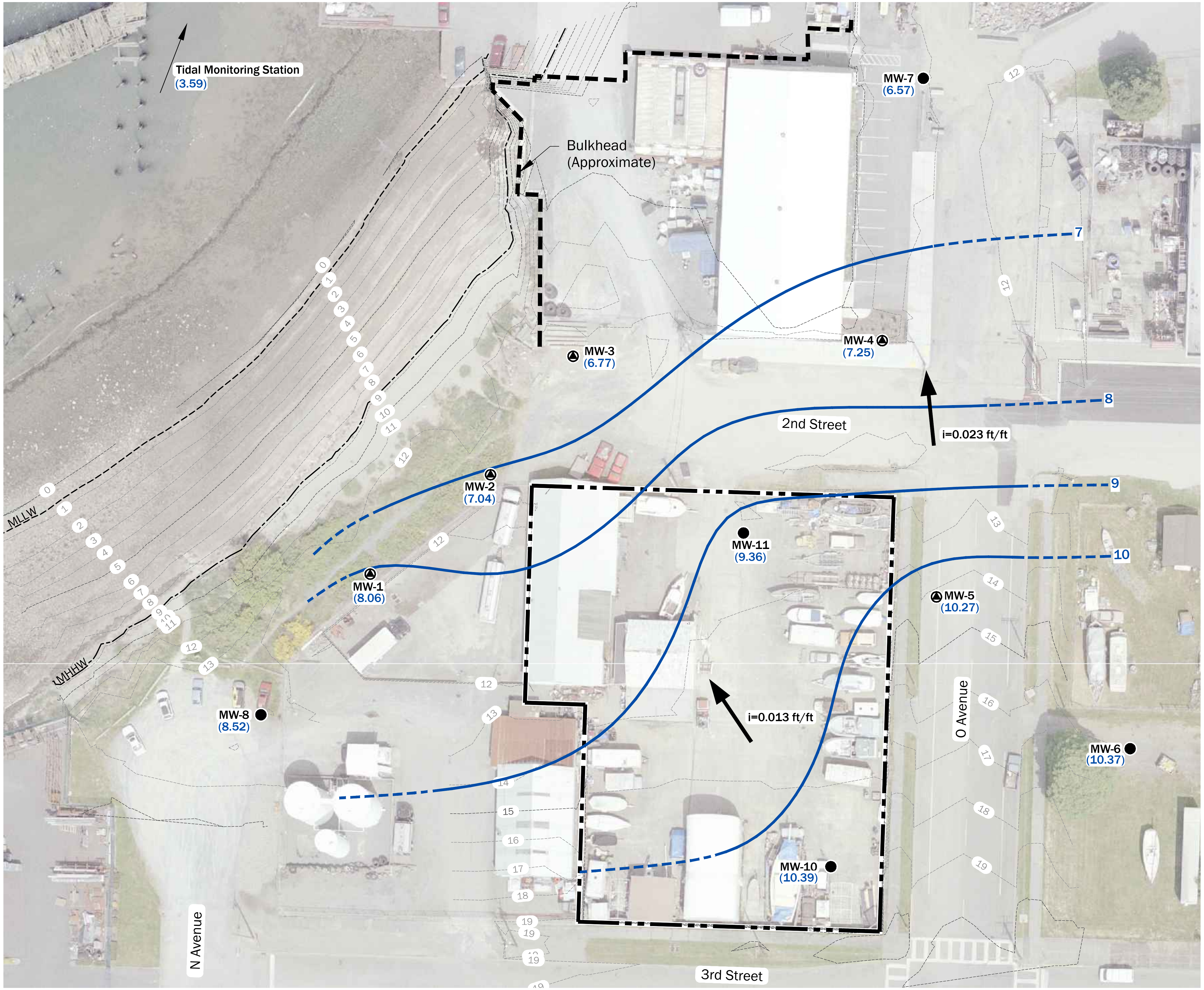
Figure 4

P:\5\5147024\CAD\07\RI Data Report\514702407_F04_Hydrogeologic Investigation Locations.dwg TAB:F04 Date Exported: 05/13/19 - 15:41 by hmara



Legend

▬ · ▬	Quiet Cove Property Boundary
-------10 -------	Contour (Feet, NAVD 88)
MW-6 ●	RI Monitoring Well
MW-1 ▲	Focused Site Investigation Monitoring Well
(10.39)	Mean Groundwater Elevation (Feet, NAVD 88), 72-Hour Tidal Study
— — —	Groundwater Elevation Contour (Feet, NAVD 88), Mean Elevations 72-Hour Tidal Study. Dashed Where Inferred.
➞ i =	Inferred groundwater flow direction and groundwater gradient in feet per foot calculated between monitoring wells MW-10 and MW-2, and between monitoring wells MW-5 and MW-4

Notes:

1. 72-hour tidal study conducted between 12:30 November 6 and 12:30 November 9, 2017.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

N
W E
S

50 0 50
Feet

Mean Groundwater and Tidal Elevations, 72-Hour Tidal Study

Quiet Cove Property
Anacortes, Washington

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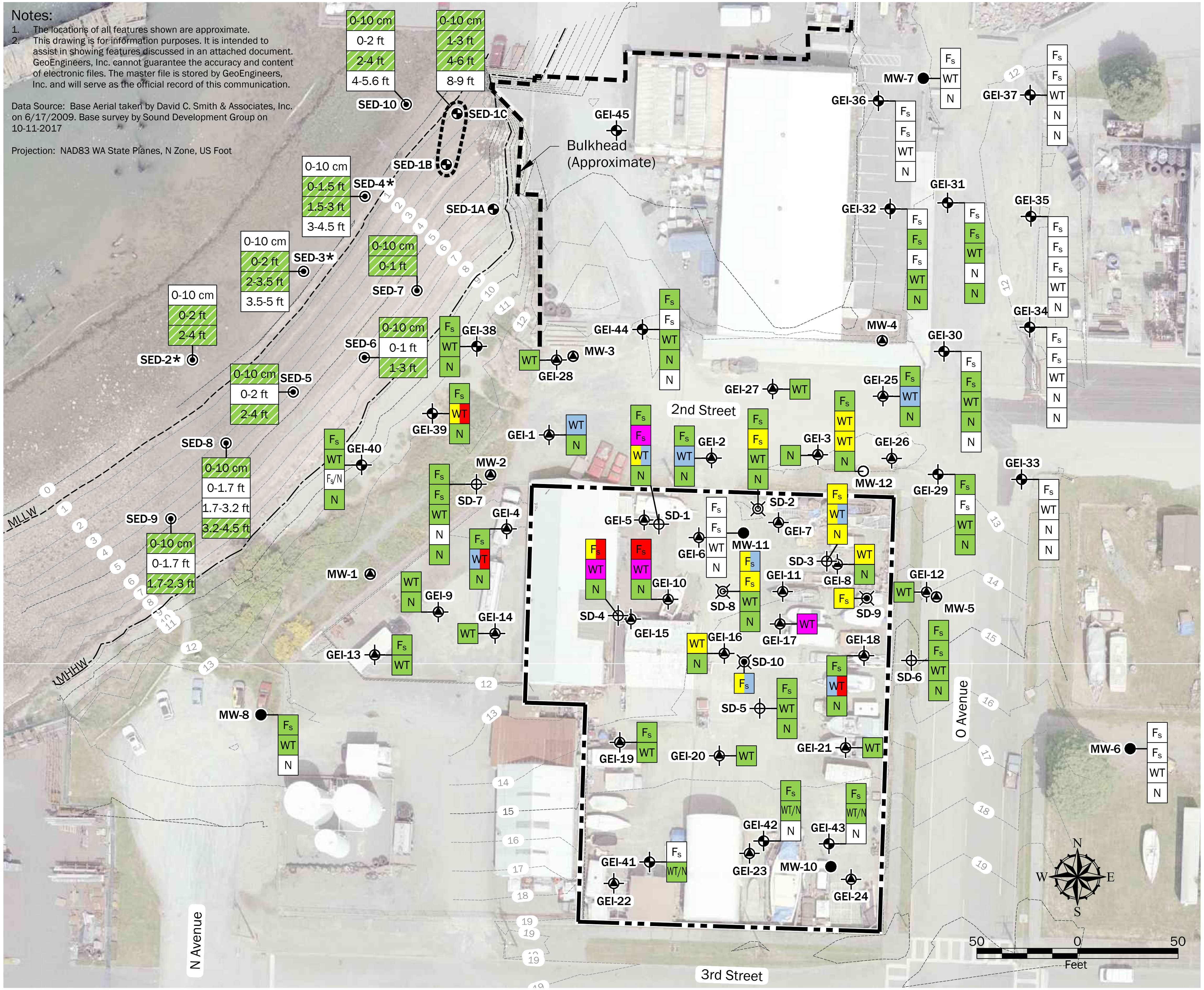
Figure 5

P:\5\5147024\CAD\07\RI Data Report\514702407_F05_Mean GW and Tidal Elevations.dwg TAB:F05 Date Exported: 05/13/19 - 15:41 by hmara



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · —	Quiet Cove Property Boundary
------10------	Contour (Feet, NAVD 88)
SD-1	Supplemental RI Soil Boring Location
SD-2	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31	RI Soil Boring Location
SED-1A	RI Tier 1 Sediment Sample
SED-2	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1	Focused Site Investigation Soil Boring Location
MW-1	Focused Site Investigation Monitoring Well
	Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

🟨	Gasoline-Range TPH	🟨🟥	Gas+Heavy-Oil TPH
🟦	Diesel-Range TPH	🟦🟥	Diesel+Heavy Oil TPH
🟥	Heavy-Oil-Range TPH	🟩	No Exceedance for TPH
🟪	Gas, Diesel and Heavy-Oil TPH	☐	Sample Not Analyzed, Archived
🟨🟦	Gas+Diesel TPH	*	Sample Only Analyzed for TPH-D

Soil Site Stratigraphy

F_s	Surface Fill	WT	Water Table
N	Native		

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

▨	No Exceedance
▨	Human Health Exceedance
▨	Benthic Exceedance
☐	Sample Not Analyzed, Archived

N
W
E
S

50 0 50
Feet

Soil and Sediment Analytical Results for Total Petroleum Hydrocarbon

Quiet Cove Property
Anacortes, Washington

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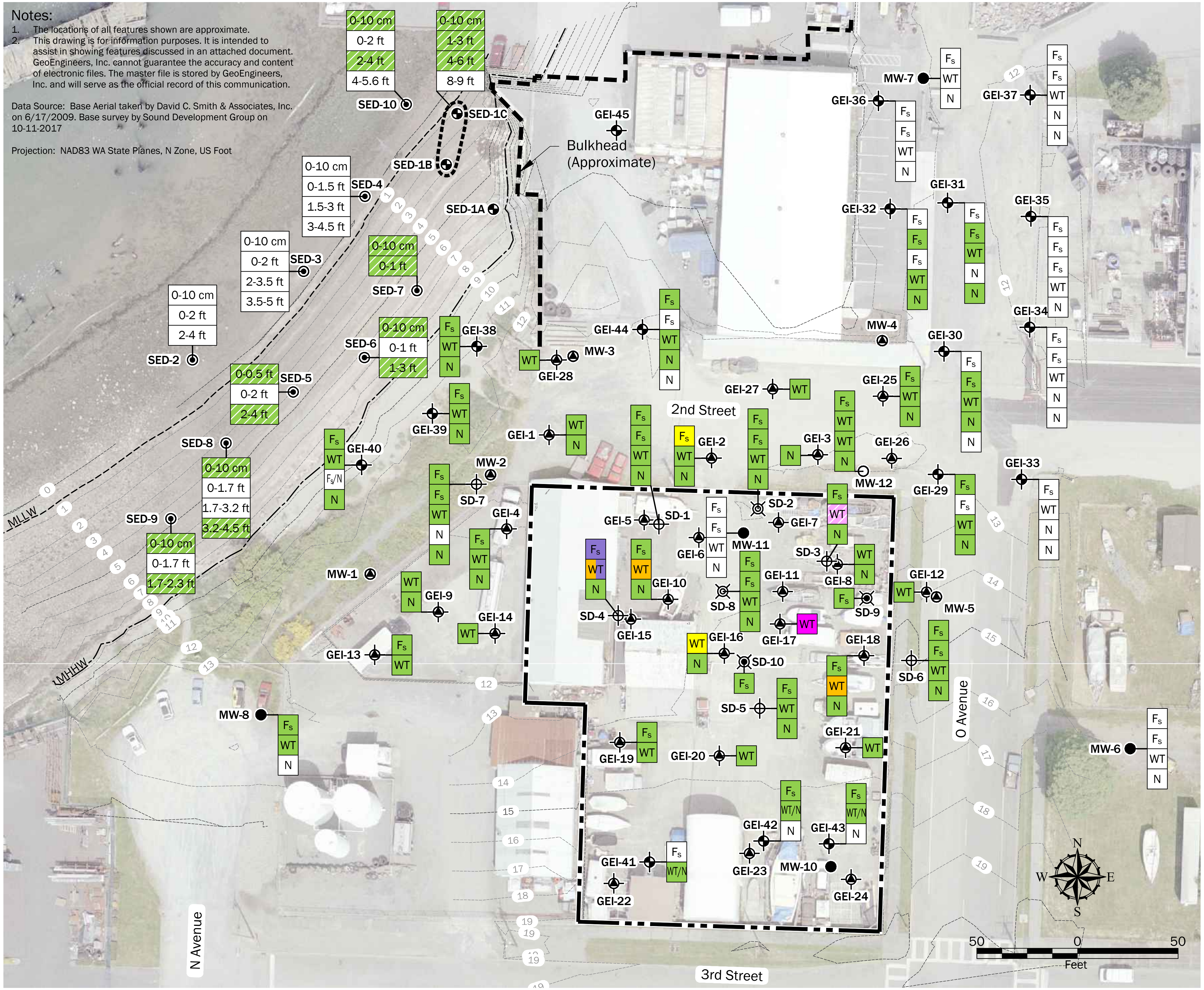
Figure 6

P:\5\5147024\CAD\07\RI Data Report\514702407_F06_Soil and Sediment Results for TPH.dwg TAB:F06 Date Exported: 05/13/19 - 15:41 by hmara



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

Quiet Cove Property Boundary

10 Contour (Feet, NAVD 88)

SD-1 Supplemental RI Soil Boring Location

SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen

SD-9 Supplemental RI Shallow Soil Boring Location

MW-12 ○ Supplemental RI Monitoring Well

GEI-31 RI Soil Boring Location

SED-1A RI Tier 1 Sediment Sample

SED-2 RI Tier 2 Sediment Sample

MW-6 ● RI Monitoring Well

GEI-1 Focused Site Investigation Soil Boring Location

MW-1 Focused Site Investigation Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

🟨	Benzene	🟪	Toulene
🟧	Total Xylenes	▨	Benzene, Toulene, Total Xylenes
🟪	All BETX and n-Hexane		
🟩	No Exceedance		
☐	Sample Not Analyzed, Archived		

Soil Site Stratigraphy

F_s Surface Fill WT Water Table

N Native

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

▨ No Exceedance

▨ Human Health Exceedance

▨ Benthic Exceedance

☐ Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for Volatile Organic Compounds

Quiet Cove Property
Anacortes, Washington

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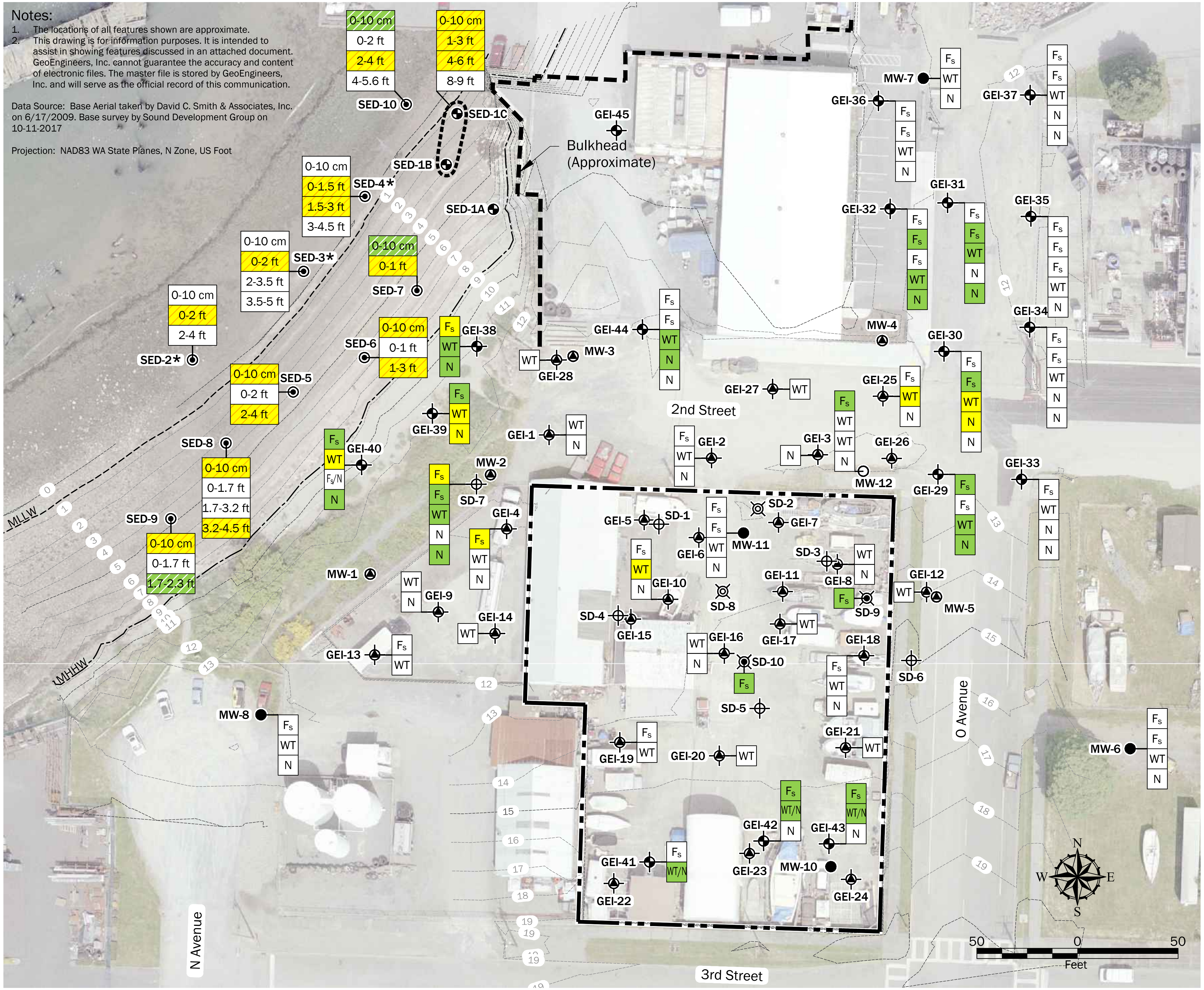
Figure 7

P:\5\5147024\CAD\07\RI Data Report\514702407_F07_Soil and Sediment Results for VOCs.dwg TAB:F07 Date Exported: 05/13/19 - 15:41 by hmara



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

‒ ‒ · ‒ ‒	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◕	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ◓	Focused Site Investigation Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result
Exceedance of Preliminary Screening Level for:

🟨	cPAH TEQ
🟩	No Exceedance
☐	Sample Not Analyzed, Archived
*	Sample Only Analyzed for cPAHs

Soil Site Stratigraphy

F_S	Surface Fill	WT	Water Table
N	Native		

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

▨	No Exceedance
▨	Human Health Exceedance
▨	Benthic Exceedance
☐	Sample Not Analyzed, Archived

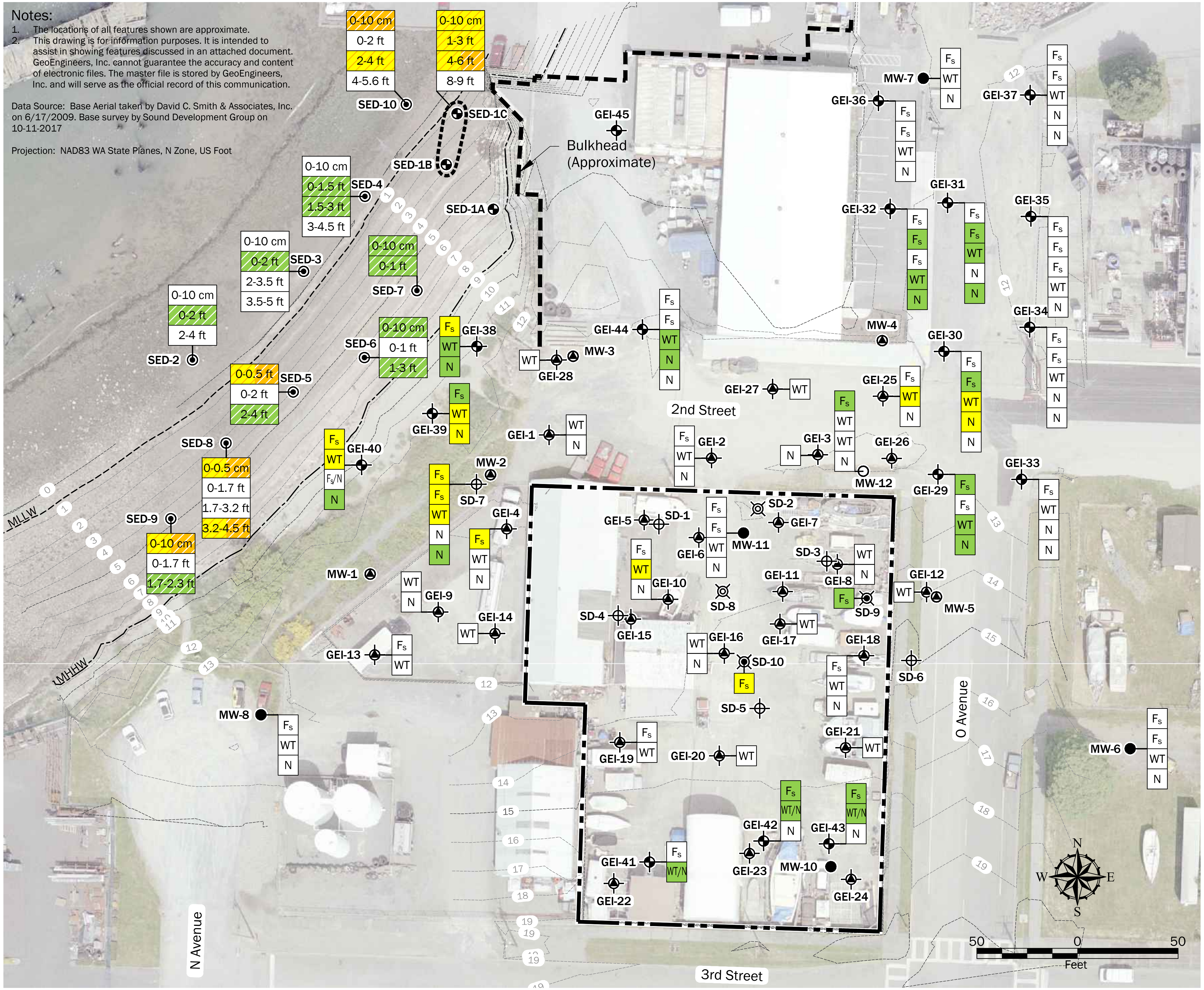
Soil and Sediment Analytical Results for cPAH TEQ

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 8

P:\5\5147024\CAD\07\RI Data Report\514702407_F08_Soil and Sediment Results for cPAH TEQ.dwg TAB:F08 Date Exported: 05/13/19 - 15:41 by hmara



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

▬ · ▬	Quiet Cove Property Boundary
------10------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◐	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ▲	Focused Site Investigation Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result
Exceedance of Preliminary Screening Level for:

🟨	One or More Individual PAH Detections Greater than Soil Screening Level
🟩	No Detections Above Soil Screening Levels
☐	Sample Not Analyzed, Archived

Soil Site Stratigraphy

F_s	Surface Fill	WT	Water Table
N	Native		

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

▨	No Exceedance
▨	Human Health Exceedance
▨	Benthic Exceedance
☐	Sample Not Analyzed, Archived

Note: Sediment samples exceedance for one or more PAH compound.

PAH = Polycyclic Aromatic Hydrocarbons

50 0 50
Feet

Soil and Sediment Analytical Results for PAHs

Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 9

P:\5\5147024\CAD\07\RI Data Report\514702407_F09_Soil and Sediment Results for PAHs.dwg TAB:F09 Date Exported: 05/13/19 - 15:42 by hmara

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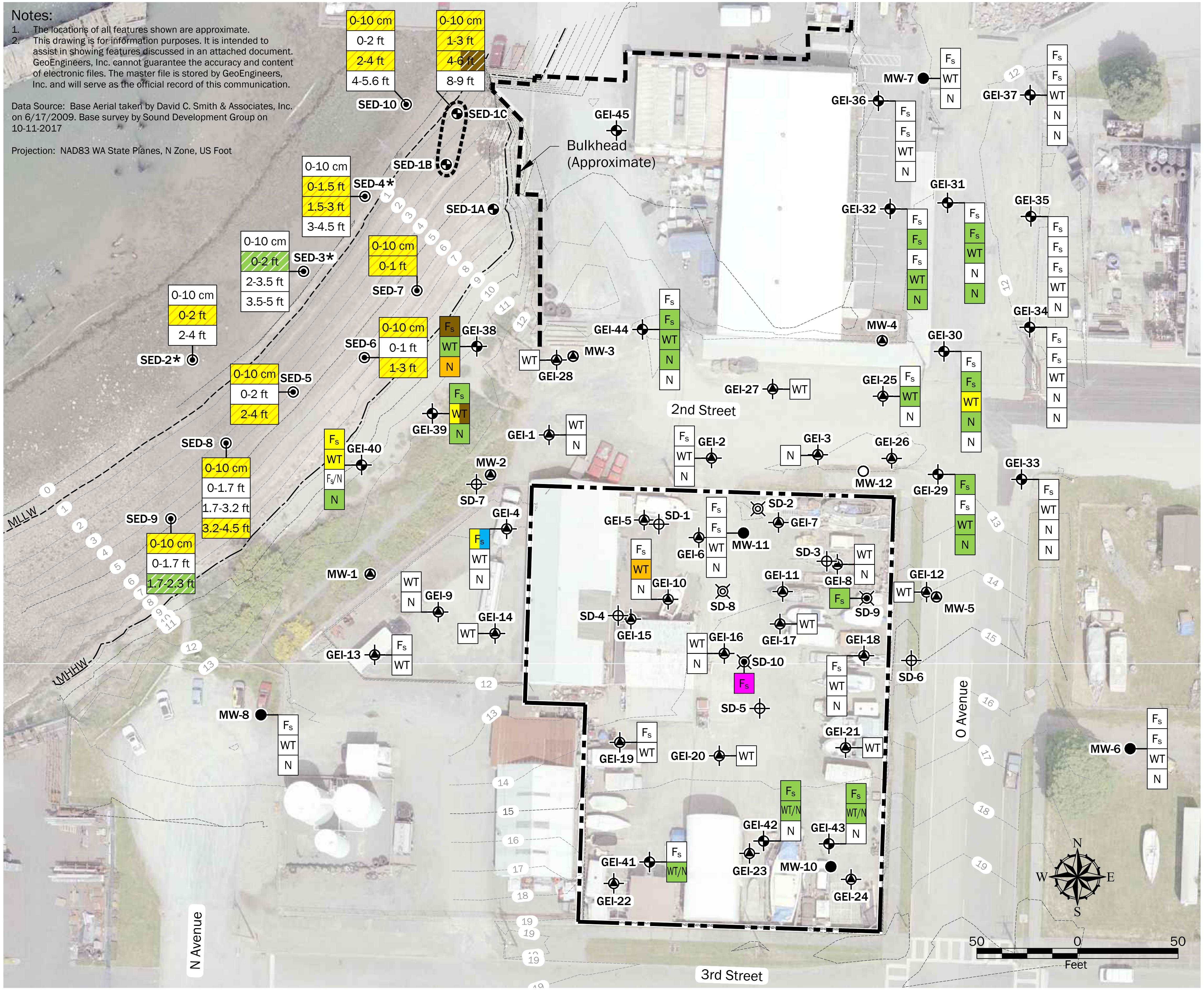
Projection: NAD83 WA State Planes, N Zone, US Foot



P:\5\5147024\CAD\07\RI Data Report\514702407_F10_Soil and Sediment Results for Metals.dwg TAB:F10 Date Exported: 05/13/19 - 15:42 by hmara

Legend

Quiet Cove Property Boundary

10 Contour (Feet, NAVD 88)

SD-1 Supplemental RI Soil Boring Location

SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen

SD-9 Supplemental RI Shallow Soil Boring Location

MW-12 ○ Supplemental RI Monitoring Well

GEI-31 RI Soil Boring Location

SED-1A RI Tier 1 Sediment Sample

SED-2 RI Tier 2 Sediment Sample

MW-6 ● RI Monitoring Well

GEI-1 Focused Site Investigation Soil Boring Location

MW-1 Focused Site Investigation Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

Lead	Cadmium
Lead+Cadmium	Mercury
Lead+Mercury	No Exceedance for Any Metals
Lead, Cadmium, Mercury	Sample Not Analyzed, Archived
Chromium	* Sample Only Analyzed for Lead

Soil Site Stratigraphy

Fs	Surface Fill	WT	Water Table
N	Native		

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

No Exceedance

Human Health Exceedance - Lead

Human Health Exceedance - Mercury

Benthic Exceedance

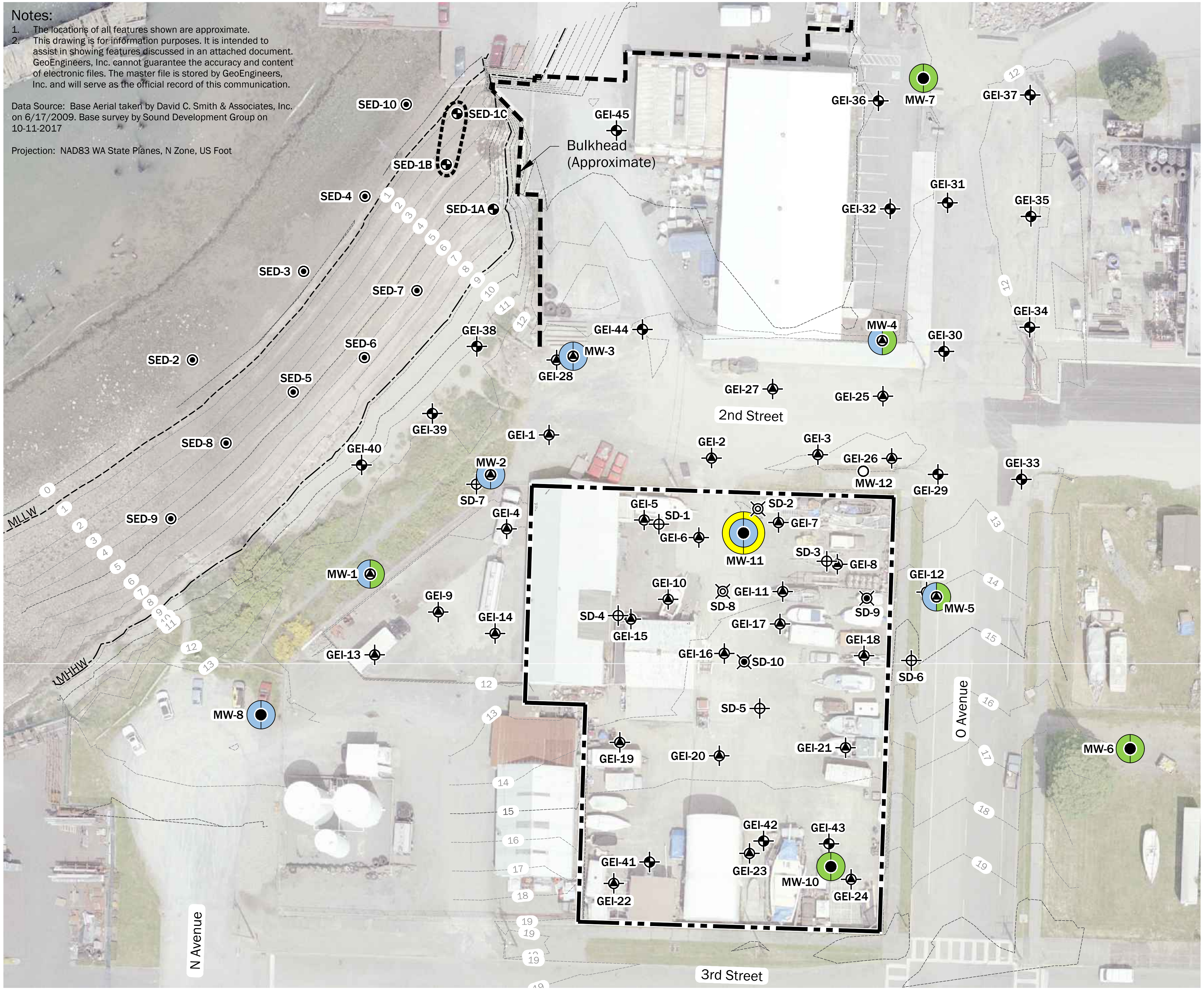
Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for Metals

Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 10



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · — · —	Quiet Cove Property Boundary
------10------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◕	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ▲	Focused Site Investigation Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

November 2017 Monitoring ⊕ March 2018 Monitoring

Groundwater Sample Result
Exceedance of Preliminary Screening Level for:

🔵	Diesel
🟡	Gasoline
🟢	No Exceedance

Groundwater Analytical Results for Total Petroleum Hydrocarbon (TPH)

Quiet Cove Property
Anacortes, Washington

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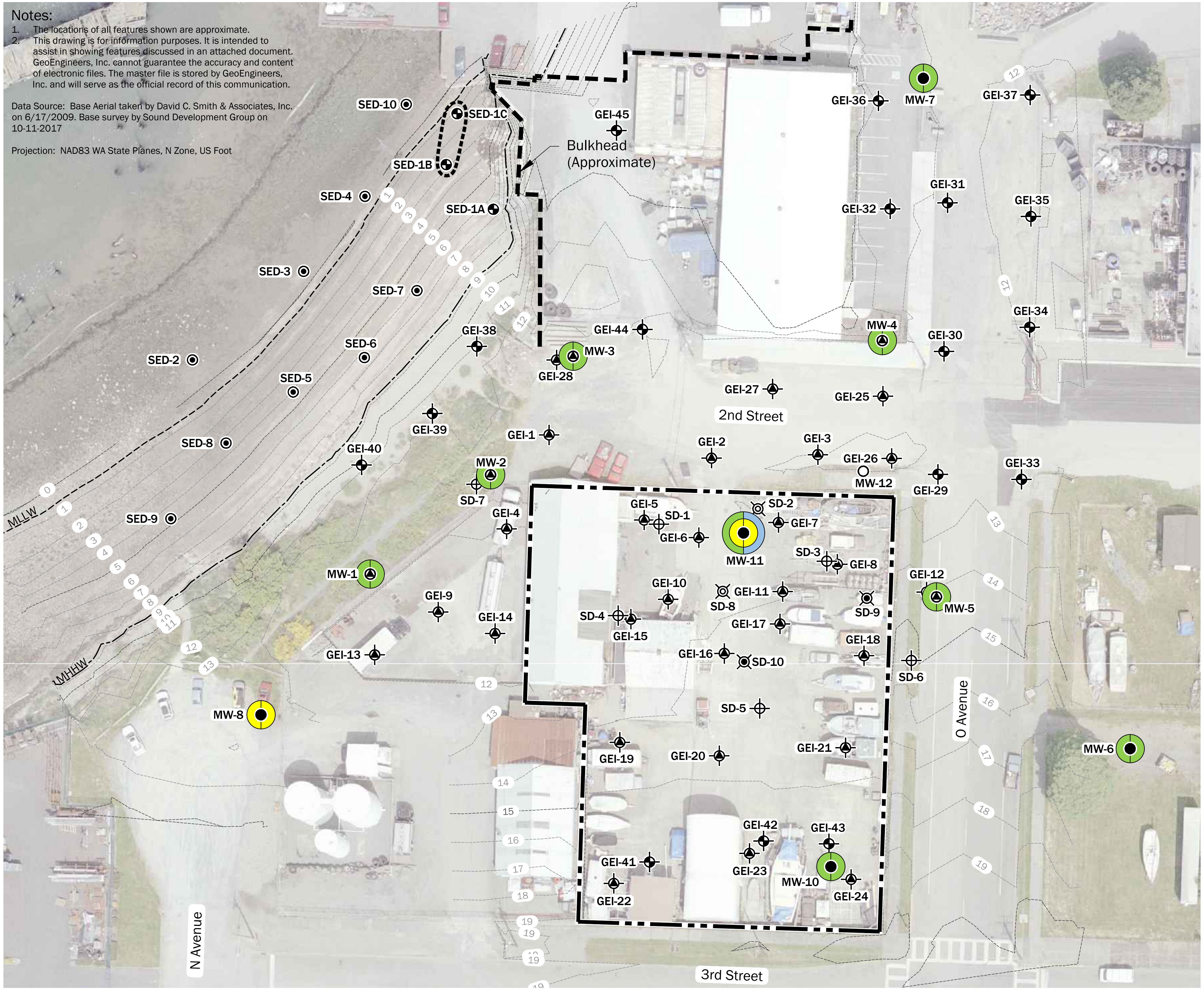
Figure 11

P:\5\5147024\CAD\07\RI Data Report\514702407_F11_GW Results for TPH.dwg TAB:F11 Date Exported: 05/13/19 - 15:42 by hmara



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Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · — · —	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◕	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ◉	Focused Site Investigation Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

November 2017 Monitoring ◐ March 2018 Monitoring

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

🟡	Benzene
🟢	No Exceedance
🔵	EDB

N
W E
S

50 0 50
Feet

Groundwater Analytical Results for Volatile Organic Compounds (VOCs)

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 12

P:\5\5147024\CAD\07\RI Data Report\514702407_F12_GW Results for VOCs.dwg TAB:F12 Date Exported: 05/13/19 - 15:42 by hmara

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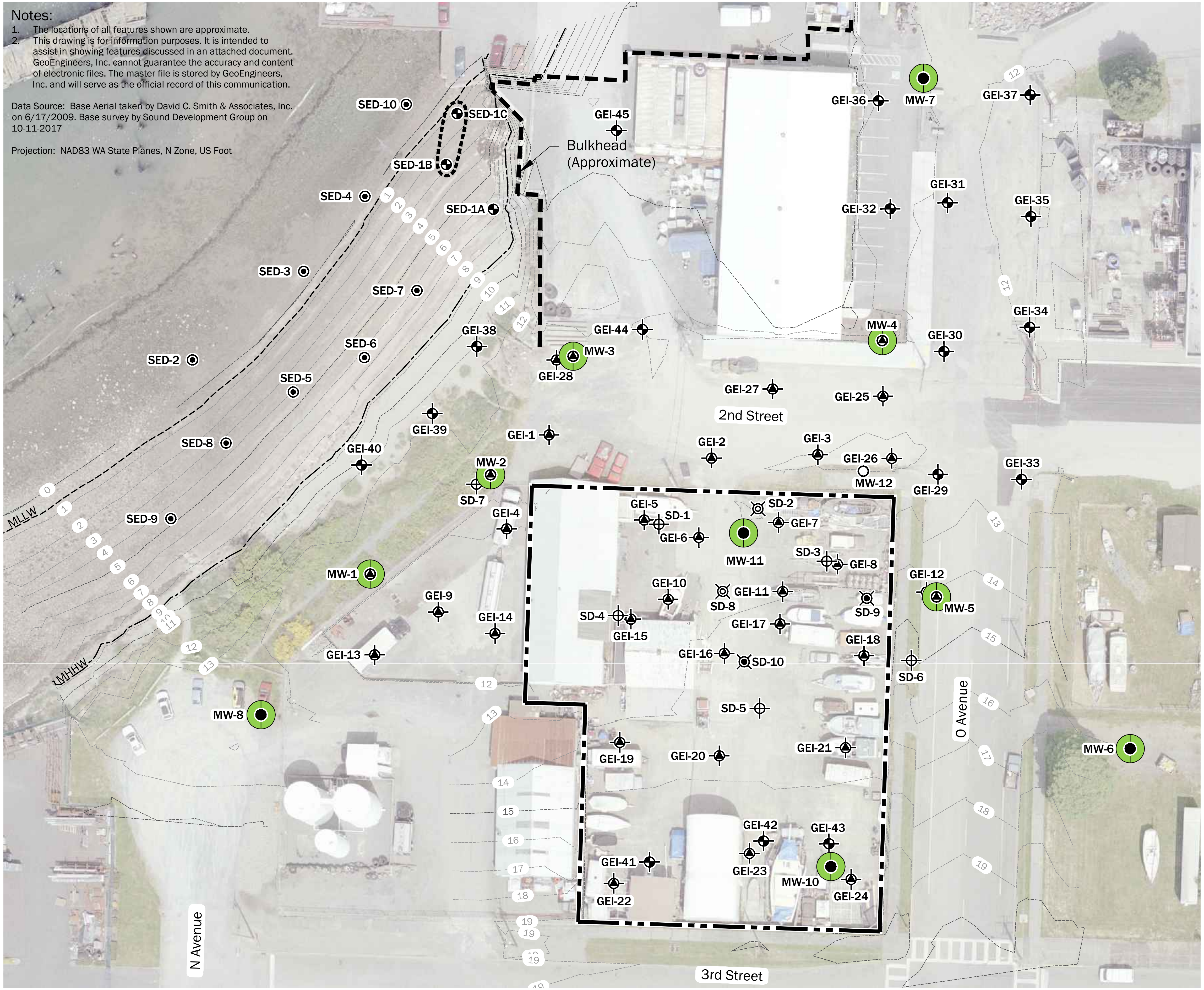
Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

— · — ·	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1	Supplemental RI Soil Boring Location
SD-2	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31	RI Soil Boring Location
SED-1A	RI Tier 1 Sediment Sample
SED-2	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1	Focused Site Investigation Soil Boring Location
MW-1	Focused Site Investigation Monitoring Well
	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

November 2017 Monitoring — March 2018 Monitoring

Groundwater Sample Result
Exceedance of Preliminary Screening Level for:

🟢 No Exceedance

Groundwater Analytical Results for cPAH TEQ

Quiet Cove Property
Anacortes, Washington

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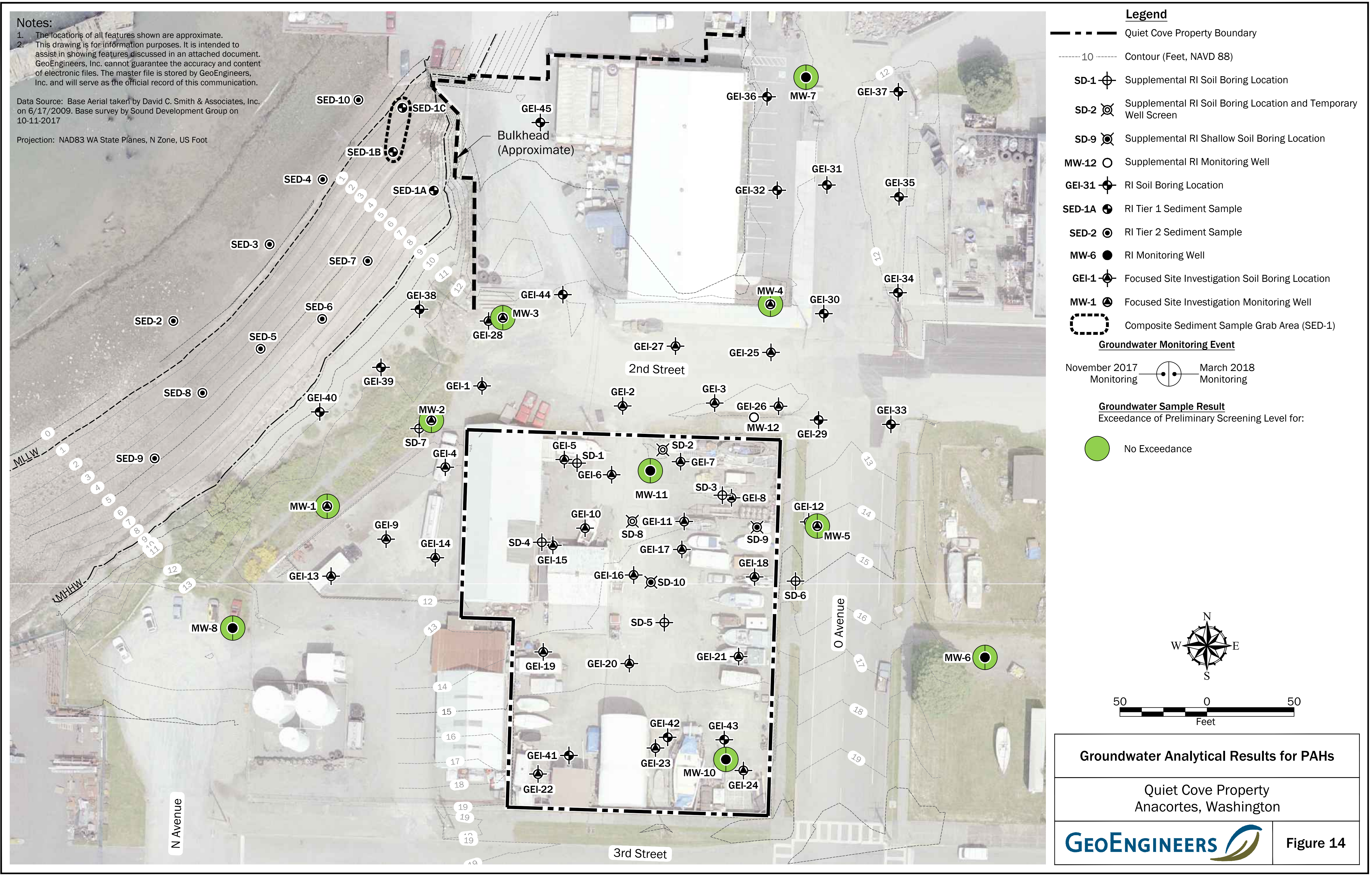
Figure 13

P:\5\5147024\CAD\07\RI Data Report\514702407_F13_GW Results for TEQ.dwg TAB:F13 Date Exported: 05/13/19 - 15:42 by hmara



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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · —	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◕	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ▲	Focused Site Investigation Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

November 2017 Monitoring | March 2018 Monitoring

Groundwater Sample Result
Exceedance of Preliminary Screening Level for:

🟢	No Exceedance

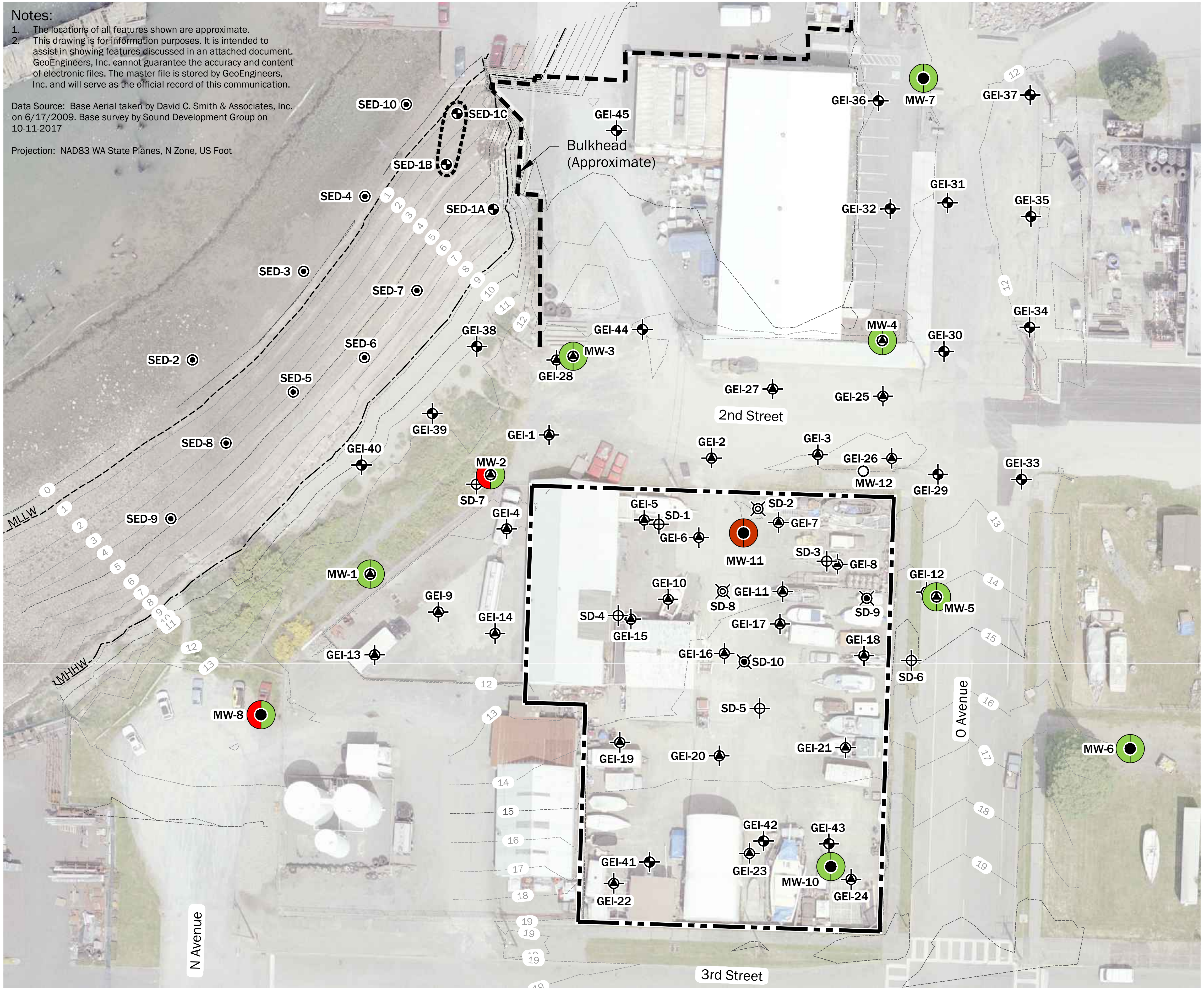
Groundwater Analytical Results for PAHs

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 14

P:\5\5147024\CAD\07\RI Data Report\514702407_F14_GW Results for PAHs.dwg TAB:F14 Date Exported: 05/13/19 - 15:42 by hmara



Notes:

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

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · —	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1 ⌖	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⌖	RI Soil Boring Location
SED-1A ◐	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⌖	Focused Site Investigation Soil Boring Location
MW-1 ◬	Focused Site Investigation Monitoring Well
⬚	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

November 2017 Monitoring ◐ March 2018 Monitoring

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

🟥	Arsenic
🟩	No Exceedance

N
W
E
S

50 0 50

Feet

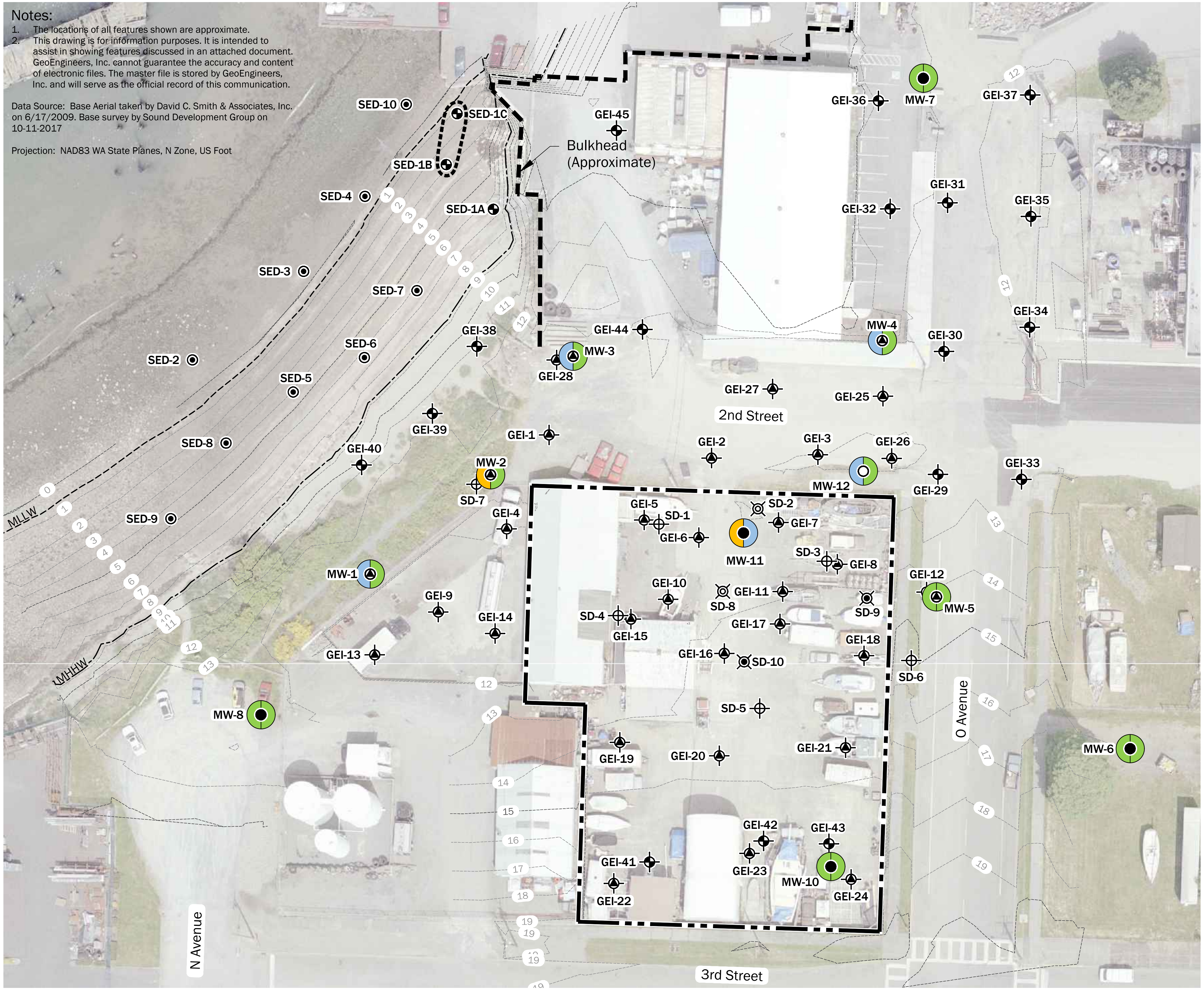
Groundwater Analytical Results for Dissolved Metals

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 15

P:\5\5147024\CAD\07\RI Data Report\514702407_F15_GW Results for Metals.dwg TAB:F15 Date Exported: 05/13/19 - 15:42 by hmara



Notes:

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

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

— · —	Quiet Cove Property Boundary
-------10-------	Contour (Feet, NAVD 88)
SD-1 ⊕	Supplemental RI Soil Boring Location
SD-2 ⊗	Supplemental RI Soil Boring Location and Temporary Well Screen
SD-9 ⊗	Supplemental RI Shallow Soil Boring Location
MW-12 ○	Supplemental RI Monitoring Well
GEI-31 ⊕	RI Soil Boring Location
SED-1A ◐	RI Tier 1 Sediment Sample
SED-2 ◉	RI Tier 2 Sediment Sample
MW-6 ●	RI Monitoring Well
GEI-1 ⊕	Focused Site Investigation Soil Boring Location
MW-1 ▲	Focused Site Investigation Monitoring Well
⬚	Composite Sediment Sample Grab Area (SED-1)

Groundwater Monitoring Event

TPH-D without Silica Gel Cleanup — ◐ — TPH-D with Silica Gel Cleanup

Groundwater Sample Result
Exceedance of Preliminary Screening Level for:

🔵	Diesel
🟠	Diesel and Heavy Oil
🟢	No Exceedance

N
W E
S

50 0 50
Feet

Groundwater Analytical Results for TPH-Diesel

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 16

P:\5\5147024\CAD\07\RI Data Report\514702407_F16_GW Results for TPH-D.dwg TAB:F16 Date Exported: 05/13/19 - 15:42 by hmara

APPENDICES

GeoEngineers

ATTACHMENT 1

Investigation Exploration Logs

SOIL CLASSIFICATION CHART

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

▼	**Measured groundwater level in exploration, well, or piezometer**
▽	**Measured free product in well or piezometer**

Graphic Log Contact

——	**Distinct contact between soil strata or geologic units**
╱	**Approximate location of soil strata change within a geologic soil unit**

Material Description Contact

——	**Distinct contact between soil strata or geologic units**
– – – –	**Approximate location of soil strata change within a geologic soil unit**

Sampler Symbol Descriptions

▯	**2.4-inch I.D. split barrel**
◨	**Standard Penetration Test (SPT)**
■	**Shelby tube**
▤	**Piston**
◧	**Direct-Push**
☒	**Bulk or grab**

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

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

Laboratory / Field Tests

%F	**Percent fines**
AL	**Atterberg limits**
CA	**Chemical analysis**
CP	**Laboratory compaction test**
CS	**Consolidation test**
DS	**Direct shear**
HA	**Hydrometer analysis**
MC	**Moisture content**
MD	**Moisture content and dry density**
OC	**Organic content**
PM	**Permeability or hydraulic conductivity**
PI	**Plasticity index**
PP	**Pocket penetrometer**
PPM	**Parts per million**
SA	**Sieve analysis**
TX	**Triaxial compression**
UC	**Unconfined compression**
VS	**Vane shear**

Sheen Classification

NS	**No Visible Sheen**
SS	**Slight Sheen**
MS	**Moderate Sheen**
HS	**Heavy Sheen**
NT	**Not Tested**

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

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft)	10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559713.808503 1208686.68265	System Datum	NAD83	Groundwater	

Notes: Crush gravel road surface - flat

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								GP	Approximately 2-inches crushed gravel			
									SM	Gray silty fine to coarse sand (moist)			
						1			SP	Grayish-brown fine to coarse sand with occasional gravel (moist)	NS	<1	
			46.8										
						2					NS	<1	
									ML	Gray silt (moist)	NS	<1	
									SP	Gray fine to medium sand (wet)			
	5					3 CA					HS	155	Slight petroleum odor and black staining
			58.9										
						4			SP	Brown fine to medium sand (wet)	MS	124	Slight petroleum odor
									SP	Grayish-brown fine to medium sand (wet)			
						5 CA							
											NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-1

GEOENGINEERS

Project: Quiet Cove Property

Project Location: Anacortes, Washington

Project Number: 5147-024-01

Figure A-2

Sheet 1 of 1

Drilled Start 3/31/2014 End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push	
Surface Elevation (ft) Vertical Datum: Undetermined	Hammer Data: Pneumatic	Drilling Equipment: Geoprobe 6600			
Easting (X) 559702.238962 Northing (Y) 1208767.39188	System Datum: NAD83	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)			
Notes: Crush gravel road surface - flat					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								GP	Approximately 2-inches crushed gravel (moist) (fill)			
						1 CA			SP	Gray to brown fine to coarse sand with gravel (moist) (fill)	NS	<1	
			42.4						SM	Brown silty fine to corse sand (moist)			
						2					HS	255	Slight petroleum odor
	5					3 CA					MS	225	Slight petroleum odor
									SP-SM	Increasing sand content (wet) (native?)			
			26.4			4					MS	148	Slight petroleum odor
						5 CA					NS	53	
	10									No recovery			
			0										
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-2

GeoEngineers

Project: Quiet Cove Property

Project Location: Anacortes, Washington

Project Number: 5147-024-01

Figure A-3
Sheet 1 of 1

Drilled: Start 3/31/2014, End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push		
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic
Drilling Equipment	Geoprobe 6600		
Easting (X) Northing (Y)		System Datum	NAD83
Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)	

Notes: Crush gravel road surface - flat

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							GP	Approximately 3-inches crushed gravel			
						1		SP	Grayish-brown fine to corse sand with gravel (moist) (fill)	NS	145	
			49.2									
						2		SM	Gray silty fine sand (moist)	HS	212	Strong petroleum odor
	5					3 CA		SM	Gray silty fine sand (wet)	HS	124	Strong petroleum odor
			52.4			4				HS	85	
								PT	Brown organic peat (moist) (native)			
						5				HS	4	Moderate petroleum odor
	10							SM	Brown silty fine to medium sand (wet)			
						6				NS	<1	
			50.4									
						7				NS	<1	
								GP	Gray fine gravel and coarse sand (wet)	NS	<1	
	15											

Note: See Figure A-1 for explanation of symbols.

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Log of Boring GEI-3

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-4
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559667.094916 1208665.63775	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Crush gravel road surface - slope to southwest

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								GP	Gray crushed rock			
						1 CA			SP	Brown fine to medium sand with occasional gravel (dense, moist)	NS	<1	
									Brick	Red brick debris			
			42.2			2 CA			SP	Black medium to coarse sand with occasional gravel (very dense, moist)	HS	7	Free product
	5					3 CA			PT	Dark brown organic matter (peat) (soft, moist) (native)	NS	<1	
			60			4			SM	Brown silty fine to coarse sand with occasional gravel (medium dense, wet)	SS	<1	
						5			ML	Dark brown silt (soft, moist)	NS	<1	
	10		0							No recovery			
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-4

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-5
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559673.029199 1208729.04073	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Asphalt work surface - flat

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	Approximately 2-inches asphalt concrete			
								SM	Brown silty fine sand with occasional gravel (moist)			
					1			GP	Gray crushed gravel (moist)	NS	<1	
								ML	Gray silt with occasional gravel (moist)			
					2					HS	325	
								ML	Grayish-brown silt with occasional gravel (moist)			
								ML	Gray silt (moist)			
	5				3			ML	Gray silt with sand and occasional gravel (wet)	HS	242	Free product (product beads)
					4					HS	137	Free product (product beads)
								PT	Dark brown organic matter (peat) (moist) (native)			Free product (product beads)
					5			SM	Dark brown silty sand (moist)	NS	2	
	10											

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-5

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-6
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559662.730738 1208760.88317	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 7-inches cement concrete			
									ML	Grayish-brown silty fine to coarse sand (moist) (fill)			
						1					NS	16	
			28.8										
						2					MS	144	Slight petroleum odor
									SM	Gray silty fine sand (moist)			
	5					3					MS	106	Slight petroleum odor
			57.6			4, Dup-1					HS	345	Strong petroleum odor
									PT	Brown organic matter (peat) (moist) (native)			
						5					NS	<1	
									GP	Grayish-brown fine to medium sand and gravel (wet)			
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-6

GEOENGINEERS

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-7
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined		Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559670.247312 1208800.65608		System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Concrete work surface - flat

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SP	Brown fine to medium sand (moist)			
						1					NS	5	
									SP	Gray fine to medium sand (moist)			
			3.2										
						2					HS	30	
	5					3				Increasing sand content, becomes wet	HS	36	Strong petroleum odor and black staining
			4.8										
						4					HS	22	Strong petroleum odor and black staining Free product (product beads)
						5					HS	19	Strong petroleum odor and black staining
	10												
						6			GP	Gray fine gravel with fine to coarse sand (wet) (native)	SS	22	Strong petroleum odor and black staining
			4.7										
						7					NS	<1	
	15												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring GEI-7

GeoEngineers

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559653.480995 1208830.05768	System Datum	NAD83	Groundwater	
Notes: Concrete work surface - flat				Date Measured	Depth to Water (ft) / Elevation (ft)

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Brown silty fine to medium sand with gravel (moist)			
						1					NS	<1	
			42.2						SP	Gray fine to medium sand (moist)			
						2			GP	Gray fine gravel (round rocks) (moist)	HS	234	Moderate petroleum odor and black staining
									ML	Brown silt (moist)			
	5								GP	Gray fine gravel (round rocks) (wet)	NS	<1	
						3							
													Free product (product beads)
			54			4 CA			PT	Brown organic matter (peat) (moist) (native)	HS	232	Heavy petroleum odor
									GM	Grayish-brown silty gravel and sand (wet)			
						5 CA					NS	<1	
									ML	Light brown silt with fine sand (moist)			
	10												
			21.6			6					NS	<1	
											NS	<1	
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-8

GeoEngineers

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-9
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559625.794741 120831.63921	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Gravel work surface - flat

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								SP	Brown medium to coarse sand with occasional gravel (moist) (fill)			
						1					NS	<1	
									Wood	Approximately 6 inch layer wood debris	NS	<1	
			28.8						PT	Dark brown organic peat (moist) (native)			
						2 CA					NS	<1	
	5								SP	Grayish-brown coarse sand with occasional gravel (wet)			
						3					HS	5	Slight petroleum odor and black staining
			58.8										
									SM	Transitions to silty sand (wet)			
						4							
									ML	Gray silt (moist)			
						5 CA					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-9

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-10
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559632.085368 1208745.85571	System Datum	NAD83	Groundwater	
Notes: Concrete/asphalt work surface - flat					

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								SP	Brown fine to coarse sand and gravel (moist) (fill)			
						1 CA					NS	<1	
			34.8			2					HS	18	Slight petroleum odor and black staining
									ML	Gray silt with occasional gravel (moist)			
									SP	Black fine to medium sand with occasional gravel and trace roots (wet)			Slight petroleum odor and black staining
	5					3 CA					HS	123	Moderate petroleum odor Free product (product beads)
			32.4			4					HS	43	Moderate petroleum odor Free product (product beads)
									ML	Gray silt (moist)			
									SM	Gray silty fine to coarse sand with gravel (wet) (native?)			
						5					HS	23	Moderate petroleum odor Free product (product beads)
	10								ML	Gray silt (moist)			
						6 CA					NS	<1	
			51.6										
						7					NS	<1	
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-10

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-11
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559636.679434 1208803.20423	System Datum	NAD83	Groundwater	

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Concrete work surface - flat

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Brown silty fine to coarse sand with gravel (moist) (fill)			
						1			ML	Black silt with sand and wood debris (unknown) (moist)	NS	<1	
			42.8						SP	Brown fine to medium sand with occasional gravel (moist)			
						2					HS	18	Slight petroleum odor and black staining
									ML	Brown silt (moist)			
	5					3, Dup-2			SP	Gray fine to coarse sand with occasional gravel (wet)	HS	32	Slight petroleum odor and black staining
			42.8			4					HS	28	Slight petroleum odor and black staining
						5			PT	Brown organic matter (peat) (moist) (native)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring GEI-11

GeoEngineers

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-12
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)		System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) / Elevation (ft)

Notes: O Avenue right-of-way - slope to north

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								AC	Approximately 4-inches asphalt concrete			
									CC	Approximately 3-inches cement concrete			
									ML	Light brown silt with fine to medium sand and occasional gravel (moist) (fill)			
						1					NS	<1	
			30			2					NS	<1	
	5								SP	Brown medium to coarse sand and gravel (wet)			
						3 CA					NS	<1	
			56.4			4			ML	Brown silt with fine to medium sand and gravel (moist)	NS	<1	
									SM	Gray silty fine to medium sand (wet) (native?)			
	10					5					NS	<1	
									ML	Light brown silt with occasional gravel (moist)			
			38.4			6					NS	<1	
						7					NS	<1	
	15												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-12

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-13
Sheet 1 of 1

Drilled Start 4/1/2014 End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum: Undetermined	Hammer Data: Pneumatic		Drilling Equipment: Geoprobe 6600	
Easting (X) 559604.485169 Northing (Y) 1208600.03781	System Datum: NAD83		Groundwater Date Measured / Depth to Water (ft) / Elevation (ft)	

Notes: Gravel work surface - flat

FIELD DATA													
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		36			1			SP	Brown medium sand with occasional gravel (moist)	NS	81	
									SM	Brown silty fine to medium sand (moist)			
						2 CA			SP	Gray medium sand (wet)	HS	362	Strong petroleum odor
						3			PT	Dark brown organic matter (peat) (moist) (native)	NS	6	
	5		60										
						4, Dup-4 CA			SM	Brown silty fine to medium sand with occasional gravel (wet)	NS	2	
						5			ML	Gray to brown silt with occasional gravel (moist)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-13

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-14
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559615.108573 1208659.82933	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								SP	Approximately 2 inches medium to coarse sand and approximately 8 inches coal			
						1			SP	Brown medium to coarse sand with occasional brick debris (moist)	NS	<1	
			40.8						ML	Gray silt with occasional gravel (moist)	NS	<1	
						2			SM	Gray silty medium to coarse sand with occasional gravel (wet)			
						3 CA			PT	Dark brown organic matter (peat) (moist)	NS	<1	
	5		60						SM	Brown silty fine to medium sand with occasional gravel (wet)			
						4					NS	<1	
						5			SM	Gray silty fine to medium sand with occasional gravel (wet)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-14

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-15
Sheet 1 of 1

Drilled Start 4/1/2014 End 4/1/2014
Total Depth (ft) 10
Logged By RST
Checked By
Driller Cascade Drilling, L.P.
Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum Undetermined
Hammer Data Pneumatic
Drilling Equipment Geoprobe 6600
Easting (X) 559627.988445
Northing (Y) 1208728.25271
System Datum NAD83
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Asphalt/concrete work surface - flat

		FIELD DATA											
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								AC	Approximately 1-inch asphalt concrete			
									CC	Approximately 3-inches cement concrete			
						1			GP	Gray fine gravel (poor recovery) (moist) (fill)	NS	<1	
			31.2						OL	Dark brown organic matter (wood debris)			
						2			ML	Dark gray silt with occasional gravel (moist)	NS	56	Slight petroleum odor and black staining
	5					3			SP	Brown fine to medium sand with occasional gravel (wet)	HS	148	Slight petroleum odor and black staining Free product (product beads)
			44.4			4					HS	103	Slight petroleum odor and black staining Free product (product beads)
									OL	Dark brown organic matter (wood debris)			
									ML	Dark brown organic silt (moist)			Slight petroleum odor and black staining Free product (product beads)
						5			SM	Gray silty fine to coarse sand with gravel (wet)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring GEI-15

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-16
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559605.184619 1208773.99176	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:	Concrete work surface - flat				

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Brown silty fine to coarse sand with occasional gravel (moist) (fill)			
						1					NS	<1	
			47.6						ML	Gray silt (moist)			
						2					NS	<1	
						3 CA					SS	198	
	5								SM	Brown silty fine to coarse sand and gravel (wet)			
			46.8			4					SS	44	
									ML	Grayish-brown silt (moist) (native)			
						5 CA					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-16

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-17
Sheet 1 of 1

Seattle: Date:7/29/14 Path:\\SEA\PROJECTS\5\5147024\GINT\514702401.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559619.383345 1208802.62127	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) / Elevation (ft)

Notes: Concrete work surface - flat

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Dark brown silty fine to medium sand with occasional gravel (moist)			
						1					NS	<1	
			38.4										
									SP	Gray fine to medium sand (moist)			
						2			ML	Brown silt (moist)	SS	895	
	5					3 CA			SM	Brownish-gray silty fine to coarse sand and gravel (wet)	HS	>1000	Strong petroleum odor
			60			4					HS	>1000	Strong petroleum odor
									GM	Gray silty fine gravel (wet)			Strong petroleum odor
									SP-SM	Gray silt with sand (wet) (native)			
						5					NS	25	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-17

GEOENGINEERS

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-18
Sheet 1 of 1

Drilled	Start 3/31/2014	End 3/31/2014	Total Depth (ft)	10
Logged By	RST	Checked By		
Driller	Cascade Drilling, L.P.		Drilling Method	Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined			
Hammer Data	Pneumatic		Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559604.089077 1208843.16033			
System Datum	NAD83			
Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes:	Concrete work surface - flat			

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									ML	Brown silt with fine sand and gravel (moist) (fill)			
						1 CA					NS	<1	
			38.4						SM	Brown silty fine to coarse sand with gravel (moist)			
						2			ML	Gray silt with gravel and sand (moist)	NS	<1	
									SP	Brown coarse sand and gravel (wet)			
						3, Dup-3 CA					HS	24	Slight petroleum odor
	5												
			51.6			4					HS	32	Slight petroleum odor
									ML	Brown silt (moist) (native)			
						5 CA					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-18

GEOENGINEERS

Project: Quiet Cove Property

Project Location: Anacortes, Washington

Project Number: 5147-024-01

Figure A-19

Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559560.989787 1208721.83017	System Datum	NAD83	Groundwater	

Notes: Concrete work surface - flat

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Dark brown silty sand with occasional gravel (moist)			
						1 CA					NS	<1	
			37.2										
						2					NS	<1	
									SP	Gray medium to coarse sand with occasional gravel (wet)			
	5					3 CA					NS	<1	
									ML	Grayish-brown silt with occasional gravel (moist)			
			60			4					NS	<1	
						5					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-19

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-20
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559555.013645 1208770.90691	System Datum	NAD83	Groundwater	
Notes: Concrete work surface - flat					

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
						1			SM	Brown silty medium to coarse sand with gravel (moist) (fill)	NS	<1	
			36										
						2			PT	Dark brown organic matter (peat) (moist) (native)	NS	<1	
									SP	Gray medium to coarse sand with occasional gravel (wet)			
	5					3 CA					NS	<1	
			38.4			4, Dup-5					NS	<1	
						5					NS	<1	
									ML	Brown silt (moist)			
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-20

GeoEngineers

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-21
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559558.366702 12088834.00014	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:	Concrete work surface - flat				

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Dark gray silty fine to coarse sand with occasional gravel (moist)			
						1					NS	<1	
									SM	Brown silty fine to medium sand with occasional gravel (moist)			
			32.4										
						2					NS	<1	
									SP	Brown coarse sand with occasional gravel (wet)			
	5					3 CA					NS	<1	
									SP	Brown fine sand (moist)			
			51.6			4					NS	<1	
						5					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

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Log of Boring GEI-21

GEOENGINEERS

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-22
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined		Hammer Data	Pneumatic	Drilling Equipment Geoprobe 6600
Easting (X) Northing (Y)	559490.925134 1208718.82857		System Datum	NAD83	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
						1			SM	Dark brown silty fine to medium sand (moist) (fill)	NS	<1	
			39.6			2			SP	Grayish-brown medium to coarse sand (moist)	NS	<1	
	5					3			ML	Brown silt with occasional gravel (moist) (native)	NS	<1	
			60			4					NS	<1	
						5			SP	Brown fine sand (moist)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-22

GeoEngineers

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-23
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559505.820472 1208786.26447	System Datum	NAD83	Groundwater	

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Concrete work surface - flat

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
									SM	Brown silty fine to medium sand with gravel (moist) (fill)			
						1					NS	<1	
			30										
						2			ML	Brown silt with occasional gravel (moist) (native)	NS	<1	
	5					3, Dup-6					NS	<1	
			60			4					NS	<1	
						5					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-23

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-24
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559492.730723 1208836.83202	System Datum	NAD83	Groundwater	

Notes: Concrete work surface - flat

Date Measured	Depth to Water (ft)	Elevation (ft)

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								CC	Approximately 4-inches cement concrete			
						1			SP	Brown fine to medium sand with occasional gravel (moist) (fill)	NS	<1	
			42.2										
						2			ML	Brown silt with occasional gravel (moist) (native)	NS	<1	
	5					3					NS	<1	
			50.4			4					NS	<1	
									SP	Brown fine to medium sand (wet)			
						5			SM	Brown silty fine to medium sand with occasional gravel (moist)	NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-24

GEOENGINEERS

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-25
Sheet 1 of 1

Drilled	Start 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559732.98936 1208852.565	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Gravel road surface - flat

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								GP	Approximately 4-inches crushed gravel			
									SM	Gray silty fine to medium sand with occasional gravel (moist) (fill)			
						1 CA					SS	<1	
			43.2										
						2					SS	10	
									GP	Gray fine gravel with fine to medium sand (wet)			
	5					3 CA					HS	32	Free product (product beads)
			50.4			4					HS	31	Free product (product beads)
									PT	Dark brown organic matter (peat) (moist) (native)			Free product (product beads)
						5 CA					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-25

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-26
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559702.095257 1208856.96764	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)

Notes: Gravel road surface - flat

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0									Approximately 3-inches crushed gravel			
									SM	Gray silty fine to medium sand and gravel (moist) (fill)	NS	<1	
						1					SS	110	
											MS	142	
			18										
										Poor recovery			
									SP	Gray coarse sand with gravel and silt (wet)			
	5												
						2					HS	238	Free product (product beads)
			42.2						PT	Dark brown organic matter (peat) (moist) (native)			Free product (product beads)
						3					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-26

GeoEngineers

Project:	Quiet Cove Property
Project Location:	Anacortes, Washington
Project Number:	5147-024-01

Figure A-27
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559736.600528 1208797.78828	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes:	Gravel road surface - flat				

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								SM	Gray silty fine to medium sand with gravel (moist) (fill)			
						1					NS	<1	
									SM	Brown silty fine to medium sand with occasional gravel (moist)			
			3.4										
						2					NS	<1	
	5									Approximate 2-inch roots at 5 feet			
						3 CA					NS	<1	
			3.9						PT	Dark brown organic matter (peat) with roots and grass reed traces (moist) (native)			
						4					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-27

GEOENGINEERS

Project: Quiet Cove Property

Project Location: Anacortes, Washington

Project Number: 5147-024-01

Figure A-28
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Direct-Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559751.019073 1208690.39644	System Datum	NAD83	Groundwater	Date Measured / Depth to Water (ft) / Elevation (ft)
Notes: Gravel road surface - flat					

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0								SP	Gray silty fine to medium sand with occasional gravel (moist)			
						1					NS	<1	
									GP	Gray fine to coarse gravel (dry)			
			46.8						SM	Brown silty fine to medium sand with occasional gravel (moist)			
						2					NS	<1	
									SP	Brown medium sand (moist)			
	5					3			SP	Light brown medium sand (moist)	NS	<1	
									SP	Brown medium sand (wet) (native)			
			58.8			4, Dup-7 CA					NS	<1	
										Transitioning to gray			
						5					NS	<1	
	10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-28

GeoEngineers

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-29
Sheet 1 of 1

Seattle: Date:7/29/14 Path:\\SEA\PROJECTS\5\5147024\GINT\514702401.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_STANDARD

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	6/23/2014	6/23/2014	16.5	NRS		Cascade Drilling, L.P.	Hollow-Stem Auger

Hammer Data: Automatic 140 (lbs) / 30 (in) Drop
Drilling Equipment:
Surface Elevation (ft): 12.27
Vertical Datum: NAVD88
Top of Casing Elevation (ft):
Easting (X): 559643.3137
Northing (Y): 1208598.405
Horizontal Datum: NAD83

DOE Well I.D.: BID 546
A 2 (in) well was installed on 6/23/2014 to a depth of 12 (ft).

Groundwater

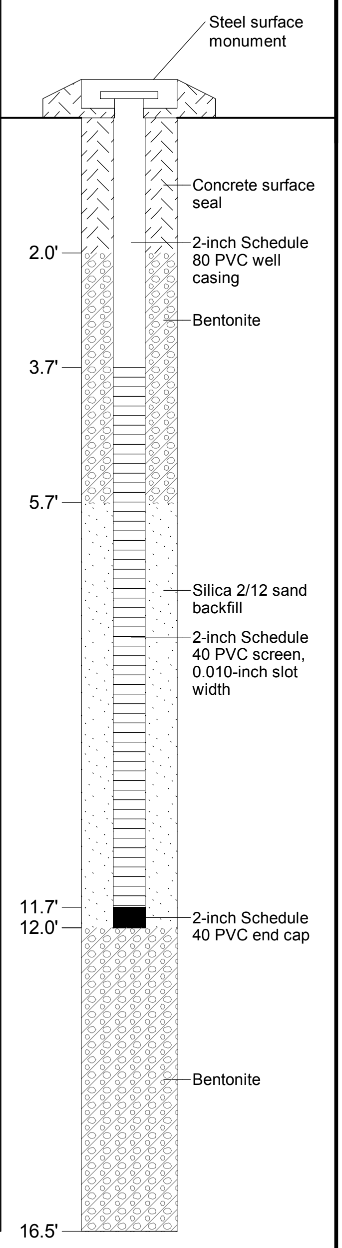
Date Measured	Depth to Water (ft)	Elevation (ft)
6/23/2014	5.0	7.3

Notes:

FIELD DATA

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0					GP	Gray round rock (river rock)		
						SM	Dark brown silty sand with fine gravel and trace organics (loose, moist)		
10		11	5	1				NS	<1
	5	9	8	2	▼	SP	Dark brown fine to medium sand with occasional gravel (loose, wet) Slight petroleum odor	SS	12
5		14	3	3			Grades to gray Slight petroleum odor	SS	
						SM	Brown silty fine to medium sand (loose, wet)	MS	3
	10	3	24	4			Poor recovery; bouncing on rock	NS	<1
						GP	Gray fine to ocarse gravel with sand		
0		16	35	5				NS	
						ML	Brown silt (moist)	NS	<1
	15	14	30	6				NS	<1

WELL LOG



Note: See Figure A-1 for explanation of symbols.

Seattle: Date:7/29/14 Path:\\SEA\PROJECTS\5\5147024\GINT\514702401.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL

Log of Monitoring Well MW-1

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-30
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	6/23/2014	6/23/2014	16.5	NRS		Cascade Drilling, L.P.	Hollow-Stem Auger

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

Drilling Equipment:

Surface Elevation (ft): 11.93

Vertical Datum: NAVD88

Top of Casing Elevation (ft):

Easting (X): 559692.5327

Northing (Y): 1208656.1166

Horizontal Datum: NAD83

DOE Well I.D.: BID 547

A 2 (in) well was installed on 6/23/2014 to a depth of 14 (ft).

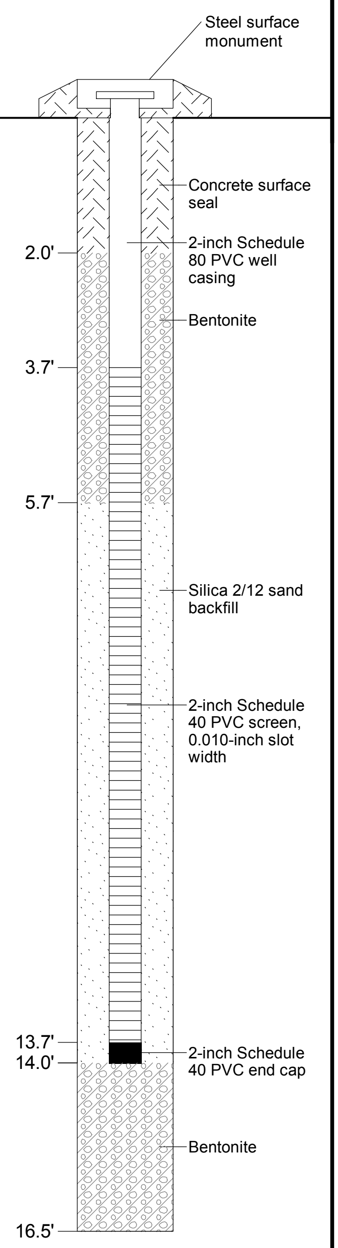
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
6/23/2014	6.0	5.9

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								GP	Gray round rock		
									SM	Dark brown silty fine to medium sand with occasional gravel (moist)		
10											NS	
									SP	Gray fine sand (medium dense, moist)		
	5	■	14	13		1					SS	6
							▼		SM	Dark brown silty fine to medium sand (medium dense, wet)		
5												
		■	18	27		2					NS	<1
										With occasional gravel		
	10	■	9	11		3					NS	<1
0											SS	
		■	13	18		4					NS	<1
										Grades to gray		
									ML	Gray silt (moist)		
	15	■		22		5					NS	
											NS	<1

WELL LOG



Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-2

GEOENGINEERS

Project: Quiet Cove Property

Project Location: Anacortes, Washington

Project Number: 5147-024-01

Figure A-31

Sheet 1 of 1

Drilled Start 6/23/2014 End 6/23/2014
Total Depth (ft) 16.5
Logged By NRS
Checked By
Driller Cascade Drilling, L.P.
Drilling Method Hollow-Stem Auger

Hammer Data Automatic 140 (lbs) / 30 (in) Drop
Drilling Equipment
DOE Well I.D.: BID 548
A 2 (in) well was installed on 6/23/2014 to a depth of 16 (ft).

Surface Elevation (ft) 12.97
Vertical Datum NAVD88
Top of Casing Elevation (ft)

Easting (X) 559756.678468316
Northing (Y) 1208701.08910405
Horizontal Datum NAD83

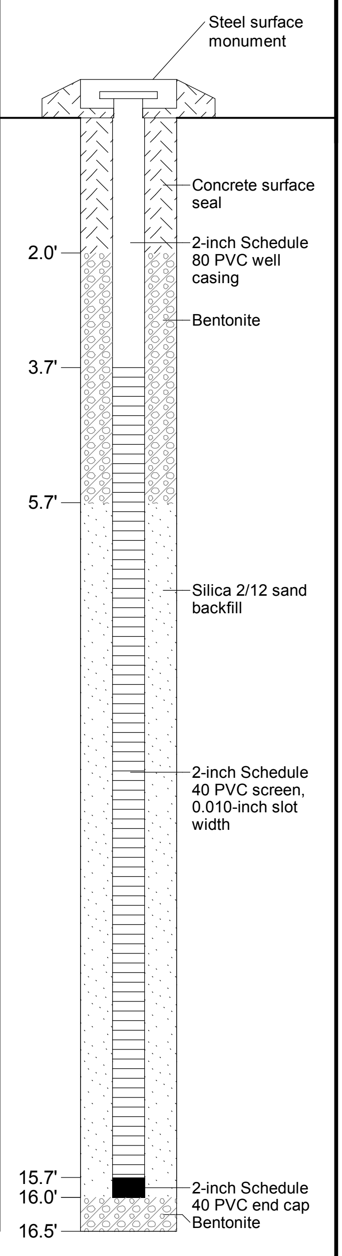
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
6/23/2014	6.0	7.0

Notes:

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0						GP	Gray round rock		
							SM	Dark brown silty fine to medium sand with occasional gravel		
							SP	Black fine to medium sand with occasional gravel		
10									NS	
							SP	Brown fine sand (moist)		
	5	14	13		1				SS	6
						▼		Grades to wet		
5		18	27		2			Strong petroleum odor	NS	<1
	10	9	11		3			Stained black soil with moderate petroleum odor	NS	<1
0		13	18		4				SS	
							GP	Gray fine to coarse gravel with sand (wet)	NS	<1
	15		22		5		SP	Gray fine to coarse sand with occasional gravel (wet)	NS	
							SM	Gray fine to medium sand with occasional gravel (wet)	NS	<1

WELL LOG



Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-3

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-32
Sheet 1 of 1

Drilled	Start 6/24/2014	End 6/24/2014	Total Depth (ft) 16.5	Logged By NRS Checked By	Driller Cascade Drilling, L.P.	Drilling Method Hollow-Stem Auger

Hammer Data: Automatic 140 (lbs) / 30 (in) Drop	Drilling Equipment	A 2 (in) well was installed on 6/24/2014 to a depth of 15 (ft).
Surface Elevation (ft) 12.43 Vertical Datum NAVD88	Top of Casing Elevation (ft)	
Easting (X) 559760.5958 Northing (Y) 1208852.2931	Horizontal Datum NAD83	

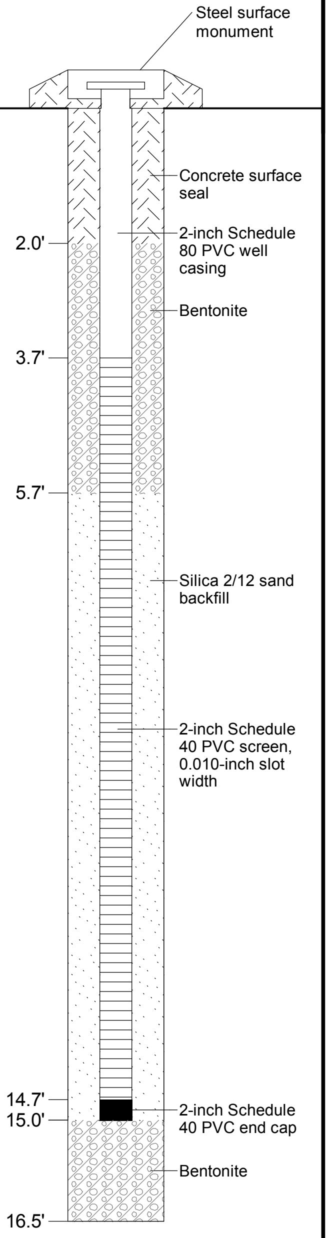
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
6/24/2014	10.5	1.9

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval / Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample / Sample Name / Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0						SM	Brown fine silty sand with wood debris (topsoil)		
10										
	5	▮	1	1			PT	Peat (very loose, dry)	NS	<1
5										
		▮	8	2					NS	2
							SM	Brown fine to medium silty sand with trace wood debris (roots) (loose, moist)		
	10	▮	12	3	▼			Slight petroleum odor	NS	<1
0										
		▮	26	4			SM	Gray fine to medium silty sand with occasional gravel (medium dense, wet) Slight odor	SS	<1
	15	▮	14	5					NS	<1
							ML	Gray silt		

WELL LOG



Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-4

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-33
Sheet 1 of 1

Drilled	Start 6/24/2014	End 6/24/2014	Total Depth (ft) 14	Logged By NRS Checked By	Driller Cascade Drilling, L.P.
Drilling Method	Hollow-Stem Auger				
Hammer Data	Automatic 140 (lbs) / 30 (in) Drop	Drilling Equipment			
Surface Elevation (ft)	14.74	Top of Casing Elevation (ft)			
Vertical Datum	NAVD88				
Easting (X)	559756.6784	Horizontal Datum	NAD83		
Northing (Y)	1208701.0891				

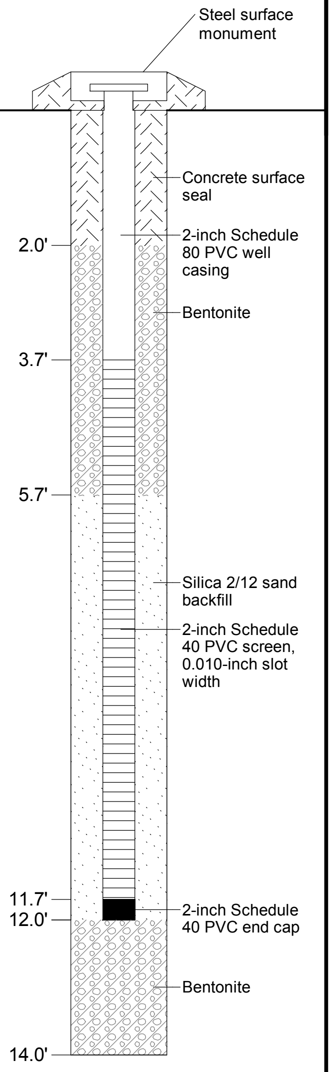
A 2 (in) well was installed on 6/24/2014 to a depth of 12 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
6/24/2014	7.5	7.2

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0							SOD	Grass		
								SM	Brown fine to medium silty sand with occasional gravel (dry)		
		■	6	6		1				NS	<1
									With occasional gravel and trace organics (grass roots), becomes moist		
10											
	5	■	13	3		2		SM	Gray fine to medium silty sand with occasional gravel (loose, moist)	NS	<1
								SM	Black fine to medium silty sand with trace wood debris (loose, moist)		
		■		9		3	▼	SM	Gray fine to medium sand with occasional gravel (loose, wet)	NS	<1
								SM	Gray fine to medium silty sand (loose, wet)		
5											
	10	■		3		4					
								SM	Gray fine to medium sand with occasional gravel	NS	<1
		■		26		5					
								ML	Gray silt (moist)		
										NS	<1

WELL LOG



Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-5

GEOENGINEERS

Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-34
Sheet 1 of 1

SOIL CLASSIFICATION CHART

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

▼	Measured groundwater level in exploration, well, or piezometer
▼	Measured free product in well or piezometer

Graphic Log Contact

—	Distinct contact between soil strata
/	Approximate contact between soil strata

Material Description Contact

—	Contact between geologic units
– – – –	Contact between soil of the same geologic unit

Sampler Symbol Descriptions

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

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

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

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

Laboratory / Field Tests

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

Sheen Classification

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

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

Key to Exploration Logs

GEOENGINEERS

Figure B-1

Drilled	Start 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				

Surface Elevation (ft) Vertical Datum	12.15 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208879.93 559694.22	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		8					AC	Approximately 6 inches asphalt concrete			
								NR	No recovery			
10												
								ML	Brown silt with occasional sand and gravel (moist) (fill)	NS	<1	
	5		52			1 CA		SP	Dark brown-gray fine to coarse sand with occasional gravel (moist)	NS	2.1	
										NS	<1	
5						2		PT	Brown organic matter (moist) (peat) (native)	SS	<1	
								ML	Brown silt with trace organic matter (weathered wood) (moist)	NS	<1	
									Wood chuck chunk at 8¼ feet			
								ML	Brown silt with sand and trace organic matter	NS	<1	
	10		60			3 CA		ML	Light gray silt with sand (wet)	NS	<1	Groundwater observed at approximately 10 feet at time of drilling
										NS	<1	
0										NS	<1	
						4 CA		ML	Gray silt with occasional sand (moist)	NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-29

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-2
Sheet 1 of 1

Drilled	Start 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				
Surface Elevation (ft) Vertical Datum	12.27 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208882.91 559755.28	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		48			1 DUP 1		AC	Approximately 8 inches asphalt concrete			
								SP	Brown fine to coarse sand with gravel (dry) (fill)	NS	<1	
10						2 CA		ML	Gray silt with trace sand (dry)	NS NS	<1 <1	Wood chunk in shoe
	5		56			3 CA		SP	Gray fine to coarse sand with occasional gravel (moist)	NS SS	<1 <1	
5								PT	Brown organic matter (peat) with occasional wood chips and grass (wet) (native)	NS NS	<1 <1	Groundwater observed at approximately 7 feet at time of drilling
						4 CA		SP	Gray fine to medium sand with trace organic matter (grass) (wet)	NS	<1	
	10		60					SP	Dark gray fine to medium sand (wet)	NS NS	<1 <1	
0						5		SP	Gray fine to coarse sand with occasional gravel (wet)	NS NS NS	<1 <1 <1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Date:5/9/18 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Log of Boring GEI-30

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-3
Sheet 1 of 1

Drilled	Start 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				
Surface Elevation (ft) Vertical Datum	12.34 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208884.7 559829.12	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		42					AC	Approximately 6 inches asphalt concrete			
						1		SP	Brown fine to coarse sand with gravel (dry) (fill)	NS	<1	
10								SP	Dark brown fine to medium sand with trace organic matter (moist)	NS	<1	Geotextile at 2 feet bgs
						2 CA		SP	Brown fine to medium sand (moist)	NS	<1	
										NS	<1	
	5		60							NS	<1	
						3 CA		SP-SM	Dark gray fine to medium sand with silt (moist)	NS	<1	Groundwater observed at approximately 6½ feet at time of drilling
5								SP	Light gray fine sand (wet) (native)	NS	<1	
										NS	<1	
						4		SP	Gray fine to medium sand (wet)	NS	<1	
	10		60							NS	<1	
								SP	Gray fine to medium sand with occasional gravel (wet)	NS	<1	
0										NS	<1	
						5 CA				NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-31

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-4
Sheet 1 of 1

Drilled Start 9/11/2017 End 9/11/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 13.44 Vertical Datum NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600
Easting (X) 1208856.16 Northing (Y) 559826.1		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Recovered (in)	Blows/foot	Sample Name Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	54			AC	Approximately 6 inches asphalt concrete			
					SP-SM	Brown fine to coarse sand with silt and gravel (fill)			
	1			1			NS	<1	
	2						NS	<1	
					ML	Brown silt with gravel (medium dense, moist)			
	3			2 CA	SP-SM	Black fine sand with silt and trace organic matter (moist)	NS	<1	
10									
	4				SP-SM	Brown fine sand with silt (moist)	NS	<1	
	5	58		3			NS	<1	
	6						NS	<1	
					SP-SM	Gray fine to medium sand with silt (moist) (native)			
	7			4 CA			NS	<1	
	8						NS	<1	
5									
	9						NS	<1	Groundwater observed at approximately 9 feet at time of drilling
	10	60		5 CA	SP	Grayish brown fine to coarse sand (wet)	NS	<1	
	11						NS	<1	
	12						NS	<1	
	13						NS	<1	
0									
	14						NS	<1	
	15								

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-32

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-5
Sheet 1 of 1

Drilled	Start 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				
Surface Elevation (ft)	12.25	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Vertical Datum	NAVD88				
Easting (X)	1208921.46	System	WA State Plane North	See "Remarks" section for groundwater observed	
Northing (Y)	559691.72	Datum	NAD83 (feet)		

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	12			AC	Approximately 6 inches asphalt concrete			
					SP	Brown fine to coarse sand with gravel (moist) (fill)	NS	<1	
10				1			NS	<1	
							NS	<1	
							NS	<1	
	5	54		2	SP	Dark brown fine to medium sand with occasional gravel (moist)	NS	<1	
							NS	<1	Groundwater observed at approximately 6 feet at time of drilling
						Becomes wet			
5					ML	Brown silt with trace organic matter (wet)	NS	<1	
				3	PT	Dark brown organic matter (peat) (moist)	NS	<1	
							NS	<1	
					SP-SM	Dark brown fine to medium sand with silt and trace organic matter (wet)			
	10	60					NS	<1	
					SP-SM	Gray fine to coarse sand with silt and occasional gravel (moist) (native)	NS	<1	
0				4			NS	<1	
					ML	Gray silt with sand (moist)	NS	<1	
							NS	<1	
	15								

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-33

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-6
Sheet 1 of 1

Drilled Start 9/12/2017 End 9/12/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 11.87 Vertical Datum NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600
Easting (X) 1208925.51 Northing (Y) 559767.3		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		48					AC	Approximately 8 inches asphalt concrete			
								SP	Brown fine to medium sand with gravel (dry) (fill)			
						1				NS	<1	
10						2		ML	Gray-brown silt with occasional organic matter (weathered wood fragments) and gravel (moist)	NS	<1	
										NS	<1	
										NS	<1	
	5		56							NS	<1	
								PT	Dark brown organic matter (peat) with weathered fibrous wood chips (moist) (native)			
						3		ML	Gray silt with trace organic matter (grass) (moist)	NS	<1	
5								SP	Gray fine to medium sand (wet)	NS	<1	Groundwater observed at approximately 7 feet at time of drilling
										NS	<1	
										NS	<1	
	10		60			4				NS	<1	
										NS	<1	
0										NS	<1	
								SP	Gray fine to medium sand with occasional gravel			
						5				NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-34

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-7
Sheet 1 of 1

Drilled	Start 9/11/2017	End 9/11/2017	Total Depth (ft) 10	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 11.67 Vertical Datum NAVD88			Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) 1208926.08 Northing (Y) 559822.33			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	Approximately 6 inches asphalt concrete			
						1		ML	Gray silt (moist) (fill)	NS	<1	
10						2		SP	Brown fine to coarse sand with gravel (moist)	NS	<1	
								ML	Gray-brown silt with trace organic matter (moist)	NS	<1	
						3		ML	Gray silt with sand (moist)	NS	<1	
	5					4		SP-SM	Gray fine to medium sand with silt (dry)	NS NS	<1 <1	Groundwater observed at approximately 5½ feet at time of drilling
5						5		SP	Dark gray fine to medium sand (wet) (native)	NS NS	<1 <1	
	10							SP	Dark gray fine to medium sand with trace gravel (wet)	NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-35

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-8
Sheet 1 of 1

Drilled	Start 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				
Surface Elevation (ft) Vertical Datum	13.47 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208850.34 559879.78	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	■	36				■	AC	Approximately 3 inches asphalt concrete			
		■			↕	1		SP	Gray-brown fine to coarse sand with gravel (moist) (fill)			
	1	■								NS	<1	
	2	■			↕	2				NS	<1	
10	3	■								NS	<1	
	4	■								NS	<1	
		■						SP	Brown fine to medium sand with occasional gravel and trace organic matter (moist)			
	5	■	48							NS	<1	
	6	■								NS	<1	
	7	■			↕	3				NS	<1	
5	8	■							Becomes wet	NS	<1	Groundwater observed at approximately 8 feet at time of drilling
	9	■						SP	Gray fine to medium sand with gravel (wet) (native)	NS	<1	
	10	■	60							NS	<1	
	11	■								NS	<1	
	12	■								NS	<1	
		■						SP	Gray fine to medium sand with occasional gravel (moist)			
0	13	■			↕	4				NS	<1	
	14	■								NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-36

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-9
Sheet 1 of 1

Drilled	Start 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push

Surface Elevation (ft) Vertical Datum	11.52 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208925.74 559882.69	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		39					AC	Approximately 6 inches asphalt concrete			
								SM	Gray silty fine to medium sand (moist) (fill)			
						1		SP	Grayish brown fine to coarse sand with gravel (dry)	NS	<1	
10												
								SP	Dark gray fine to medium sand (dry)	NS	<1	Geotextile fabric at 2¼ feet
						2				NS	<1	
										NS	<1	
								ML	Gray silt (moist)			
	5		60					SP	Brown fine to medium sand with occasional gravel (moist)	NS	<1	
						3		SP-SM	Gray fine to medium sand with silt (moist)	NS	<1	
5												
										NS	<1	
									Becomes wet	NS	<1	Groundwater observed at approximately 8 feet at time of drilling
						4		SP	Brown fine to medium sand (wet) (native)	NS	<1	
	10		60							NS	<1	
										NS	<1	
0												
								SP	Gray fine to coarse sand with occasional gravel (wet)	NS	<1	
						5				NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-37

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-10
Sheet 1 of 1

Drilled	Start 9/19/2017	End 9/19/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direch Push				

Surface Elevation (ft) Vertical Datum	11.06 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 7822 DT
Easting (X) Northing (Y)	1208650.79 559757.76	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
	0		24					SP	Light brown fine to medium sand (loose, dry) (fill)			
10										NS	<1	
						1 CA				NS	<1	
								SP-SM	Gray fine to medium sand with silt and occasional gravel (medium dense, moist)	NS	<1	
								SP-SM	Gray fine to medium sand with silt and gravel (medium dense, wet)	NS	<1	Groundwater observed at approximately 4 feet at time of drilling
	5		48			2 CA				NS	<1	
5										NS	<1	
										NS	<1	
										NS	<1	
										NS	<1	
	10		58					SP-SM	Gray fine to medium sand with silt and occasional gravel (dense, wet)	NS	<1	
0										NS	<1	
						3 CA		ML	Gray sandy silt with occasional gravel (very dense, moist) (native)	NS	<1	
										NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-38

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-11
Sheet 1 of 1

Date:5/9/18 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Drilled	Start	End	Total Depth (ft) 10	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 11.42 Vertical Datum NAVD88			Hammer Data Pneumatic		Drilling Equipment GeoProbe 7822 DT	
Easting (X) 1208628.66 Northing (Y) 559724.41			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		26					SP	Light brown fine to medium sand (dry) (fill)			
10						1 CA				NS	<1	
										NS	<1	
										NS	<1	
			30					SP	Brown fine to medium sand with occasional gravel (moist)	NS	<1	
	5					2 CA		SP	Gray fine to medium sand (moist)	NS	<1	
5								SP	Dark gray fine to medium sand with organic matter (weathered wood) (wet)	SS	<1	Groundwater observed at approximately 6 feet at time of drilling
								SP	Dark gray fine to medium sand (wet)	NS	<1	
			21			3 CA				NS	<1	
								SP	Gray fine to medium sand with occasional gravel (dense, wet) (native)	NS	<1	
	10											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-39

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-12
Sheet 1 of 1

Drilled	Start 9/19/2017 End 9/19/2017	Total Depth (ft) 15	Logged By SJB/NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push

Surface Elevation (ft) 10.3 Vertical Datum NAVD88	Hammer Data Pneumatic	Drilling Equipment GeoProbe 7822 DT
Easting (X) 1208593.49 Northing (Y) 559698.84	System WA State Plane North Datum NAD83 (feet)	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
10	0	39			SP	Light brown fine to medium sand (dry) (fill)			
	1						NS	<1	
	2			1 CA			NS	<1	
	3				SP-SM	Brown fine to medium sand with occasional silt and gravel (moist)	NS	<1	
	4						NS	<1	
5	5	54		2 CA			NS	<1	
	6					Becomes wet	SS	18	Groundwater observed at approximately 6 feet at time of drilling
					SP-SM	Dark gray to black fine to medium sand with silt and gravel (wet)			
					SP-SM	Gray fine to medium sand with occasional silt and gravel (wet)			
	7						NS	<1	
	8						NS	<1	
	9			3			NS	<1	
0	10	48					NS	<1	
					SP-SM	Gray fine to coarse sand with occasional silt and gravel (wet) (native)			
	11						NS	<1	
	12			4 CA			NS	<1	
	13						NS	<1	
	14						NS	<1	
	15								

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-40

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Drilled	Start 9/13/2017	End 9/13/2017	Total Depth (ft) 10	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 14.5 Vertical Datum NAVD88			Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) 1208736.61 Northing (Y) 559501.57			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:						

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		12					CC	Approximately 4 inches cement concrete			
						1		SP	Brown fine to coarse sand with gravel (fill)			Rock in shoe
										NS	<1	
										NS	<1	
										NS	<1	
										NS	<1	
10												
	5		60			2 CA		ML	Gray sandy silt with trace gravel (moist) (native)	NS	<1	
										NS	<1	
										NS	<1	
										NS	<1	
										NS	<1	
5												
	10											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-41

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-14
Sheet 1 of 1

Drilled	Start: End:	Total Depth (ft): 15	Logged By: NS Checked By: BJT	Driller: Cascade Drilling, LP	Drilling Method: Direch Push
Surface Elevation (ft): 14.27 Vertical Datum: NAVD88		Hammer Data: Pneumatic		Drilling Equipment: GeoProbe 6600	
Easting (X): 1208793.28 Northing (Y): 559512.02		System Datum: WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		26					CC	Approximately 4 inches cement concrete			
								SP	Dark brown fine to coarse sand with gravel (dry) (fill)			
						1 CA				NS	<1	
										NS	<1	
								SP	Light brown fine to medium sand with occasional gravel (moist)	NS	<1	
10										NS	<1	
	5		60							NS	<1	
						2 CA		ML	Gray silt with sand (moist) (native)	NS	<1	
								ML	Brown-gray silt with sand (moist)	NS	<1	
									Becomes wet	NS	<1	Groundwater observed at approximately 8 feet at time of drilling
5										NS	<1	
								ML	Brown silt with sand (moist)			
	10		60			3				NS	<1	
										NS	<1	
										NS	<1	
										NS	<1	
0										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-42

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-15
Sheet 1 of 1

Drilled	Start 9/13/2017	End 9/13/2017	Total Depth (ft) 10	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) 14.37 Vertical Datum NAVD88			Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600
Easting (X) 1208825.75 Northing (Y) 559510.64			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		36					CC	Approximately 6 inches cement concrete			
								SP	Dark brown fine to coarse sand with gravel (fill)	NS NS	<1 <1	
						1 CA		SP	Light brown fine to medium sand with gravel (moist)	NS	<1	
10								ML	Brown silt with sand (wet) (native)	NS	<1	
	5		60			2 CA				NS	<1	
								ML	Brown silt with sand (moist)	NS NS	<1 <1	
						3		ML	Brown silt with sand (dry)	NS NS	<1 <1	
5												
	10											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

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Log of Boring GEI-43

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-16
Sheet 1 of 1

Drilled	Start 9/13/2017	End 9/13/2017	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push

Surface Elevation (ft) Vertical Datum	12.94 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 6600
Easting (X) Northing (Y)	1208733.06 559766.2	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		32					CR	Crushed gravel			
								SP	Brown fine to coarse sand with gravel (dry) (fill)	NS	<1	
						1 CA				NS	<1	
10										NS	<1	
								SP	Light brown fine to medium sand (dry)	NS	<1	
	5		60			2				NS	<1	
										NS	<1	
						3 CA DUP 2			Becomes moist, 1-inch shell layer	NS	<1	Groundwater observed at approximately 7½ feet at time of drilling
5								SP	Gray fine to medium sand (wet) (native)	NS	<1	
										NS	<1	
	10		60			4 CA				NS	<1	
										NS	<1	
								SP	Dark gray fine to medium sand with occasional gravel (wet)	NS	<1	
0						5				NS	<1	
										NS	<1	
	15											

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-44

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-17
Sheet 1 of 1

Drilled	Start 9/18/2017	End 9/18/2017	Total Depth (ft) 15
Logged By NS	Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger

Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	15.96 NAVD88	Top of Casing Elevation (ft)	15.43
Easting (X) Northing (Y)	1208975.42 559557.88	Horizontal Datum	WA State Plane North NAD83 (feet)

DOE Well I.D.: BKA-355
A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).

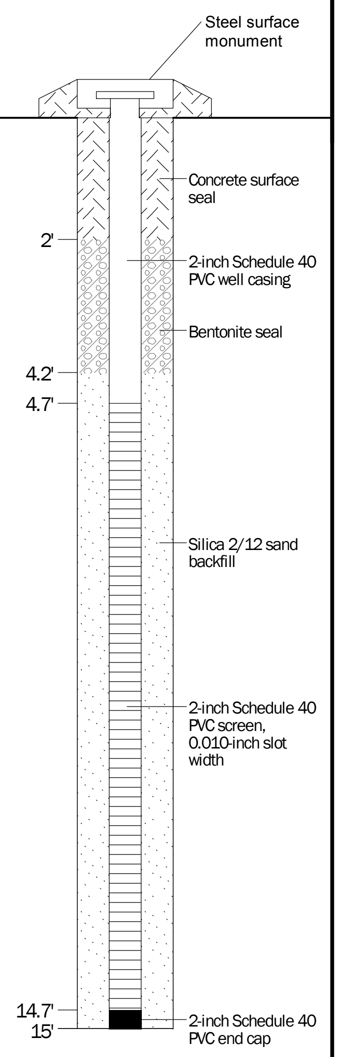
Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
10/18/2017	5.68	9.75

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								SP	Gray fine to medium sand with gravel (moist) (fill)		
15												
			18	6		1			SP	Light brown fine to coarse sand with gravel (loose, dry)	NS	<1
			18	9							NS	<1
											NS	<1
	5		18						NR	No recovery	NS	<1
							▼					
10												
			18	23		2			SM	Brown silty sand with occasional gravel (loose, moist)	NS	<1
											NS	<1
			18	25					SP-SM	Brown fine to medium sand with silt (medium dense, moist)	NS	<1
			18	20		3			SP-SM	Brown fine sand with silt (loose, wet) (native)	NS	<1
	10										NS	<1
5			18	20							NS	<1
			18	16							NS	<1
						4			SP-SM	Brown fine sand with silt (medium dense moist)	NS	<1
			18	42								
											NS	<1
	15											

WELL LOG



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Date:5/9/18 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_WELL

Log of Monitoring Well MW-6

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-18
Sheet 1 of 1

Drilled	Start 9/19/2017	End 9/19/2017	Total Depth (ft) 13.5	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Hollow-stem Auger				

Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75	DOE Well I.D.: BKA-357 A 2 (in) well was installed on 9/19/2017 to a depth of 10.3 (ft).	
Surface Elevation (ft) Vertical Datum	13.1 NAVD88	Top of Casing Elevation (ft)	12.62		
Easting (X) Northing (Y)	1208872.65 559890.97	Horizontal Datum	WA State Plane North NAD83 (feet)		

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
10/18/2017	6.69	5.93

Notes:

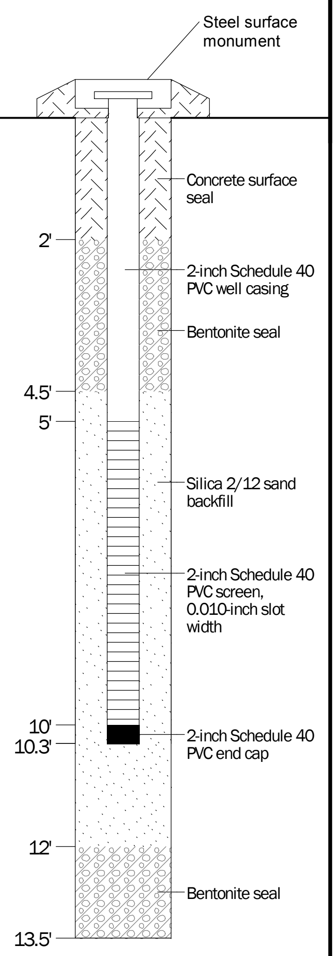
FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level
	0						
			10	9			
						1	
10			18	6			
			18	16			
	5						
			18	16		2	
							▼
5			18	13			
			18	10			
	10						
			18	16		3	
0			18	12			

Group Classification	MATERIAL DESCRIPTION
CR	Crushed gravel
SP	Brown fine to medium sand with trace gravel (loose, dry) (fill)
SP	Brown fine to medium sand with occasional gravel (loose, dry) Becomes moist
SP	Brown fine to medium sand (loose, wet)
SP	Brown fine to coarse sand with gravel (loose, wet)
SP-SM	Dark brown fine to medium sand with silt (loose, wet) (native)
SP-SM	Brown fine to coarse sand with silt and gravel (loose, wet)
SP-SM	Brown fine to medium sand with silt (loose, wet)

Sheen	Headspace Vapor (ppm)
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1
NS	<1

WELL LOG



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Monitoring Well MW-7

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-19
Sheet 1 of 1

Date:5/9/18 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_WELL

Drilled	Start 9/19/2017	End 9/19/2017	Total Depth (ft) 13.5	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger

Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	13.58 NAVD88	Top of Casing Elevation (ft)	13.13
Easting (X) Northing (Y)	1208872.65 559890.97	Horizontal Datum	WA State Plane North NAD83 (feet)

DOE Well I.D.: BKA-356
A 2 (in) well was installed on 9/19/2017 to a depth of 13 (ft).

Groundwater

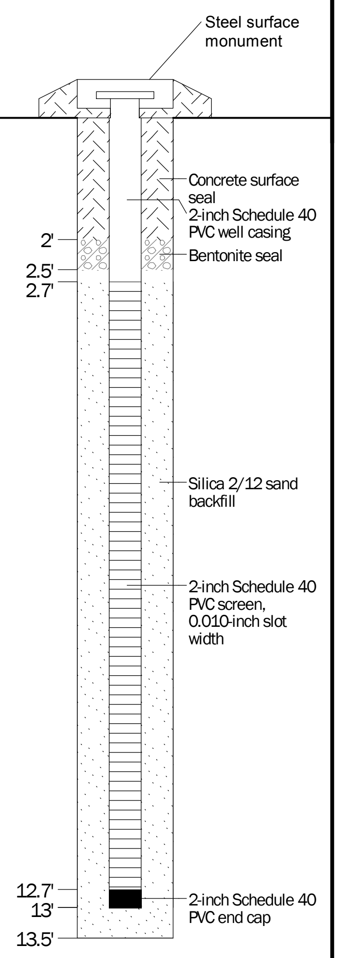
Date Measured	Depth to Water (ft)	Elevation (ft)
10/17/2017	5.51	7.62

Notes:

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0		14	8					Bark	Bark and vegetation		
									SP-SM	Brown fine to coarse sand with silt and gravel (loose, moist) (fill)	NS	<1
									SP-SM	Gray fine sand with silt (loose, moist)		
			10	13							NS	<1
						1 CA			ML	Light gray silt with orange mottling (medium stiff, moist)		
			12	6							NS	<1
10												
											SS	2.7
									PT	Black organic matter (peat) with trace grass (soft, moist)		
			9	35					SP	Dark gray fine to medium sand with gravel (medium dense, wet)		
	5					2 CA	▼				NS	<1
											NS	<1
			0	45					NR	No recovery		
											NS	<1
			9	21					SP	Dark gray fine to coarse sand with trace silt and gravel (loose, wet)	NS	<1
5												
			14	10							NS	<1
	10										NS	<1
			18	16		3			SP-SM	Light gray fine to coarse sand with silt (loose, moist) (native)	NS	<1
									SM	Gray silty sand (loose, moist)	NS	<1
			18	26					SM	Brown silty sand (medium dense, moist)	NS	<1

WELL LOG



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Monitoring Well MW-8

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-20
Sheet 1 of 1

Drilled	Start 9/18/2017	End 9/18/2017	Total Depth (ft)	15	Logged By Checked By
Driller	Cascade Drilling, LP		Drilling Method	Hollow-stem Auger	

Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	14.5 NAVD88	Top of Casing Elevation (ft)	14.17
Easting (X) Northing (Y)	1208826.27 559499.27	Horizontal Datum	WA State Plane North NAD83 (feet)

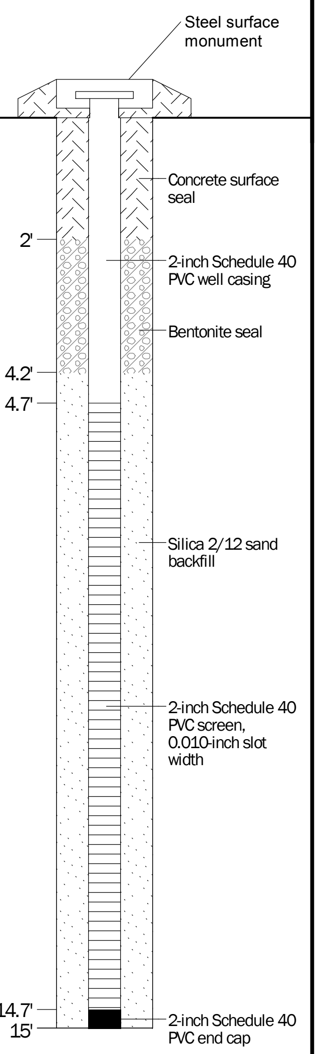
DOE Well I.D.: BKA-353
A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
10/17/2017	4.49	9.68

Notes: Soil descriptions referenced from exploration log GEI-43

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0								CC	Approximately 6 inches cement concrete		
									SP	Dark brown fine to coarse sand with gravel (fill)		
											NS	<1
											NS	<1
									SP	Light brown fine to medium sand with gravel (moist)	NS	<1
									ML	Brown silt with sand (wet) (native)	NS	<1
10							▼					
	5										NS	<1
									ML	Brown silt with sand (moist)		
											NS	<1
											NS	<1
									ML	Brown silt with sand (dry)		
											NS	<1
											NS	<1
5												
	10											
0												
	15											

WELL LOG



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Monitoring Well MW-10

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-21
Sheet 1 of 1

Drilled	Start 9/18/2017	End 9/18/2017	Total Depth (ft)	15
Logged By	NS	Checked By	BJT	
Driller	Cascade Drilling, LP	Drilling Method	Hollow-stem Auger	
Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75	
Surface Elevation (ft) Vertical Datum	12.69 NAVD88	Top of Casing Elevation (ft)	12.28	
Easting (X) Northing (Y)	1208783.3 559665.06	Horizontal Datum	WA State Plane North NAD83 (feet)	

DOE Well I.D.: BKA-354
A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).

Groundwater

Date Measured	Depth to Water (ft)	Elevation (ft)
10/17/2017	3.58	8.70

Notes:

Elevation (feet) / Depth (feet): 0, 5, 10, 15 (depth); 10, 5, 0 (elevation)

FIELD DATA

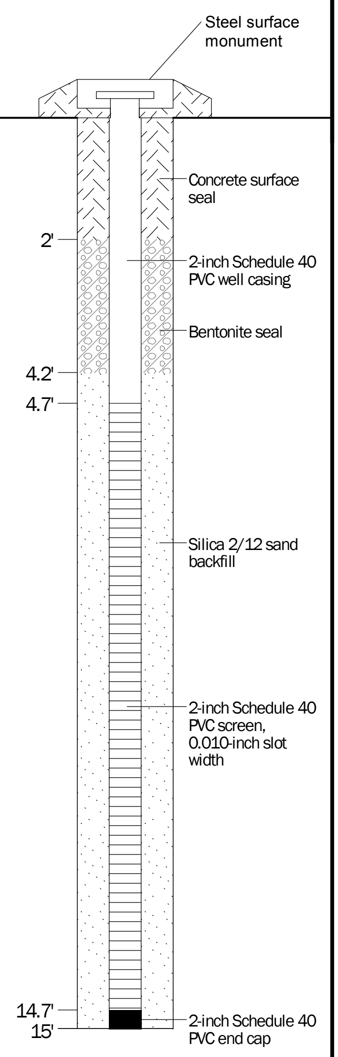
Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing
	18	12		
	18	19	↕	1
	18			
	18	5	↕	2
	18	14		
	18	13	↕	3
	18	13		
	18	19	↕	4
	18	7		

Water Level: ▼ (approx. 3.5 ft)

Group Classification	MATERIAL DESCRIPTION
CR	Crushed gravel
ML	Gray silt with sand (moist) (fill)
SP-SM	Gray fine to coarse sand with silt (loose, moist)
ML	Gray silt with sand (medium stiff, moist)
SP-SM	Gray fine to coarse sand with silt (loose, moist)
ML	Gray silt with sand and organic matter (weathered wood) (very soft, moist)
NR	No recovery due to rubble; moved boring 3 feet north
SP-SM	Gray fine to coarse sand with silt (loose, moist)
PT	Peat with organic matter (decayed wood) (soft, moist)
SP-SM	Gray medium to coarse sand with silt and gravel (loose, wet)
SP-SM	Gray fine to medium sand with silt and occasional gravel (loose, wet)

Sheen	Headspace Vapor (ppm)
NS	<1
HS	180
MS	93
HS	285
MS	90
MS	122
MS	182
MS	236
MS	198
MS	90
NS	<1
NS	<1
NS	<1

WELL LOG



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Monitoring Well MW-11

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-22
Sheet 1 of 1

Drilled Start 9/15/2017 End 9/15/2017	Total Depth (ft) 9	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push

Surface Elevation (ft) Vertical Datum	4.41 NAVD88	Hammer Data	Pneumatic	Drilling Equipment	GeoProbe 7822 DT
Easting (X) Northing (Y)	1208635.57 559848.09	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		18					GP	Sand and cobble (moist)			
								SP	Brown fine to coarse sand with occasional gravel and shell fragments (moist)			
						1 CA				NS	<1	
										NS	<1	
			32							NS	<1	
								SP-SM	Black fine to medium sand with silt (moist)			
						2 CA				NS	<1	
	5									NS	<1	
			30							NS	<1	
										NS	<1	
								GP	Gravel with fine to medium sand (moist)			
						3				NS	<1	
								SP	Brown fine to medium sand with gravel (moist)			

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring SED-1B

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Drilled	Start 9/15/2017	End 9/15/2017	Total Depth (ft) 12	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push

Surface Elevation (ft) 1.17 Vertical Datum NAVD88	Hammer Data Pneumatic	Drilling Equipment GeoProbe 7822 DT
Easting (X) 1208640.96 Northing (Y) 559873.14	System Datum WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		23					GP	Sand and cobble (moist)			
								SP-SM	Brown fine to coarse sand with silt and occasional shell fragments (moist)	NS	<1	
						1 CA						
								SP	Dark gray to black fine to coarse sand with occasional gravel (moist)	NS	<1	
			27					SP-SM	Gray fine sand with silt and occasional gravel (wet)	NS	<1	
						2 CA				NS	<1	
	5									NS	<1	
			36					SP-SM	Brown fine to medium sand with silt and occasional gravel (wet)	NS	<1	
										NS	<1	
						3				NS	<1	
			36							NS	<1	
	10									NS	<1	
										NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring SED-1C

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Drilled Start 7/17/2018 End 7/17/2018	Total Depth (ft) 4.75	Logged By PR Checked By BJT	Driller Gravity Environmental	Drilling Method Vibracore
Surface Elevation (ft) Vertical Datum: Undetermined	Hammer Data: N/A		Drilling Equipment: RV Discovery, 27' Research Vessel	
Easting (X) 1208509.45 Northing (Y) 559751.05	System Datum: WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		52.8					ML	Brown silt with sand			
								SP-SM	Brown fine to coarse sand with silt	NS	<1	
								SP	Brown-black fine to coarse sand with trace silt			<5% shell fragments
									Grades to with gravel	NS	<1	
									Increased gravel content			

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

Log of Boring SED-2

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft) 5	Logged By PR Checked By BJT	Driller Gravity Environmental	Drilling Method Vibracore
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	N/A	Drilling Equipment	RV Discovery, 27' Research Vessel
Easting (X) Northing (Y)	1208564.71 559795.03	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		60					ML	Brown-black silt with sand			
					I					NS	<1	
								SP-SM	Brown-black fine to coarse sand with silt			
					I			GP	Brown-black fine to coarse gravel with sand and trace silt	NS	<1	
					I					NS	<1	
								SP	Brown fine to coarse sand with gravel			
	5											Difficult to recover sediment at base of core

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

Log of Boring SED-3

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled	Start 7/16/2018	End 7/16/2018	Total Depth (ft)	5.5
Logged By	PR	Checked By	BJT	
Driller	Gravity Environmental	Drilling Method	Vibracore	

Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	N/A	Drilling Equipment	RV Discovery, 27' Research Vessel
Easting (X) Northing (Y)	1208595.18 559832.32	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		54					GP	Black fine to coarse gravel with sand	NS	<1	
								SP	Black fine to coarse sand with trace silt and occasional gravel			
								ML	Black silt with sand and occasional gravel	NS	<1	
								GP	Fine to coarse gravel with trace silt, sand and occasional cobbles	NS	<1	
	5											

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

Log of Boring SED-4

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled — Start: 7/16/2018 — End: 7/16/2018	Total Depth (ft): 5	Logged By: PR Checked By: BJT	Driller: Gravity Environmental	Drilling Method: Vibracore
Surface Elevation (ft) Vertical Datum: Undetermined		Hammer Data: N/A		Drilling Equipment: RV Discovery, 27' Research Vessel
Easting (X): 1208559.53 Northing (Y): 559735.1		System: WA State Plane North Datum: NAD83 (feet)		Groundwater not observed at time of exploration
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		57					SP-SM	Fine sand with silt			
								SP	Fine to coarse sand with occasional gravel	NS	<1	
												<10% shell fragments
										NS	<1	
	5											

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

Log of Boring SED-5

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft) 4.75	Logged By PR Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	N/A	Drilling Equipment	Power-corer
Easting (X) Northing (Y)	1208594.91 559752.22	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		42					SP	Brown fine to coarse sand with occasional sand	NS	<1	<10% shell fragments
												Multiple attempts with consistent refusalt at approximately 3 feet depth
								NR	No recovery, refusal			

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

Log of Boring SED-6

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled — Start 7/17/2018 — End 7/17/2018	Total Depth (ft) 1	Logged By PR Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data N/A		Drilling Equipment Power-corer
Easting (X) 1208621.02 Northing (Y) 559785.5		System WA State Plane North Datum NAD83 (feet)		Groundwater not observed at time of exploration
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA				Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					
	0		12					SP	Brown fine to coarse sand	NS	<1	<10% shell fragments
								NR	No recovery, refusal			Refusal due to asphalt/brick chunks larger than core diameter, multiple attempts

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

Log of Boring SED-7

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Drilled	Start 7/16/2018	End 7/16/2018	Total Depth (ft) 5	Logged By PR Checked By BJT	Driller Gravity Environmental
Drilling Method	Vibracore				
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	N/A	Drilling Equipment	RV Discovery, 27' Research Vessel
Easting (X) Northing (Y)	1208526.17 559709.73	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	FIELD DATA Recovered (in)	FIELD DATA Blows/foot	FIELD DATA Collected Sample	FIELD DATA Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		50.4					GP	Brown fine to coarse gravel with trace silt and sand	NS	3.3	<10% shell fragments
									Grades to with brick fragments, broken glass			
								SP-SM	Black fine to coarse sand with silt	NS	2.0	
								GP	Black fine to coarse gravel with trace silt, sand and occasional cobbles	NS	1.8	
	5								Grades to coarser gravel			

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

Log of Boring SED-8

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft)	3
Logged By	PR	Checked By	BJT	
Driller	Cascade Drilling, LP	Drilling Method	Direct Push	
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	N/A	
Drilling Equipment	Power-corer			
Easting (X) Northing (Y)	1208498.71 559672.18	System Datum	WA State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration				
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		27.6					GP	Brown fine to coarse gravel with cobbles	NS	<1	
					I			SP	Brown fine to coarse sand			
								SP	Brown fine to coarse sand with occasional gravel			
					I			GP	Brown fine to coarse gravel with trace silt and sand Grades to with cobbles	NS	2.2	
								NR	No recovery			Refusal due to cobble material, multiple attempts made

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

Log of Boring SED-9

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Drilled Start 7/17/2018 End 7/17/2018	Total Depth (ft) 6.75	Logged By PR Checked By BJT	Driller Gravity Environmental	Drilling Method Vibracore
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data N/A		Drilling Equipment RV Discovery, 27' Research Vessel
Easting (X) 1208615.7 Northing (Y) 559878		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration
Notes:				

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		74.4					ML	Brown-black silt with sand	NS	<1	
									Becomes more dense			
								SM	Brown-black silty fine sand			<5% shell fragments
									Decreased silt content	NS	2.2	
								SP	Brown-black medium to coarse sand with gravel and occasional cobbles			
	5											

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

Log of Boring SED-10

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

SOIL CLASSIFICATION CHART

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

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

ADDITIONAL MATERIAL SYMBOLS

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

Groundwater Contact

▼	Measured groundwater level in exploration, well, or piezometer
▼	Measured free product in well or piezometer

Graphic Log Contact

—	Distinct contact between soil strata
/	Approximate contact between soil strata

Material Description Contact

—	Contact between geologic units
– – –	Contact between soil of the same geologic unit

Sampler Symbol Descriptions

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

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

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

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

Laboratory / Field Tests

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

Sheen Classification

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

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

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft) 20	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Surface Elevation (ft) Vertical Datum	12.35	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559669.4416 1208741.24	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		36					CR	Crushed rock			
								SP	Brown fine to coarse sand with occasional gravel (loose, moist)			
10										SS	<1	
								ML	Gray silt with sand			
								SM	Gray silty fine to coarse sand (medium dense, moist)			
	5		60							HS	315	
5									Becomes wet			
								PT	Brown peat (medium stiff, wet)	NS	<1	Groundwater observed at approximately 8 feet during drilling
								SM	Gray silty fine to coarse sand with gravel (loose, wet)			
	10		60									
										HS	121	
0												
								SP	Gray fine to coarse sand with trace silt (loose, wet)	SS	28	
	15		60					SP	Gray medium to coarse sand			
								SM	Gray silty fine to medium sand (dense, wet)			
-5								ML	Gray silt (very dense, moist to wet) (native till)			
										NS	<1	
	20											

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

Log of Boring SD-1

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	12.36		Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig	
Easting (X) Northing (Y)	559677.0847 1208790.458		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

		FIELD DATA										
Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		36					CR	Gravel (base course/fill)			
10						1		SP	Brown fine to medium sand (loose, moist)	SS	9	
								ML	Gray silt with sand (dense, moist)	SS	11	
	5							SM	Gray silty fine to coarse sand (dense, moist)	SS	20	
5						2		SM	Brown silty fine to coarse sand with occasional organic matter (peat, wood chips, roots) (medium stiff to stiff, moist)	MS	226	
	10							PT	Peat (medium stiff, moist to wet)			
						3		SM	Dark gray silty fine to coarse sand with gravel (very dense, wet)	NS	1	
0								SM	Light gray silty fine to medium sand (very dense, wet)			
								ML	Gray silt (very dense, moist)	NS	<1	
						4						
	15											

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

Log of Boring SD-2

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-3
Sheet 1 of 1

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Surface Elevation (ft) Vertical Datum	12.59	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559651.0388 1208824.646	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		30					CC	Cement concrete pavement			
								SP	Brown medium to coarse sand with gravel			
10						1		SM	Brown silty fine to coarse sand with gravel (loose, moist)	SS	30	
								SM	Gray silty fine to medium sand with trace gravel (loose, moist)			
	5		36					SP	Black medium to coarse sand with gravel (loose, wet)			
5						2				HS	428	
								PT	Peat			
	10		60					SM	Light gray silty fine to coarse sand with gravel	NS	<1	
0						3		ML	Gray silt	NS	<1	
	15											

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

Log of Boring SD-3

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Drilled Start 10/17/2018 End 10/17/2018	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 12.89	Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig	
Easting (X) 559624.0329 Northing (Y) 1208721.003	System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		30					CC	6 inches concrete cement pavement			
								SP	Brown fine to coarse sand with gravel (very loose, dry)			
10						1		SP	Dark brown fine to coarse sand with occasional gravel (very loose, dry)	MS	74	
								SP	Gray fine to coarse sand with gravel (loose, dry)			
5	5		36			2		SM	Gray silty fine to coarse sand with occasional gravel (dense, moist)	HS	290	Groundwater observed at approximately 7½ feet during drilling
								PT	Peat			
	10		60					SM	Dark gray silty fine to coarse sand with gravel (very dense, moist)			
								SM	Light gray silty fine to coarse sand with gravel (dense, wet)			
0						3		ML	Gray silt with trace gravel (very dense, moist)	NS	<1	
	15											

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

Log of Boring SD-4

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-5
Sheet 1 of 1

Drilled	Start 10/18/2018	End 10/18/2018	Total Depth (ft) 11	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Surface Elevation (ft) Vertical Datum	13.1	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559577.8851 1208791.369	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		18					SOD	Grass surface			
						1		SM	Brown silty fine to medium sand (loose, dry)	NS	<1	
10								SM	Light brown silty fine to medium sand with gravel (loose, moist)			
								SM	Dark brown silty fine to coarse sand with occasional gravel (medium dense, moist)			
	5		60			2				SS	<1	Groundwater observed at approximately 5 feet during drilling
									Becomes wet			
5												
								SM	Light brown to gray silty fine to coarse sand with gravel			
						3		ML	Gray silt with sand and occasional gravel (very dense, moist)	NS	<1	
	10		12									

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

Log of Boring SD-5

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-6
Sheet 1 of 1

Drilled	Start 10/18/2018	End 10/18/2018	Total Depth (ft) 10	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	15.66		Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559601.709 1208866.706		System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		54					SOD	Grass surface			
15						1		SM	Brown silty fine to medium sand (loose, dry)	NS	<1	
								SM	Light brown silty fine to medium sand with gravel (loose, moist)			
						2		SM	Dark brown silty fine to coarse sand with occasional gravel (medium dense, moist)	NS	<1	
	5		60									
10									Becomes wet			Groundwater observed at approximately 6 feet during drilling
						3				NS	<1	
								SM	Light brown to gray silty fine to coarse sand with gravel			
						4		ML	Gray silt with sand and occasional gravel (very dense, moist)	NS	<1	
	10											

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

Log of Boring SD-6

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-7
Sheet 1 of 1

Drilled	Start 10/17/2018 End 10/17/2018	Total Depth (ft) 20	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	12.28	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559689.3087 1208650.605	System Datum	WA State Plane North NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		48					CR	Gravel surface			
						1		SP	Dark brown fine to coarse sand with occasional gravel and trace organic matter (roots) (loose, moist)	SS	<1	
10						2		SP	Brown fine to medium sand with trace gravel (medium dense, moist)	SS	<1	
								SP	Gray fine sand (medium dense, moist)	NS	<1	
	5		60									
5								SM	Gray silty fine to medium sand with occasional gravel (medium dense, moist)	NS	<1	
								SM	Gray silty fine to medium sand with occasional gravel (dense, wet)	NS	<1	Groundwater observed at approximately 8½ feet during drilling
						3						
	10		60									
0												
								SM	Gray silty fine to coarse sand with gravel (very dense, wet)	NS	<1	
	15		60			4						
-5								SM	Gray silty fine to coarse sand (very dense, wet)	NS	<1	
						5		ML	Gray silt with sand (very dense, moist)	NS	<1	
	20											

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

Log of Boring SD-7

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-8
Sheet 1 of 1

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Surface Elevation (ft) Vertical Datum	12.81	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559636.0374 1208772.986	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		40					CR	Gravel base course			
						1		SP	Brown fine to coarse sand with gravel (dense, moist)	HS	336	
10												
								SM	Gray silty fine to medium sand with organic layering			
	5		48					WD	Wood debris (log decay)			
						2		SP	Dark gray to brown silty fine to coarse sand with gravel (dense, moist to wet)	HS	98	
5												
						3				NS	30	
	10		60					SP	Light gray silty fine to coarse sand with gravel (dense, wet)			
								ML	Light gray silt with trace sand (very dense, moist)			
0												
						4				NS	<1	
	15											

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

Log of Boring SD-8

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-9
Sheet 1 of 1

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft) 5	Logged By NS Checked By BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum	13.02		Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y)	559632.6333 1208844.563		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		30					CC	Concrete pavement			
								SP	Brown fine to mediums and with gravel (loose, moist)			
10						1				MS	4	
								SM	Brown silty fine to medium sand (loose, moist)			
								CC	Concrete rubble			
								SP	Dark brown fine to coarse sand with gravel (dense, moist to wet)			
	5											

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

Date:5/24/19 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Log of Boring SD-9

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-10
Sheet 1 of 1

Drilled	Start 10/18/2018	End 10/18/2018	Total Depth (ft) 5	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				

Surface Elevation (ft) Vertical Datum	13.17	Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig
Easting (X) Northing (Y)	559601.036 1208783.61	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0		54					CC	Concrete pavement			
								CR	Gravel base course			
								SP	Light brown fine to medium sand (loose, dry)			
								CC	Concrete			
10								SP	Brown to dark brown fine to coarse sand (loose, dry)			
								CC	Concrete			
								SP	Dark gray fine to coarse sand with gravel (dense, moist)	MS	293	
	5											

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

Log of Boring SD-10

GEOENGINEERS

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-11
Sheet 1 of 1

Drilled	Start 10/18/2018	End 10/18/2018	Total Depth (ft) 15	Logged By NS Checked By BJT	Driller Cascade Drilling, LP
Drilling Method	Direct Push				
Hammer Data	N/A	Drilling Equipment	Track-mounted Drill Rig		
Surface Elevation (ft) Vertical Datum	12.05	Top of Casing Elevation (ft)	11.17		
Easting (X) Northing (Y)	559695.7474 1208842.819	Horizontal Datum	WA State Plane North NAD83 (feet)		

DOE Well I.D.: BKF-773
A 2-in well was installed on 10/18/2018 to a depth of 15 ft.

Groundwater

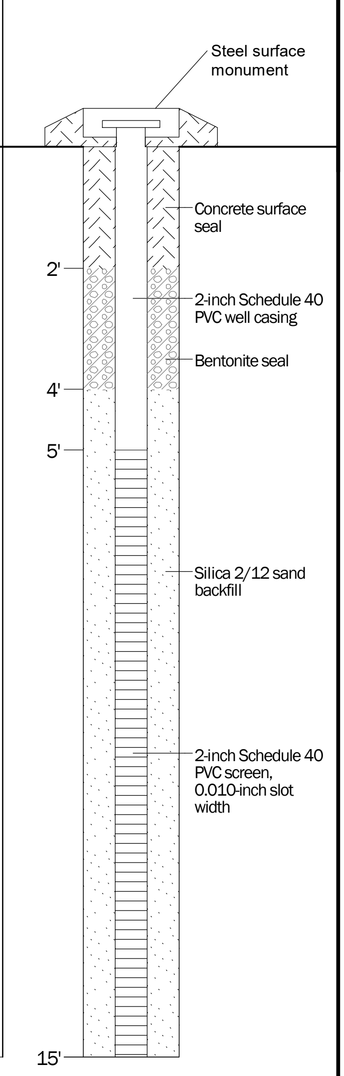
Date Measured	Depth to Water (ft)	Elevation (ft)
10/18/2018	8.00	3.17

Notes:

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0		36						SP	Brown fine to coarse sand with occasional gravel		
10												
									SM	Light brown silty fine to medium sand		
						1					NS	<1
									SM	Light to dark gray silty fine to coarse sand with occasional gravel (dense, moist to wet)		
	5		44									
5												
						2					HS	125
							▼			Becomes wet		
									PT	Peat		
	10		60						SM	Dark brown silty fine to coarse sand with gravel and occasional peat and organic matter (loose, wet)		
						3			SM	Dark gray silty fine to coarse sand with gravel (dense, wet)	SS	243
0												
										Becomes light gray		
						4			ML	Gray silt with sand (very dense, moist)	NS	<1
	15											

WELL LOG



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

Log of Boring MW-12

GeoEngineers

Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-12
Sheet 1 of 1

ATTACHMENT 2

Surveys

View of the lower beach from N Avenue looking northeast.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlxs

Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-1

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 24-29 Date Exported: 04/18/18

View of the lower beach from adjacent to Quiet Cove Site looking northeast.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-2

View from the lower beach looking east at the Quiet Cove Site (building is the office/maintenance building).

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlxs

Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-3

View of the lower beach from adjacent to the Quiet Cove Site looking southwest.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-4

Close-up of beach substrate at elevation around 0 feet MLLW.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-5

View of the south end of Curtis Wharf looking east from the lower beach.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-6

View of the southwest section of Curtis Wharf from the lower beach.

Notes:
1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA

GeoEngineers

Figure 2-7

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 24-29 Date Exported: 04/18/18

Under-wharf view of the southwest bulkhead on Curtis Wharf. Pipe is for fire suppression system. No evidence of historical product lines coming through the bulkhead.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
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7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-8

Under-wharf view from the bulkhead looking north. Pipe is for fire suppression system.

Notes:
1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

Figure 2-9

Under-wharf view close up of bulkhead and wharf interface near the west end of the wharf.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA

GEOENGINEERS

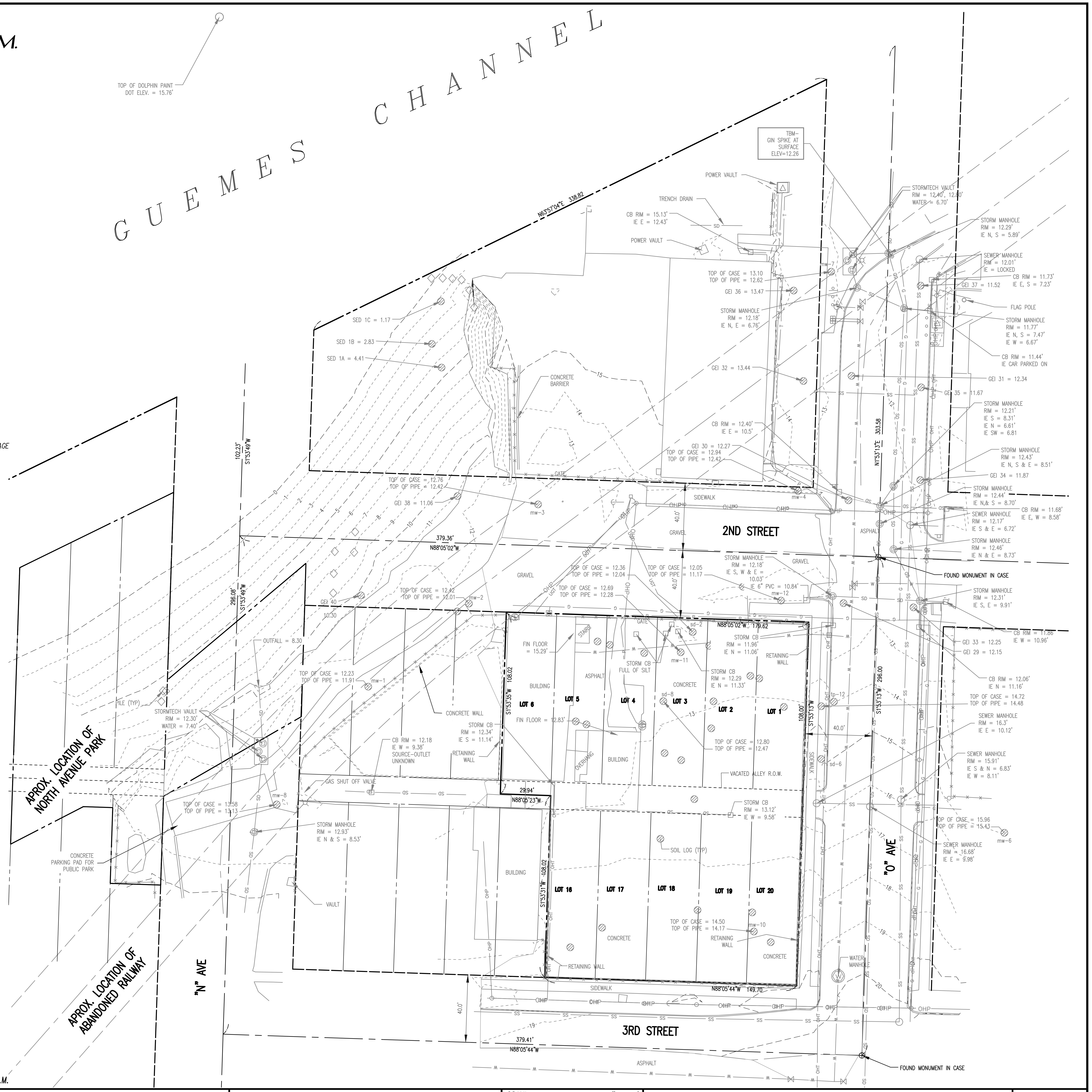
Figure 2-10

SECTION 13, TOWNSHIP 35 NORTH, RANGE 1 E., W.M.

Point #	Raw Description	Rim Elevation	Top of Pipe	Northing	Easting
1327	sed 1a	4.410		559834.0830	1208641.3250
1295	mw–2	12.421	12.01	559693.9790	1208657.5940
1331	gei 44	12.938		559766.2000	1208733.0590
1315	mw–1	12.229	11.91	559644.6200	1208597.8020
1325	sed 1c	1.182		559873.4100	1208640.9590
1326	sed 1b	2.830		559848.0990	1208635.5730
1328	gei 38	11.059		559757.7590	1208650.7900
1457	mw–8	13.575	13.13	559574.7290	1208543.5030
1329	gei 39	11.424		559724.4140	1208628.6570
1330	gei 40	10.295		559698.8360	1208593.4930
1332	gei 43	14.371		559510.6390	1208825.7510
1333	gei 42	14.273		559512.0150	1208793.2780
1334	gei 41	14.500		559501.5740	1208736.6060
1335	gei 29	12.146		559694.2160	1208879.9360
1336	gei 33	12.250		559691.7200	1208921.4610
1338	gei 35	11.673		559822.3250	1208926.0830
1339	gei 37	11.519		559882.6920	1208925.7370
1340	gei 36	13.466		559879.7810	1208850.3360
1341	gei 32	13.437		559826.0970	1208856.1550
1342	gei 31	12.345		559829.1170	1208884.6970
1344	gei 30	12.272		559755.2750	1208882.9080
1352	mw–3	12.764	12.42	559752.8430	1208698.6300
1337	gei 34	11.872		559767.2990	1208925.5050
1362	mw–4	12.94	12.42	559760.7700	1208852.9400
1371	mw–11	12.686	12.28	559665.0550	1208783.3000
1372	mw–10	14.501	14.17	559499.2730	1208826.7160
1570	mw–6	15.956	15.43	559557.8830	1208975.4200
1696	mw–7	13.101	12.62	559890.9730	1208872.6500
185	SD–1	12.353		559669.4416	1208741.2395
192	SD–2	12.359	12.04	559677.0847	1208790.4584
187	SD–3	12.591		559651.0388	1208824.6462
186	SD–4	12.889		559624.0329	1208721.0025
189	SD–5	13.103		559577.8851	1208791.3689
196	SD–6	15.662		559601.7090	1208866.7063
184	SD–7	12.278		559689.3087	1208650.6050
194	SD–8	12.805	12.47	559636.0374	1208772.9862
190	SD–9	13.017		559632.6333	1208844.5630
188	SD–10	13.166		559601.0360	1208783.6097
191	MW–12	12.054	11.17	559695.7474	1208842.8186
199	MW–5	14.72	14.48	559633.052	1208866.748

LEGEND

— — — — — —	*EXISTING RIGHT OF WAY LINE*
——— — ———	*ASBUILT ROAD CENTERLINE*
——— — ———	*EXISTING ROAD CENTERLINE*
————————	*EXISTING PROPERTY LINE*
○	*EXISTING PROPERTY CORNER*
—— SD —— SD ——	*EXISTING STORM DRAIN*
⊡	*EXISTING TYPE 2 CB*
□	*EXISTING TYPE 1 CB*
—— SS ——	*EXISTING SANITARY SEWER*
◯	*EXISTING SANITARY MANHOLE*
—— W —— W ——	*EXISTING WATERLINE*
⋈	*EXISTING WATER VALVE*
-○-	*EXISTING FIRE HYDRANT*
—— G ——	*EXISTING GAS LINE*
—— P ——	*EXISTING POWERLINE*
—×—×—×—×—	*EXISTING FENCELINE*
————————	*EXISTING EDGE OF ASPHALT*
════════	*EXISTING CURB & GUTTER*
▨	*EXISTING CONCRETE*
▩	*EXISTING ASPHALT*
▨	*EXISTING GRAVEL*
– – – 29 – – –	*EXISTING CONTOUR*
◇	*PILE [TYP.]*
—— UGT ——	*EXISTING UNDERGROUND LOW VOLTAGE*
—— OHT ——	*EXISTING OVERHEAD LOW VOLTAGE*
—— OHP ——	*EXISTING OVERHEAD POWER*



LEGAL DESCRIPTION

LOTS 1 THROUGH 6, INCLUSIVE, AND LOTS 16 THROUGH 20, INCLUSIVE, BLOCK 66, "MAP OF THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON," AS PER PLAT RECORDED IN VO.UME 2 OF PLATS, PAGE 4, RECORDS OF SKAGIT COUNTY, WASHINGTON.

TOGETHER WITH THAT PORTION OF THE NORTH HALF OF THE VACATED ALLY ADJACENT TO LOTS 1 THROUGH 6,INCLUSIVE, AND THAT PORTION OF THE WOIUTH HALF OF SAID VACATED ALLEY ADJACENT TO LOTS 16 THROUGH 20, INCLUSIVE, WHICH AS REVERTED TO SAID PREMISES BY OPERATION OF LAW.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON. (FROM GUARDIAN NORTHWEST TITLE REPORT ORDER NO. 107445, DATED APRIL 4, 2014)

VERTICAL DATUM NAVD 88'

VERTICAL DATUM BASED ON TIE TO JETTY 2 AS PUBLISHED BY THE "PORT OF ANACORTES" BY WHPACIFIC.
NAVD 88 + 0.66 = MLLW (TIDAL DATUM) AS PUBLISHED BY THE "PORT OF ANACORTES" BY WHPACIFIC.

BASIS OF BEARING

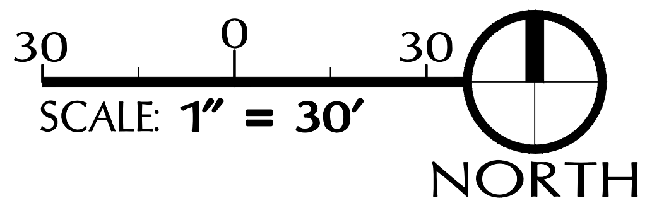
BASED ON THE MONUMENTS AT THE INTERSECTION OF 2ND AND "O" AND 3RD AND "O" AS SHOWN HEREON BEARS NORTH 1°53'13" EAST

UTILITIES NOTE

UTILITIES SHOWN HEREON ARE BASED ON FIELD OBSERVATION AND PRIVATE LOCATES COMPLETED IN 2014. TELEPHONE LINES COULD ALSO BE T.V., CABLE OR INTERNET.

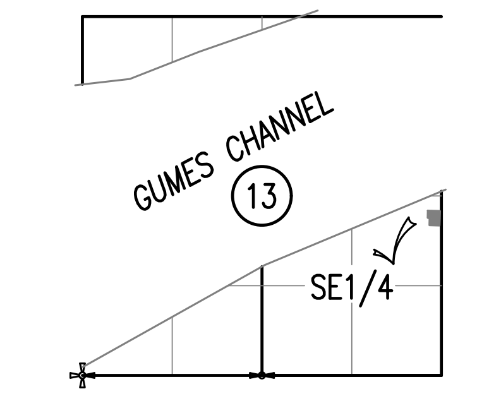
RESEARCH

A.F.N. 9809040088 SKAGIT COUNTY
A.F.N. 9011020026 SKAGIT COUNTY
A.F.N. 9210140061 SKAGIT COUNTY
A.F.N. 8508270029 SKAGIT COUNTY
A.F.N. 200206260016 SKAGIT COUNTY
A.F.N. 9612190052 SKAGIT COUNTY



MYLES J. STANDISH
52089

INDEX MAP



SECTION 13, TWP.35 N., RGE.1 E., W.M.

CALL 48 HOURS
BEFORE YOU DIG
1-800-424-5555

NO.	DATE	REVISIONS	BY	APRVD

Sound Development Group
ENGINEERING, SURVEYING & LAND DEVELOPMENT SERVICES
P.O. Box 1705 • 1111 Cleveland Avenue, Suite 202
Mount Vernon, WA 98273
Tel: 360–404–2010 Fax: 360–404–2013

SHEET DESCRIPTION
QUITE COVE TOPO
GUEMES CHANNEL
ANACORTIES, WA

SCALE: 1" = 30'
DRAWN BY: M.J.S.
DESIGNED BY:
CHECKED BY: M. WARE
FIELD BOOK/PAGE: 5/75
DATE: 05-07-2019

PROJECT
TOPOGRAPHIC SURVEY
FOR
GEO ENGINEERS, INC.
SEC 13 - TWP 35 - RNG 1 E

JOB NO.
17065
DRAWING NAME
18082 TOPO.dwg
SHEET
1 OF 1

ATTACHMENT 3

Tier 2 Sediment Sampling Letter

GeoEngineers

Plaza 600 Building, 600 Stewart Street, Suite 1700, Seattle, Washington 98101, Telephone: 206.728.2674, Fax: 206.728.2732 www.geoengineers.com

Memorandum

To: Arianne Fernandez and Susannah Edwards; Washington State Department of Ecology

From: Brian Tracy and John Herzog; GeoEngineers on behalf of Port of Anacortes

Date: April 17, 2018

File: 5147-024-05

Subject: Quiet Cove Remedial Investigation Tier 2 Sediment Sampling

The purpose of this memorandum is to document the detail on the scope and procedures for completing Tier 2 sediment sampling for the Remedial Investigation (RI) field study of the Quiet Cove Cleanup Site (Site) that was recently discussed and agreed to with the Washington State Department of Ecology (Ecology). These details provided herein, supplement the existing Remedial Investigation/Feasibility Study (RI/FS) Work Plan (GeoEngineers, 2017). GeoEngineers collected Tier 1 soil, sediment and groundwater samples in September and October 2017. Analytical results indicate that contaminants of potential concern (COPCs) exist at concentrations greater than preliminary screening levels in soil and sediment along the shoreline. In accordance with the RI/FS Work Plan, these analytical results trigger the need to collect and analyze additional sediment samples to determine the nature and extent of contamination related to historical Site operations. Ecology provided comment regarding the locations and methodology for the future sediment sampling and the Port collaborated with Ecology to refine the plans and procedures for the Tier 2 sediment sampling as described below.

Sampling and analysis procedures will be completed in accordance with the Sampling and Analysis Plan (SAP) included in the RI/FS Work Plan. The information below provides detail for collection and analysis for the Tier 2 sediment sampling effort.

SAMPLE COLLECTION

The Tier 2 sediment sampling locations included in the RI/FS Work Plan were preliminary, and the tiered approach in the work plan was designed to allow for modifying these sample locations based on the results of the Tier 1 study. Figure 1 provides the proposed locations for the Tier 2 sediment sampling study. Based on findings of the Tier 1 RI field study, the Tier 2 sediment sample locations have been modified to focus on the areas where data is needed to fully define the extent of contamination at the Site. As requested by Ecology, three additional locations were added for further coverage of the sediment area. In total nine sediment sample locations will be collected, SED-2 through SED-10, as presented in Figure 1.

Surface Sample Collection and Processing

Surface sediment samples will be collected via beach access at low tides or by a power-grab sampler off the vessel at higher tides. The preference is to collect surface samples via beach access. Sample locations SED-2, -3, -4 and -10 may not be accessible at low tides and will be collected from a vessel.

Surface sediment samples will be obtained using hand tool (stainless steel trowel or spoon) from the beach or power grab sampler from a vessel. Surface samples will be obtained from the upper 10 centimeters (cm) of sediment. Sampling equipment will be decontaminated and inspected before sampling. The procedures for collecting surface sediment samples are as follows:

1. Identify the sample location using a handheld global-positioning system (GPS) for locations accessible by the beach. Maneuver the vessel to the sampling location using a handheld GPS and/or the GPS location on the vessel and measure the depth of water to the mudline for samples collected from the water.
2. Record the location of the sample.
3. Use a stainless-steel spoon to collect the sediment from the top 10 cm and place in stainless steel bowl(s). Samples for volatile analysis will be collected from a discrete location prior to homogenization following the Ecology 5035A methodology
4. Visually classify sediment in accordance with ASTM International (ASTM) D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of staining shall also be recorded.
5. The visual absence or presence of wood debris in the surface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.
6. Photograph the sediment sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large print; use care not to touch the sediment with the paper/whiteboard or with hands contaminated with whiteboard ink.
7. To avoid cross-contamination, a clean hands/dirty hands approach to use of whiteboard pens and erasers and lab pens will be utilized during all sample collection activities where subsequent chemical analyses will be carried out on the samples collected. Gloves that have been in contact with lab pens and whiteboard pens will not be used for sample handling.
8. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with Sediment Cleanup Users' Manual II (SCUM II) within a stainless-steel mixing bowl using a stainless-steel spoon and/or stainless-steel mixing paddle attached to a power drill.
9. Distribute the sample to designated sample containers and ensure that the samples are properly labeled and tightly closed. Sample containers will be filled to minimize headspace.
10. Clean the exterior of the sample containers and store them in a cooler with ice.
11. Decontaminate all equipment in accordance with the RI/FS Work Plan SAP.
12. Double check that field collection forms are completely filled out.

Surface sediment sampling, storage, transport and disposal will be completed in accordance with the RI/FS Work Plan.

Subsurface Sample Collection

Vibracore sampling methods will be used to extract the proposed sediment cores. Based on our field experience vibracores will provide opportunity to obtain high quality sediment cores for the conditions at the Site. The vibracores will be collected from a small research-type vessel at high tide to access the proposed sample areas located higher elevations of the beach.

Vibracoring technology is utilized to collect sediment cores by attaching a core tube to a source of mechanical vibration (power head). The vibration allows the core tube to be driven into sediment by the force of gravity minimizing disturbance of the core. Vibracores are driven into the sediment using an approximately 5-inch diameter lexan liner with a core catcher at the point of the tube. Cores will be completed to depths where native material is encountered or refusal. Note that vibracore methods are not likely be effective in coring through hard native silt material. Based on upland geology, we expect the cores will be advanced to depths of about 5 feet below mudline.

The Port will subcontract the sediment sample collection vessel, captain and deckhand. GeoEngineers staff will oversee and direct the sample collection efforts. Acceptance of cores will be determined on the vessel as the cores are extracted. Upon extraction of the core barrel, the liner will be capped and the core will be examined relative to the following acceptance criteria:

- Overlying water is present and the surface is intact.
- Calculated linear compaction is not greater than 25 percent.
- The core tube appears intact without obstructions or blockage.

If any of the sediment acceptance criteria are not achieved, the sample will be rejected and the location resampled. If the proposed sampling location cannot be achieved after four deployments, the Project Manager will be notified. Ecology will be contacted for required review and approval if an alternative location is needed as described in the Contingency Measures for Coring section below.

If the core meets the acceptance criteria, then proceed with core processing. Core processing including geologic logging and sediment sampling will be completed in the upland (i.e., east of the beach). Core collection, processing, transport, and disposal will be completed in accordance with the sediment core procedures included in the SAP and the Health and Safety Plan (see Appendix C and Appendix D, respectively, of the RI/FS Work Plan).

The procedures for collecting and processing subsurface sediment samples are as follows:

1. Maneuver the vessel to the sampling location using a handheld GPS and/or the GPS location on the vessel (Note: the GPS device on the vessel provides precise coordinates of the core).
2. Record the location of the sample.
3. Measure the depth to mudline below the water using a lead line after the GPS location is recorded.
4. Record the time and the depth of water measurement.
5. Drive the sampler into the sediment surface to the target depth or until refusal.
6. Collect a continuous core to the specified target depth or until refusal.
7. For each core interval, record the penetration depth on the field form.
8. Extract the core barrel and open using a decontaminated core-opening device.
9. Visually classify sediment in accordance with ASTM D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of product/staining shall also be recorded.

10. The visual absence or presence of wood debris in the subsurface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.
11. Photograph the sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large black print; use care not to touch the sediment with the paper/whiteboard or with gloved hands in contact with whiteboards, pens or with whiteboard ink. It is likely several photos will be necessary to record the entire length of the core sample. Include the depth interval on the paper/whiteboard.
12. Collect sediment from the liner using a decontaminated stainless-steel spoon. Minimize collection of sediment that has been in contact with the sides of the core liner, or the core-opening device to the extent possible. Place the sediment into a decontaminated stainless-steel homogenization bowl. Cover the container with a new sheet of aluminum foil and dispose after use.
13. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with SCUM II within a stainless-steel mixing bowl using a stainless-steel spoon and/or stainless-steel mixing paddle attached to a power drill.
14. Distribute the sample to appropriate sample containers and ensure that the samples are properly labeled and tightly closed.
15. Clean the exterior of the sample containers and store them in a cooler with ice.
16. Decontaminate all equipment as described in accordance with the RI/FS Work Plan SAP.
17. Double check that field collection forms are completely filled out.

If adequate sample volume cannot be obtained in a particular interval(s) in cores or the location, additional cores will be attempted within a 10-foot radius of the original core location.

Drill cuttings from borings completed for the sediment sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

Contingency Measures for Coring

Vibracoring is expected to be successful in areas where water is at least 2 to 3 feet deep during drilling and where obstructions such as large cobbles, bedrock or hard silt are not present. If the first attempt is unsuccessful due to refusal we will make up to 3 additional attempts within an approximately 10-foot radius of the proposed sampling location in attempt to drive a successful core. This 10-foot radius is consistent with Ecology and Dredged Material Management Program (DMMP) protocols. If a core location is unsuccessful, we will notify Ecology and attempt to discuss in real time whether to move or abandon the location while the sampling vessel is still onsite, to maximize the use of the sampling mobilization. In areas with less than approximately 3 feet of water during drilling, there is a higher likelihood that the vibracore will heat up the liner resulting in an unsuccessful core. If this occurs, the location will be moved in consultation with Ecology to deeper water, while remaining as close to the original location as possible. Alternatively, sampling may be completed during a more advantageous tide, to the extent practical, to re-attempt coring.

In the case that Vibracoring is not successful, an alternative coring method using a portable beach rotary impact corer at low tides will be utilized. The vessel would be beached, the corer unloaded and moved into place. The corer would be powered by the vessel. This equipment drives an approximately 3-inch diameter core tube using a pneumatic rotary hammer.

SAMPLE ANALYSIS

Surface and subsurface sediment samples would be collected at the nine locations shown in the attached figure (SED-2 to -10). Subsurface samples would extend a minimum of 2-feet into the native geologic layer. The following analyses are proposed for these sediment samples based on the observed contamination in the adjacent upland:

- Gasoline-range total petroleum hydrocarbons (TPH-Gx), diesel-range total petroleum hydrocarbons (TPH-Dx), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and metals would be analyzed at locations SED-5, -6, -7, -8, -9 and -10 from one sample interval each. TPH and VOCs analyses will be completed on a rush turnaround time so that follow-up analysis can be completed within the hold time, if necessary. The remaining samples collected will be archived.
- Selection of sample interval for analysis would be based on field evidence of contamination. In the absence of field evidence, the sample interval on top of the native layer would be analyzed.
- Additional analysis of archived samples would only be triggered if exceedances are found in SED-5 through -10 and weight of evidence indicates contamination has passed into the marine environment. These additional analyses would be determined in consultation with Ecology.
- The remainder of the sample intervals collected would be archived.

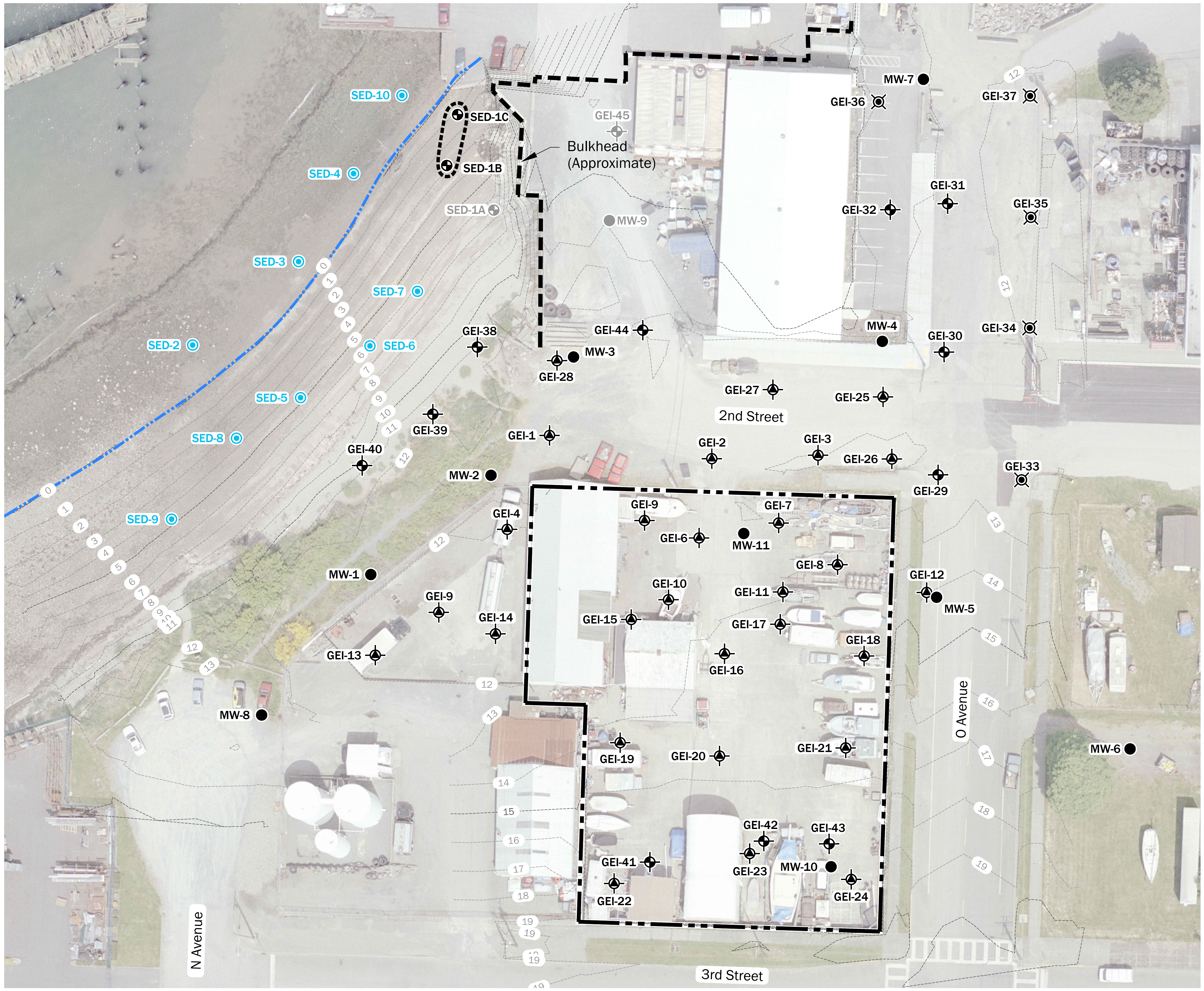
Laboratory method requirements and protocols are provided in the RI/FS Work Plan.

SCHEDULE

The Tier 2 sediment sampling field work will be planned for the end of July. The specific schedule dates will be determined based on predicted tides and contractor availability. The specific schedule for field work will be communicated to Ecology when dates are confirmed and prior to implementation of the work. It is our understanding that Ecology may be present to oversee the field sample collection.

Attachments:

Figure 1. Revised Tier 2 Sampling Locations



Legend

▬ ▪ ▬	Site Boundary
GEI-31 ⊕	Tier 1 Soil Boring
GEI-36 ⊗	Tier 2 Soil Boring
SED-1A ⊕	Tier 1 Sediment Sample
SED-2 ◎	Proposed Tier 2 Sediment Sample Location
GEI-1 ⊕	Integrated Planning Grant Soil Boring Location, 2014
MW-10 ●	Monitoring Well
⬭	Composite Sediment Sample Grab Area (SED-1)
------10------	Contour (Feet, NAVD 88)
GEI-45	Proposed Sampling Location Not Completed Due to Refusal
━ · · ━	Approximate Elevation of native geologic Layer based on borings at GEI-38, -39 and -40

Notes:

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

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

N
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50 0 50
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Revised Tier 2 Sampling Locations

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 1

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ATTACHMENT 4

Hydrogeological Investigation

GEOENGINEERS

Memorandum

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Prepared For: Arianne Fernandez – Washington State Department of Ecology

Date: August 1, 2018

Prepared By: GeoEngineers, Inc. on Behalf of Port of Anacortes

GEI File No.: 5147-024-05

Subject: Hydrogeologic Evaluation
Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

INTRODUCTION

This technical memorandum presents the results of hydrogeologic testing completed to evaluate tidal influence, groundwater flow directions and aquifer hydraulic parameters for the Quiet Cove Property (Site) located along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington. The hydrogeologic testing described in this memorandum was completed at the Site in November 2017 and consisted of a tidal study and hydraulic conductivity testing that included slug testing. The tidal study was completed on ten groundwater monitoring wells and slug testing was completed on six groundwater monitoring wells.

Figure 1 identifies the approximate locations used for hydrogeologic testing. The results of the tidal study and hydraulic conductivity testing are presented in the following sections.

TIDAL STUDY

Purpose and Objectives

The purpose of the tidal study was to evaluate the influence of water level fluctuations in Guemes Channel on groundwater conditions at the Site to support development of a hydrogeologic conceptual site model and evaluation of contaminant fate and transport in groundwater. Water level fluctuations in Guemes Channel in the vicinity of the Site were due to tidal fluctuations in Puget Sound during the tidal study.

The tidal study was conducted to achieve the following objectives:

- To identify and analyze the extent of tidal response and evaluate Site groundwater conditions.
- To provide a better understanding of measured groundwater levels, groundwater gradients, and their relative degree of variation under tidal influence at the Site.
- To estimate values for groundwater unit apparent hydraulic diffusivity (T/S) and transmissivity (T). The estimated values were combined with the results of slug testing to estimate average hydraulic conductivity (K) where appropriate.

The objectives were achieved by performing a tidal study using selected monitoring wells as representative indicators of the groundwater response at the Site. Monitoring wells used to evaluate the influence of water level fluctuations in Guemes Channel on groundwater conditions at the Site are shown on Figure 1.

Puget Sound Water Level Fluctuations

Puget Sound experiences daily tides that feature complex double highs and lows of uneven magnitude during each full tidal cycle. This pattern is caused by dominant diurnal and semidiurnal lunar/solar cycles that combine to create what is known as a mixed tide (also called a bichromatic tide). This pattern features a continuously changing pattern of primarily high and low tides, with smaller secondary high and low tides mixed in the cycle through each month. The pattern strongly affects the surface water level of Puget Sound. A portion of the monthly pattern can be seen in the measured tidal data collected for this study from the water-level sensor installed in Guemes Channel. All elevations that were measured are relative to the North American Vertical Datum 1988 (NAVD 88).

Methodology

Aquifers or groundwater units that are hydraulically connected to tidal surface waters typically show a progressively attenuated and delayed tidal response with increasing distance from the shoreline. In order to evaluate tidal-groundwater hydraulic connection at the Site, monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-10, and MW-11 were selected to provide a representative hydrogeologic cross-section. Well construction details and the soil type for the screened intervals for the monitoring locations used for the tidal study are presented in Table 1.

Each of the tidal study wells was equipped with a water level sensor consisting of a piezoelectric pressure transducer and automated data logger (transducer/data logger) programmed to record water pressure (head) above the sensor every minute over a period of three days from November 6 through 9, 2017. In addition, tidal fluctuations in Guemes Channel were also recorded during this time period using a transducer/data logger attached to a pile situated beneath Curtis Wharf (located north of the Site). To correct for changes in barometric pressure during the tidal study, a transducer/data logger was positioned on-site and secured within a well monument box that was allowed to vent to the atmosphere.

Prior to installation, the transducer/data loggers were pre-programmed to record pressure head at every 60 seconds from 12:30 pm on November 6 until 12:30 pm on November 9, 2017 (three days). Programming was performed using a single computer to ensure that each transducer/data logger was time-synced to the same clock. As a check on the transducer/data logger data, and to account for instrument drift, water level was measured in each monitoring well at the beginning and end of the tidal study using a decontaminated electronic water level indicator ("e-tape"). All measurements were made from a surveyed reference mark on the top of each casing. At the conclusion of the study, all transducers/data loggers were removed and returned to GeoEngineers for data processing.

Mean Groundwater Elevations

Mean groundwater elevations for the tidal study were calculated for each monitoring location and the tidal gauge using the Serfes (1991) method, which gives the mean of a subset of 25-point moving averages (Y_j) calculated from 48, 24-point moving averages (X_i). The mean groundwater elevations for the monitoring wells ranged between 10.39 and 6.57 feet NAVD 88. The mean tidal elevation during the tidal study was 3.59 feet

NAVD 88. Based on the results of the tidal study, the average groundwater flow direction at the Site was from the interior of the Site to the northwest toward Guemes Channel (Figure 2).

Hydrographs showing mean groundwater elevations for each location and the mean surface water elevation calculated from the tidal study using the Serfes (1991) method are shown on Figures 3 through 13 over the full period of the tidal study.

Tidal Influence on Groundwater

The groundwater level data collected at each of the tidal study monitoring well locations are presented in elevation relative to the Site survey datum (NAVD 88) and plotted along with the measured surface water elevations in Guemes Channel during the tidal study period for comparison of groundwater elevation and tidal trends. Comparative plots showing hydrographs for each tidal study monitoring well plotted along with the water level in Guemes Channel over the full period of the tidal study are shown on Figures 3 through 13. Three monitoring wells (MW-6, MW-7 and MW-10) were observed to be tidally influenced (Table 2; Figures 9, 10 and 12). The remaining monitoring wells exhibited little to no response to tidal changes as shown in Figures 4 through 8, 11, and 13.

As shown in these figures, the transducer monitoring tidal changes during the tidal study (shown in blue) recorded apparently anomalous fluctuations at times during the study that may be the result of equipment malfunction. To check the accuracy of the tidal transducer data, the predicted tidal fluctuations for Anacortes (NOAA Station 9448794, Anacortes, Fidalgo Island) were plotted in Figures 3 through 12 (shown in green) along with the tidal fluctuations recorded during the tidal study. Predicted tidal elevations for NOAA Station 9448794 were converted from Mean Lower Low Water (MLLW) to NAVD 88 or direct comparison to measured tidal elevations at the Site using the Port of Anacortes conversion factor (NAVD 88=MLLW-0.66 feet) published by the Port of Anacortes by WHPacific. A review of the predicted versus recorded tidal elevations (Figure 3) indicate the tidal elevations recorded at the Site during the tidal study are generally close to the predicted tides for Anacortes and therefore are considered appropriate for use in the tidal match analysis.

For each tidal study monitoring well, the time lag and stage ratio were evaluated. The time lag represents the time for propagation of the tidal effect through the groundwater unit from Guemus Channel to the monitoring well while the stage ratio represents the relative degree of groundwater level change resulting from tidal changes in Guemus Channel. Stage ratio and lag time were determined using the following procedures:

- **Time Lag** was determined by shifting the Date/Time scale (x-axis) of the groundwater record backwards relative to the tidal record from Guemes Channel until the respective peaks and troughs matched. The value of time (in hours and minutes) indicated on the secondary axis represents the time lag or phase shift.
- **Stage Ratio** was determined by expanding and shifting the elevation scale (y-axis) of the groundwater plot relative to the tidal plot from Guemes Channel, until the respective amplitudes matched. The value of stage ratio is calculated as the ratio of secondary axis length (in feet), divided by the primary axis length (20 feet) and expressed as a percentage.

The time lag and stage ratio for each tidal study monitoring well was determined over a period of two full tidal cycles (Figures 14 through 23). The observed tidal effects on monitoring locations used for the tidal study are presented in Table 2. Tidal study data for the monitoring wells indicating the most tidal influence are summarized in the table below and are organized by shortest to longest time lag in hours.

Monitoring Well	Distance from Shoreline (ft)	Mean Groundwater Elevation (ft NAVD 88)	Time Lag (hours)	Stage Ratio (%)
MW-10	300	10.39	1.9	5.00
MW-6	380	10.37	2.4	8.75
MW-7	240	6.57	2.4	4.3

Notes:
Ft = feet
NAVD 88 = North American Vertical Datum 1988
% = percent

HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity testing that included slug testing was performed on selected monitoring locations at the Site on November 16, 2017. The purpose of the slug testing was to use the data, in combination with data gathered during the tidal study, to estimate hydraulic conductivity (*K*) within the aquifer in the vicinity of the test locations. Slug testing was performed at monitoring well locations MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11. Field procedures, as well as the procedure for data analysis from the slug testing are described below. The locations selected for slug testing are shown on Figure 2. Plots of the slug test results are presented on Figures 24 through 29.

Field Procedures

Each slug test was performed in two stages; a falling head stage followed by a rising head stage. At each location two replicates (i.e., two falling head and two rising head tests) were performed. For each test, the water level in the monitoring location was measured and recorded at 0.25-second intervals using a decontaminated, submerged water-level sensor consisting of a piezoelectric pressure transducer and automated datalogger (transducer/datalogger) programmed to record water pressure (head) above the sensor. The water level was also measured using a decontaminated electronic water level indicator (“e-tape”) as a check on the transducer/data logger.

Prior to slug testing, the pre-test static water level was measured in each well from a surveyed reference mark on top of the well casing. For the falling head stage, a slug (weighted 5-foot length of sealed PVC casing) of known volume was rapidly lowered into the well, causing displacement of the water, which rose rapidly above its initial water level. The water level in the well was then monitored until it returned (fell) to the approximate pre-test water level. For the rising-head stage, the slug was rapidly removed from the well, causing the water level to drop below its pre-test static water level, and the water level in the well was monitored until it returned (rose) to the approximate pre-test static water level.

Data Analysis

The data from all slug tests were downloaded from the transducer/datalogger, processed using spreadsheet software, and then plotted to identify the type of hydraulic response. Data from all wells that were slug tested were analyzed using the method of Bouwer and Rice (1976).

Both the falling head stage and rising-head stage data can be used only in wells where the screened interval is under the water table during all portions of the test. In wells where the screened interval extends above the water table, only the rising-head stage data is used, because some of water displaced during the falling head stage portion of the test is dispersed into the unsaturated zone above the water table. The screen interval extended above the water table in all monitoring wells that were slug tested, so only the rising head data were analyzed. The results of slug test analysis and the type of analysis are presented in Table 3.

The wells generally exhibited an over-damped response typical of moderately permeable formations. Inspection of the rising head response shows an early period of rapid head change during some tests, which was interpreted as drainage of the filter pack into the well during the first few seconds of each rising head slug test. A volumetric analysis using the method of Binkhorst & Robbins (1998) confirmed that rapid drainage of the filter pack would explain this portion of the data, with a calculated specific yield or drainable porosity for the filter pack material of around 20 percent (±4 percent). This second phase in each rising head test following drainage of the filter pack during the first few seconds of each test was interpreted to represent inflow to the well from the surrounding aquifer formation and was selected for analysis to provide an estimate of the hydraulic conductivity.

ESTIMATION OF HYDRAULIC PARAMETERS

The time lag and stage ratio data from the tidal study were analyzed to estimate diffusivity (T/S) of the aquifer. A method originally developed by Ferris (1951) was used to estimate the diffusivity of the shallow and deep groundwater units whereby time lag and stage ratio is plotted against the horizontal distance between the monitoring location and the shoreline. The calculations are predicated on the validity of the Ferris (1951) method and the presumed dominance of the diurnal tidal effect, with a period of just under 24 hours, representing the main lunar-solar diurnal tide component in Guemes Channel.

Diffusivity

The diffusivity (T/S) for the aquifer could not be estimated using time lag data and stage ratio data because the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline, resulting in a poor fit for the diffusivity analysis. The three monitoring wells that were observed to be tidally-influenced during the tidal study (MW-6, MW-7 and MW-10) were located between 80 and 380 feet from the shoreline, which is further from the shoreline than the other monitoring wells used for the tidal study, with the exception of MW-7. The remaining monitoring wells, including monitoring wells MW-1, MW-2, and MW-3, located between 35 and 80 feet from the shoreline, were not tidally-influenced. These results suggest heterogeneity in the materials comprising the Site aquifer, the presence of buried structures (i.e., historical foundations and/or bulkheads) and/or preferential flow pathways through backfill material surrounding utilities present in portions of O Avenue and 3rd Street.

Because the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline, the diffusivity could not be calculated, therefore the results of slug testing were used instead to estimate hydraulic parameters for the aquifer.

Hydraulic Conductivity

The hydraulic conductivity for the aquifer was estimated using the results of slug testing in six monitoring wells (MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11). As stated above, diffusivity could not be used to estimate the hydraulic parameters due to the unproportional timing and degree of the observed tidal influence. Based on the slug test results, hydraulic conductivity for the aquifer ranges between 0.02 and 4.11 feet/day with a mean value of 1.25 feet/day. Slug test results and calculated hydraulic conductivities for each monitoring well are shown on Figures 24 through 29.

Groundwater Flow Direction and Gradient

The groundwater flow direction and gradient during the tidal study was determined using the mean groundwater elevations. The mean groundwater flow direction based on the results of the tidal study is generally to the north and northwest toward Guemes Channel (Figure 2). Mean hydraulic gradient was calculated using two monitoring well pairs (MW-10/MW-2 and MW-5/MW-4). The calculated groundwater gradients for the selected well pairs are presented in Table 4. In the western portion of the Site, the calculated hydraulic gradient is 0.013 feet per foot (ft/ft) between monitoring wells MW-10 and MW-2. In the eastern portion of the Site, the calculated hydraulic gradient is 0.023 ft/ft between monitoring wells MW-5 and MW-4.

Groundwater Velocity

The average linear groundwater velocity between monitoring wells MW-10 and MW-2 is 0.07 feet per day (ft/day) with a flow direction to the northwest. The average linear groundwater velocity between monitoring locations MW-5 and MW-4 is 0.09 ft/day with a groundwater flow direction toward the north.

REFERENCES

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Butler, Jr. J.J., and Garnett, E.J., 2000. Simple procedures for analysis of slug tests in formations of high hydraulic conductivity using spreadsheet and scientific graphics software. Kansas Geological Survey Open-File Rept. 2000-40.

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Serfes, M.E. (1991). Determining the Mean Hydraulic Gradient of Groundwater affected by Tidal Fluctuations. Ground Water 29 (4): 549-555.

Van Der Kamp, G., 1976. Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case. Water Resources Research 12, No. 1:71-77.

LIMITATIONS

We have prepared this technical memorandum for use exclusive use of the Port of Anacortes, their authorized agents and regulatory agencies for the Quiet Cove Property located at 202 O Avenue in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

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

Attachments:
Table 1. Test Well Construction Details
Table 2. Observed Tidal Effect on Test Wells
Table 3. Slug Test Results
Table 4. Average Linear Groundwater Velocities Between Selected Wells
Figure 1. Hydrogeologic Investigation Locations
Figure 2. Mean Groundwater and Tidal Elevations, 72-Hour Tidal Study
Figures 3 through 13. Serfes Tidal Analysis
Figures 14 through 23. Ferris Tidal Analysis
Figures 24 through 29. Aquifer Slug Test

Table 1

Test Well Construction Details

Quiet Cove Property

Anacortes, Washington

Monitoring Well Identification	Well Screen Depth (feet bgs)		Top of Casing Elevation (feet NAVD 88)	Well Screen Elevation (feet NAVD 88)		Soil Type Across Screened Interval	Hydrogeologic Evaluation Performed
	Top	Bottom		Top	Bottom		
MW-1	3.7	11.7	12.27	8.57	0.57	Sand, silty sand and gravel	Tidal Study
MW-2	3.7	13.7	11.93	8.23	-1.77	Silty sand	Tidal Study, Slug Test
MW-3	3.7	15.7	12.97	9.27	-2.73	Sand and gravel	Tidal Study, Slug Test
MW-4	3.7	14.7	12.43	8.73	-2.27	Silty sand and peat	Tidal Study, Slug Test
MW-5	3.7	11.7	14.74	11.04	3.04	Silty sand	Tidal Study
MW-6	5	15	15.96	10.96	0.96	Sand with silt and peat	Tidal Study, Slug Test
MW-7	5	10	13.10	8.10	3.10	Sand, gravel and silty sand	Tidal Study, Slug Test
MW-8	3	13	13.58	10.58	0.58	Sand and silty sand	Tidal Study
MW-10	5	15	14.50	9.50	-0.50	Silt and silty sand	Tidal Study
MW-11	5	15	12.69	7.69	-2.31	Sand with silt and peat	Tidal Study, Slug Test

Notes:

bgs = below ground surface

NAVD 88 = North American Vertical Datum 1988

Table 2

Observed Tidal Effect on Test Wells

Quiet Cove Property

Anacortes, Washington

Monitoring Well Identification	Approximate Distance from Shoreline[1] (feet)	Tidal Study Results[2]		
		Mean Groundwater Elevation (feet NAVD 88)	Time Lag (hours)	Stage Ratio (percent)
MW-1	35	8.06	Indeterminate[3]	<3
MW-2	40	7.04	Indeterminate[3]	<3
MW-3	45	6.77	Indeterminate[3]	<3
MW-4	190	7.25	Indeterminate[3]	<3
MW-5	260	10.27	Indeterminate[3]	<3
MW-6	380	10.37	2.4	8.8
MW-7	240	6.57	2.4	4.3
MW-8	80	8.52	Indeterminate[3]	<3
MW-10	300	10.39	1.9	5.0
MW-11	160	9.36	Indeterminate[3]	<3

Notes:

[1] Distance is from the well to the nearest shoreline area.

[2] The tidal study was performed November 6 through 9, 2017.

[3] Tidal effects below the threshold of significance for the Ferris analytical method.

NAVD 88 = North American Vertical Datum 1988

Table 3

Slug Test Results[1]

Quiet Cove Property
Anacortes, Washington

Monitoring Well Identification	Type of Slug Test[2]	Estimated Hydraulic Conductivity[3] (K)	
		feet/day	centimeters/second
MW-2	Rising Head 1	0.58	2.0E-04
	Rising Head 2	0.47	1.7E-04
	Geometric Mean	**0.52**	**1.8E-04**
MW-3	Rising Head 1	3.99	1.4E-03
	Rising Head 2	4.24	1.5E-03
	Geometric Mean	**4.11**	**1.5E-03**
MW-4	Rising Head 1	0.75	2.6E-04
	Rising Head 2	0.76	2.7E-04
	Geometric Mean	**0.75**	**2.7E-04**
MW-6	Falling Head 1	0.02	7.1E-06
	Falling Head 2	0.03	1.1E-05
	Geometric Mean	**0.02**	**8.6E-06**
MW-7	Rising Head 1	1.67	5.9E-04
	Rising Head 2	1.49	5.3E-04
	Geometric Mean	**1.58**	**5.6E-04**
MW-11	Rising Head 1	0.54	1.9E-04
	Rising Head 2	0.58	2.0E-04
	Geometric Mean	**0.56**	**2.0E-04**

Notes:

[1] Slug tests were performed November 16, 2017.

[2] Two replicates were performed for the slug tests conducted in each well. Slug test results are calculated from rising head tests due to the water table occurring within the screened interval in all wells. The geometric mean calculated from the results for the two replicates is used to characterize the hydraulic conductivity for each well that was tested.

[3] Hydraulic conductivities were calculated for slug tests using Bouwer and Rice (1976).

Table 4

Average Linear Groundwater Velocities Between Selected Wells

Quiet Cove Property

Anacortes, Washington

Well Pair Used for Velocity Calculation				Representative Area	General Soil Type[1]	Effective Porosity by Soil Type[2] (n_e)	Hydraulic Conductivity[3] (K)	Groundwater Gradient[4] (i)	Average Linear Groundwater Velocity[5,6] (feet/day)
Upgradient Well	Well 1 Groundwater Elevation (ft NAVD 88)	Downgradient Well	Well 2 Groundwater Elevation (ft NAVD 88)					Tidal Study[7]	Tidal Study[7]
MW-10	10.39	MW-2	7.04	Western Portion of Site	Silt and fine silty sand	0.10	0.52	0.0130	0.07
MW-5	10.27	MW-4	7.25	Eastern Portion of Site	Fine to medium silty sand	0.20	0.75	0.0230	0.09

Notes:

[1] Soil type based on visual classification during well installation.

[2] Average effective porosity (n_e) values by soil type from Argonne National Laboratory Environmental Science Division website, U.S. Department of Energy.

[3] Presents average hydraulic conductivity for the well pair.

[4] Hydraulic gradients (i) are calculated from mean groundwater elevations observed during the tidal study between the two wells noted.

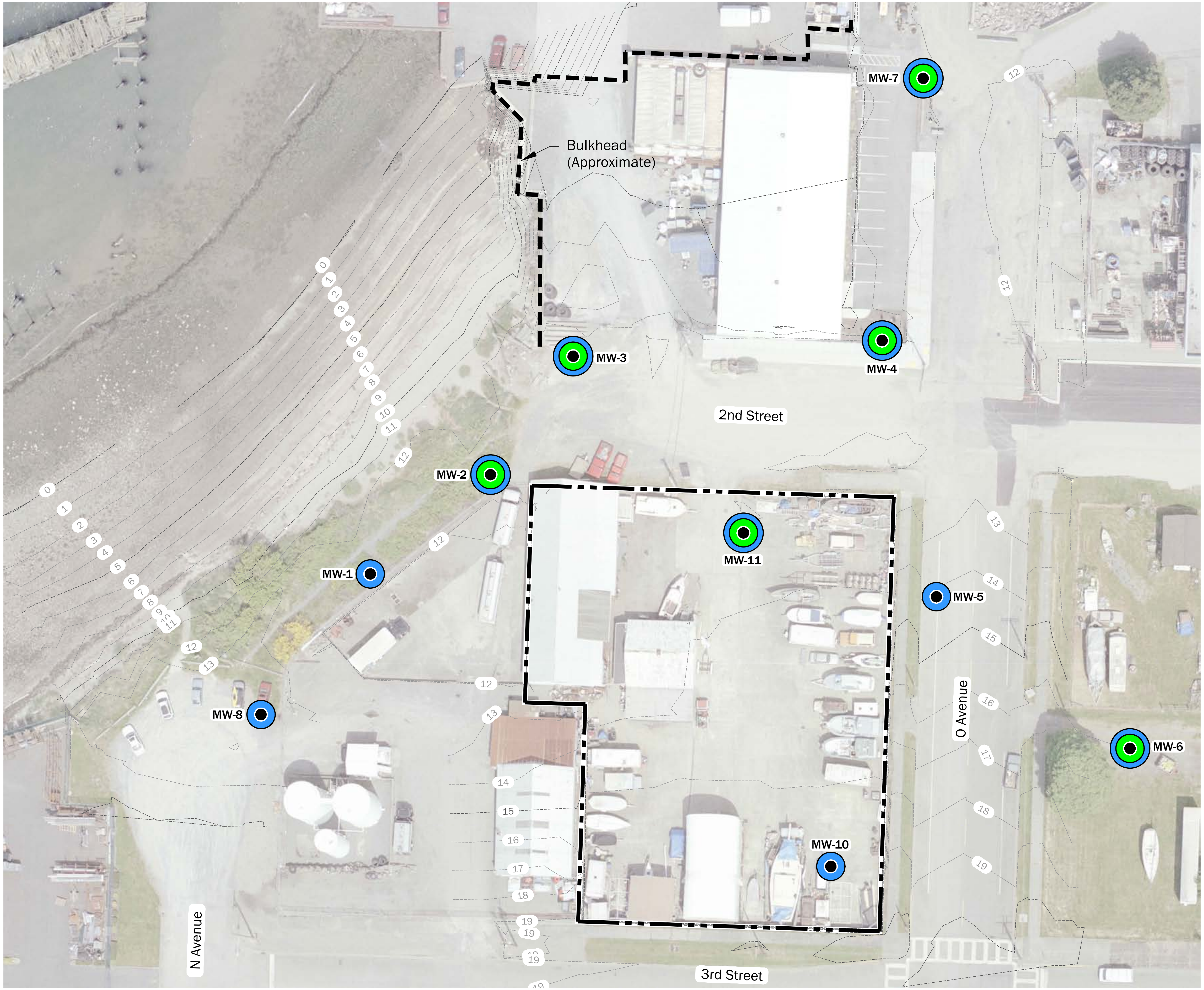
[5] Horizontal groundwater velocity calculation: $v = K/n_e * i$.

[6] Groundwater velocities are based on literature values for effective porosity by soil type and hydraulic gradients are calculated from a limited set of data points. Groundwater velocities should therefore be considered estimates.

[7] The 72-hour tidal study was performed November 6 through 9, 2017.

NAVD 88 = North American Vertical Datum 1988

ft = feet



Legend

— · — ·	Site Boundary
MW-10 ●	Monitoring Well
------10------	Contour (Feet, NAVD 88)
🟢	Slug Test Location
🔵	72-Hour Tidal Study Location

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

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

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50 0 50
Feet

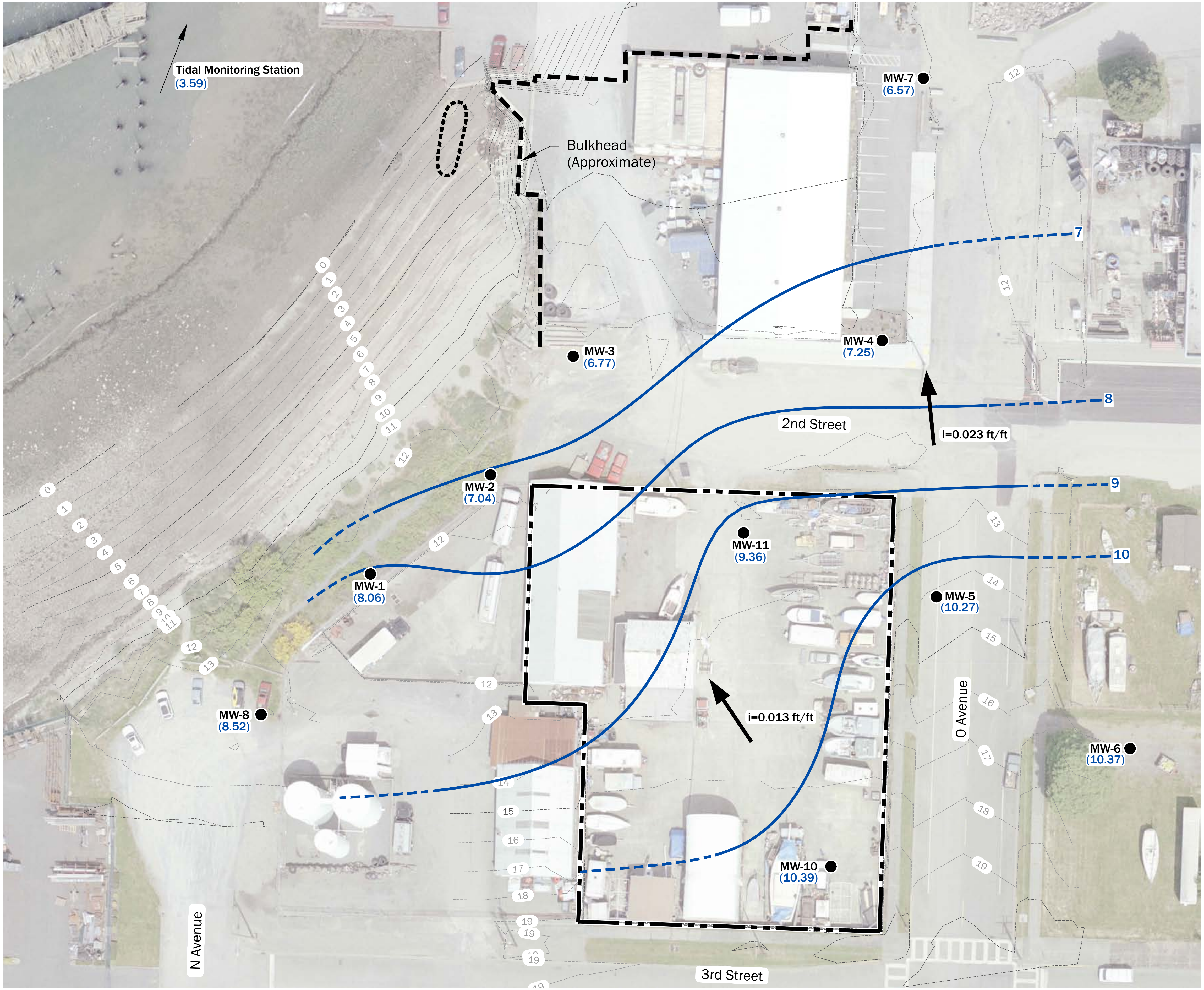
Hydrogeologic Investigation Locations

Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 1

P:\5\5147024\CAD\05\Hydrogeological Testing Memo\514702405_F01_Hydrogeologic Investigation Locations.dwg TAB:F01 Date Exported: 12/11/17 - 12:54 by hmara



Legend

- Site Boundary
- **MW-10** (10.39) ● Monitoring Well and Mean Groundwater Elevation, 72-Hour Tidal Study
- Composite Sediment Sample Grab Area (SED-1)
- 10 Ground Surface Elevation Contour (Feet, NAVD 88)
- Groundwater Elevation Contour, Mean Elevations 72-Hour Tidal Study. Dashed Where Inferred.
- i = Inferred groundwater flow direction and groundwater gradient in feet per foot calculated between monitoring wells MW-10 and MW-2, and between monitoring wells MW-5 and MW-4

Notes:

1. 72-hour tidal study conducted between 12:30 November 6 and 12:30 November 9, 2017.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Mean Groundwater and Tidal Elevations,
72-Hour Tidal Study

Quiet Cove Property
Anacortes, Washington

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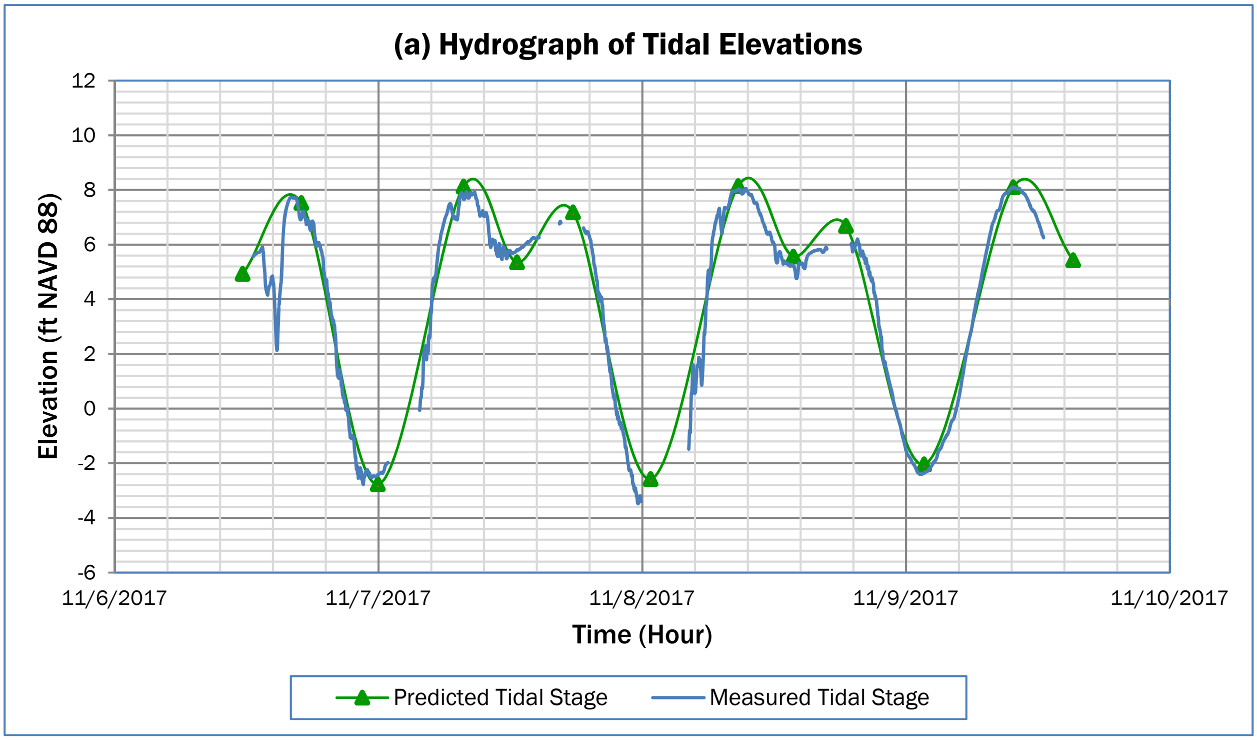
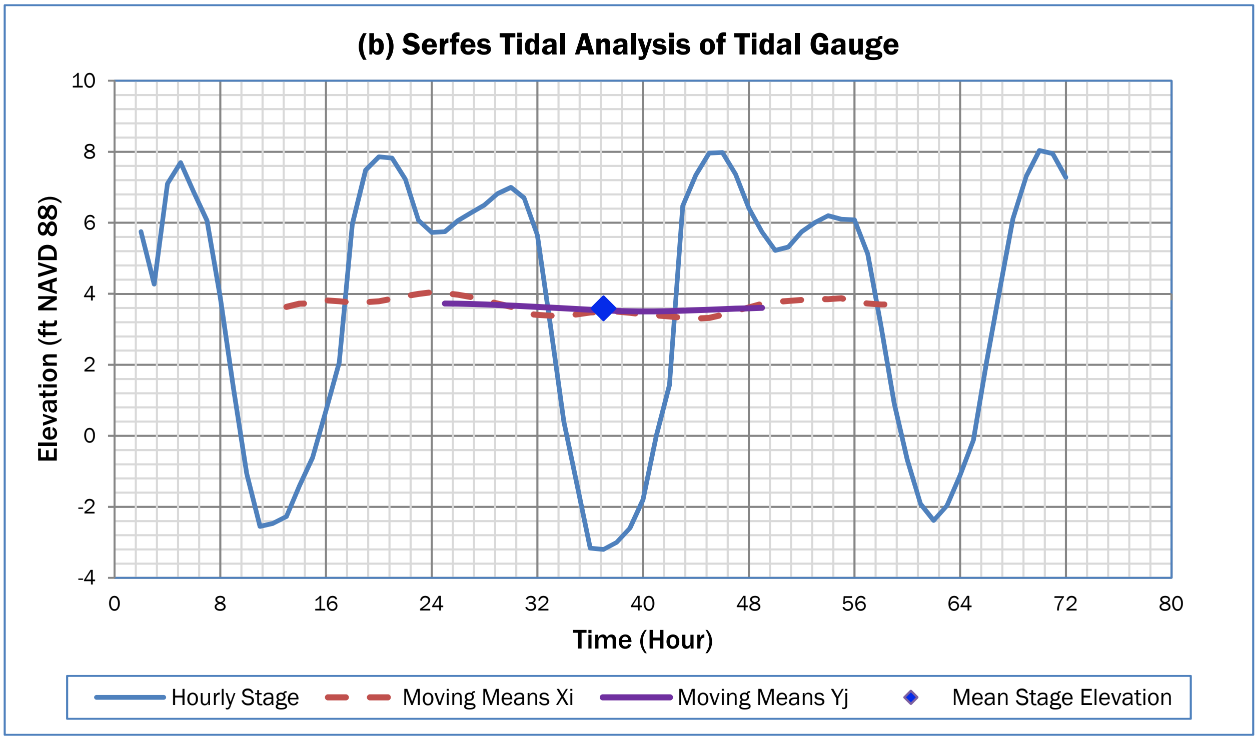
Figure 2

P:\5\5147024\CAD\05\Hydrogeological Testing Memo\514702405_F02_Mean GW and Tidal Elevations.dwg TAB:F02 Date Exported: 12/11/17 - 12:55 by hmara



(a) Hydrograph of Tidal Elevations



(b) Serfes Tidal Analysis of Tidal Gauge

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at Tidal Gauge

Quiet Cove Property
Anacortes, Washington

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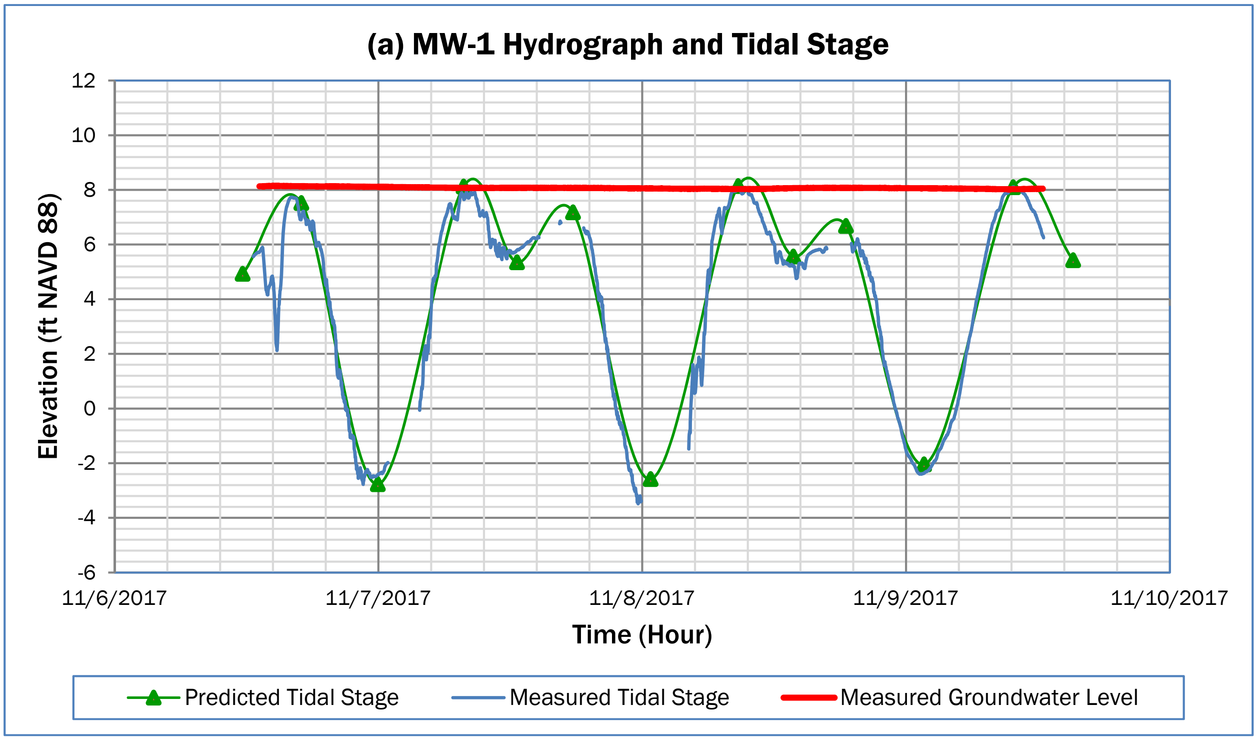
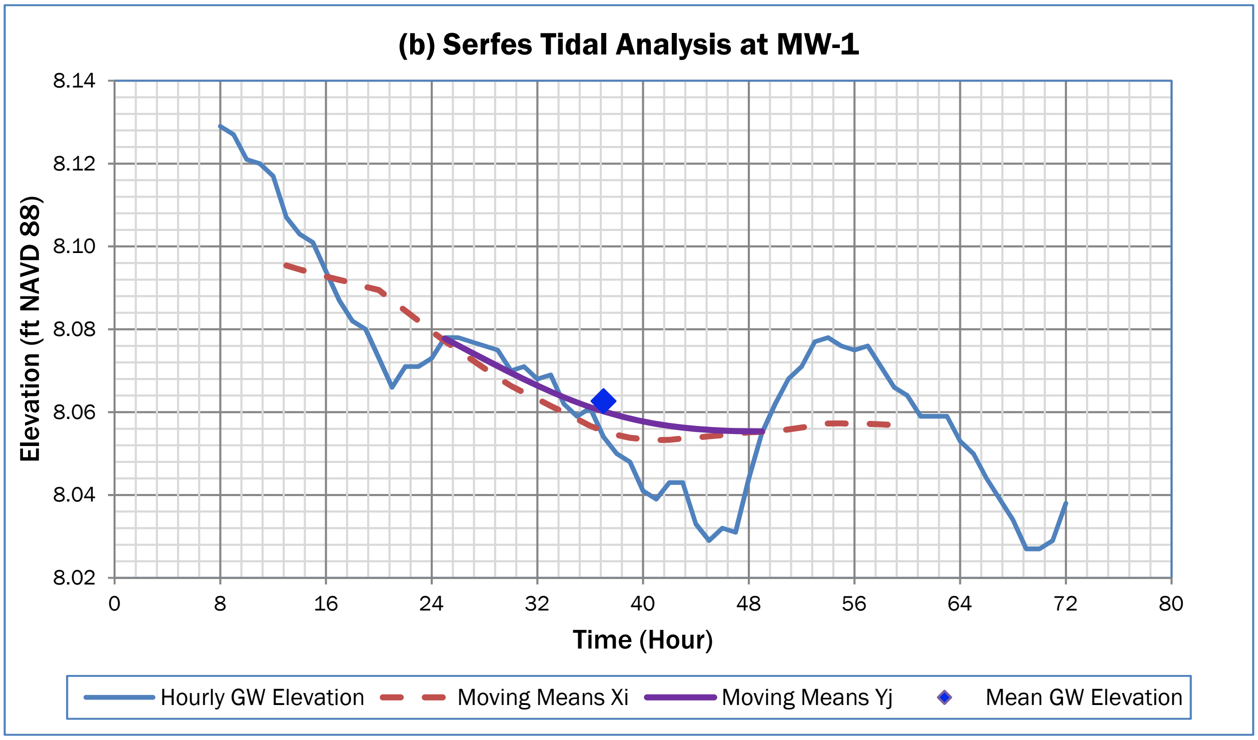
Figure 3

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18


(a) MW-1 Hydrograph and Tidal Stage


(b) Serfes Tidal Analysis at MW-1

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-1

Quiet Cove Property
Anacortes, Washington

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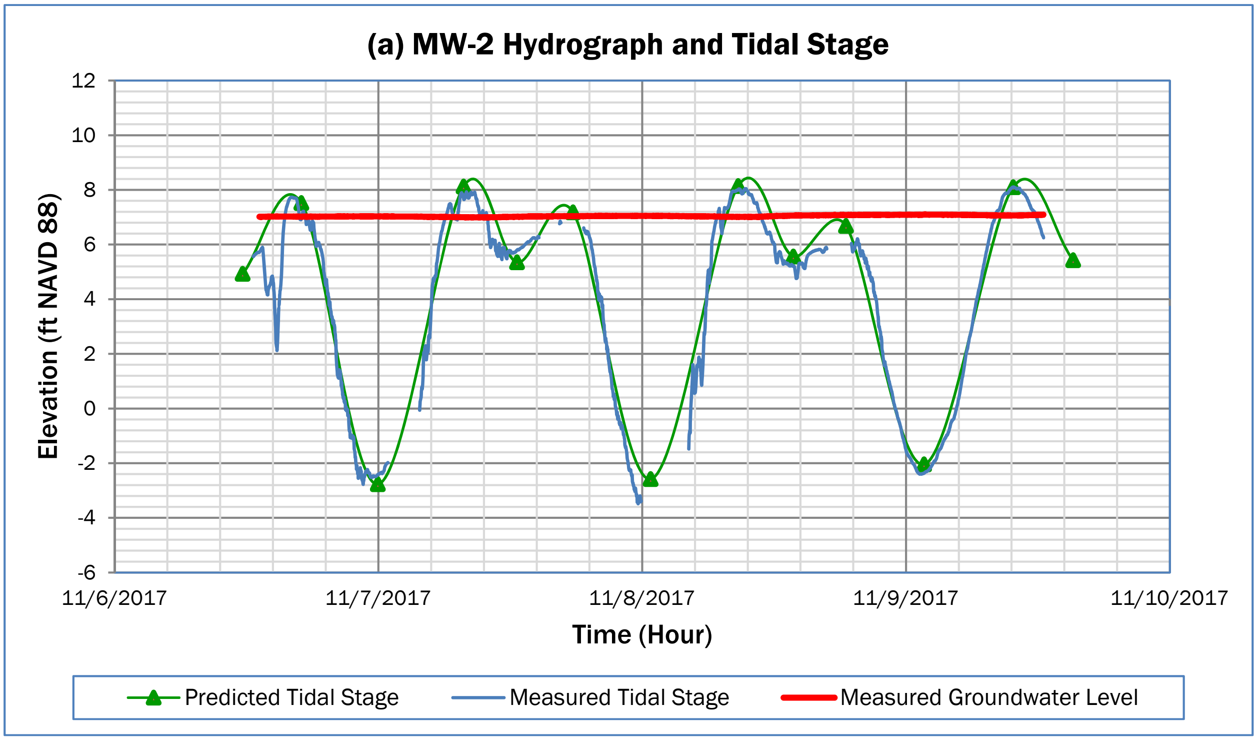
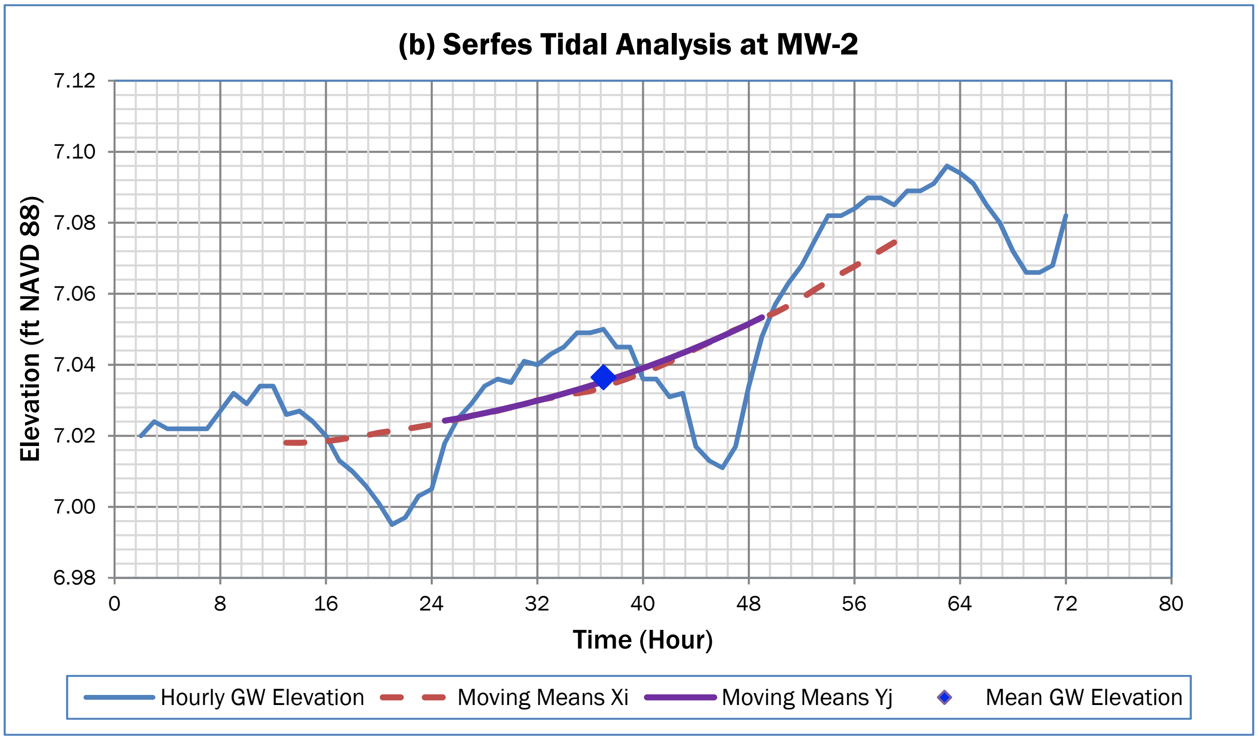
Figure 4

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18


(a) MW-2 Hydrograph and Tidal Stage


(b) Serfes Tidal Analysis at MW-2

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-2

Quiet Cove Property
Anacortes, Washington

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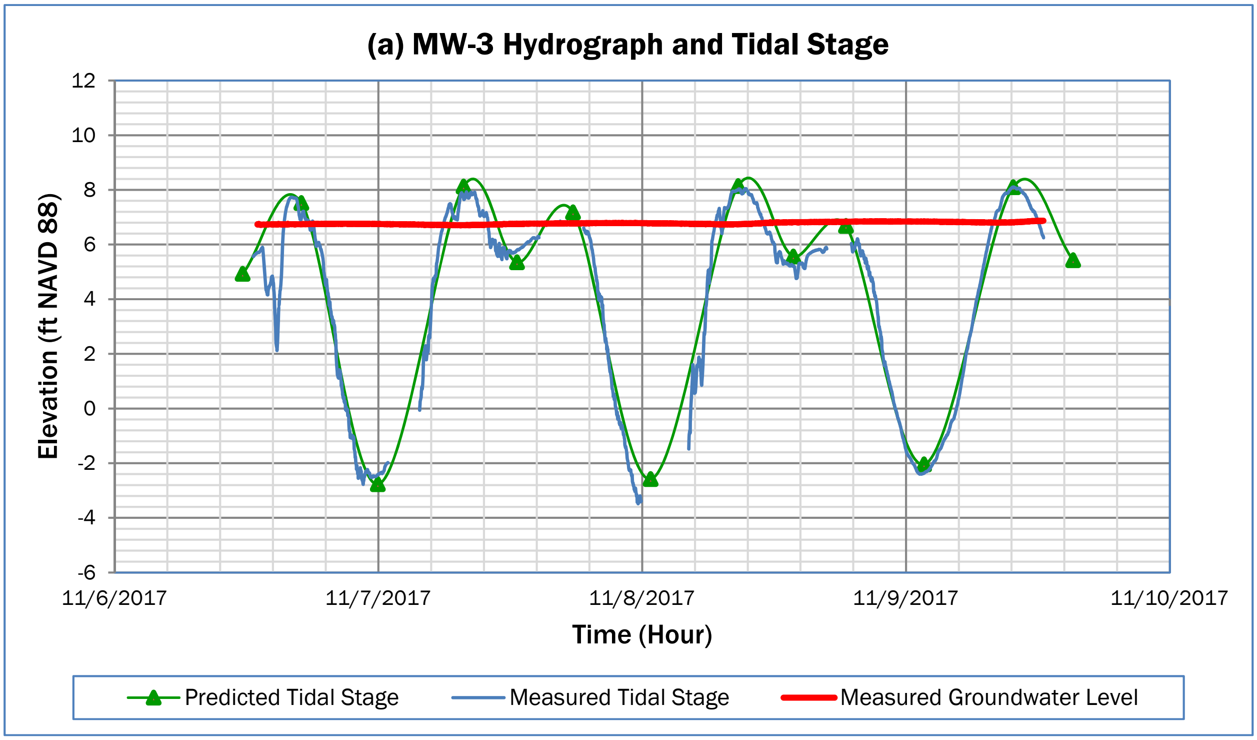
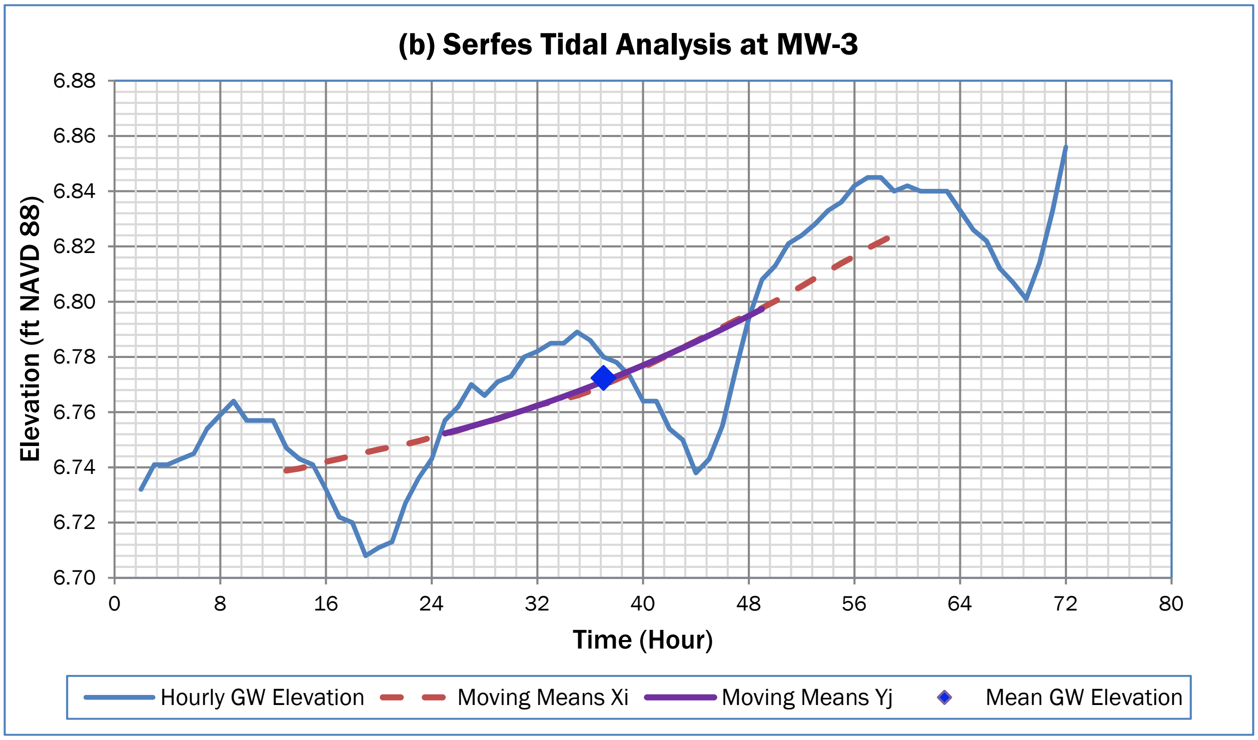
Figure 5

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18



(a) MW-3 Hydrograph and Tidal Stage



(b) Serfes Tidal Analysis at MW-3

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-3

Quiet Cove Property
Anacortes, Washington

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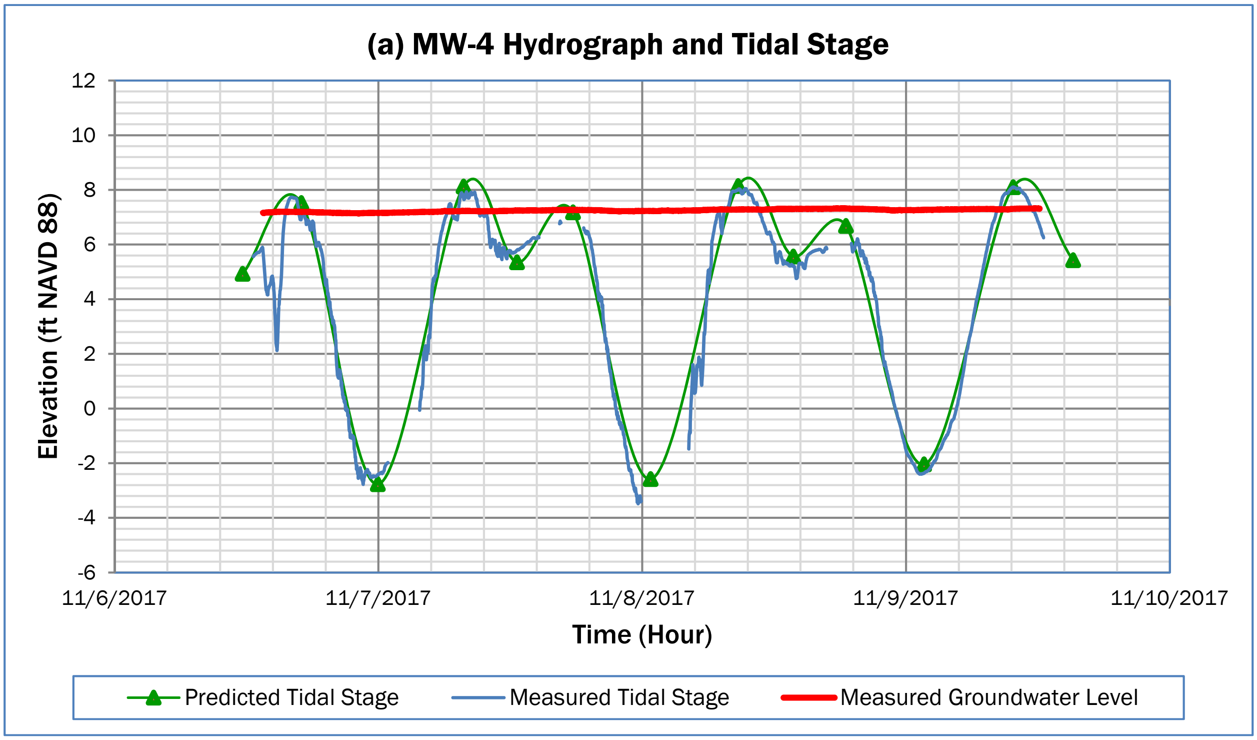
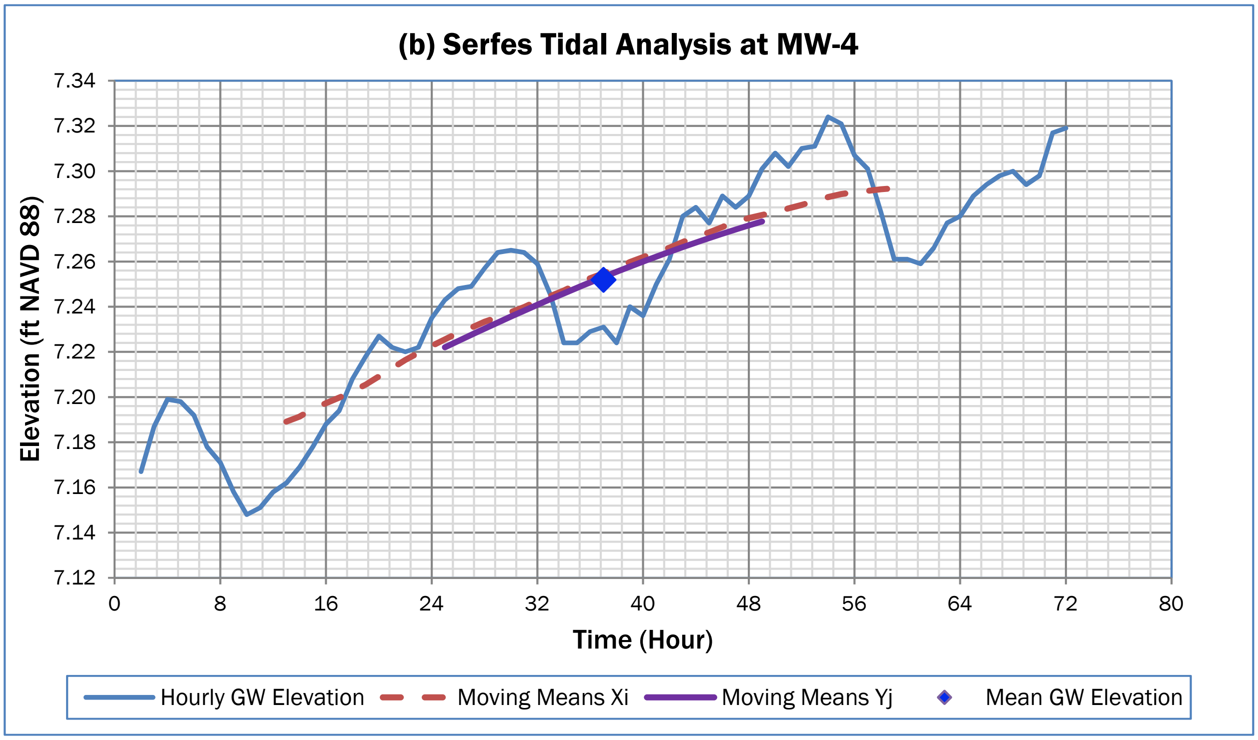
Figure 6

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18



(a) MW-4 Hydrograph and Tidal Stage



(b) Serfes Tidal Analysis at MW-4

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-4

Quiet Cove Property
Anacortes, Washington

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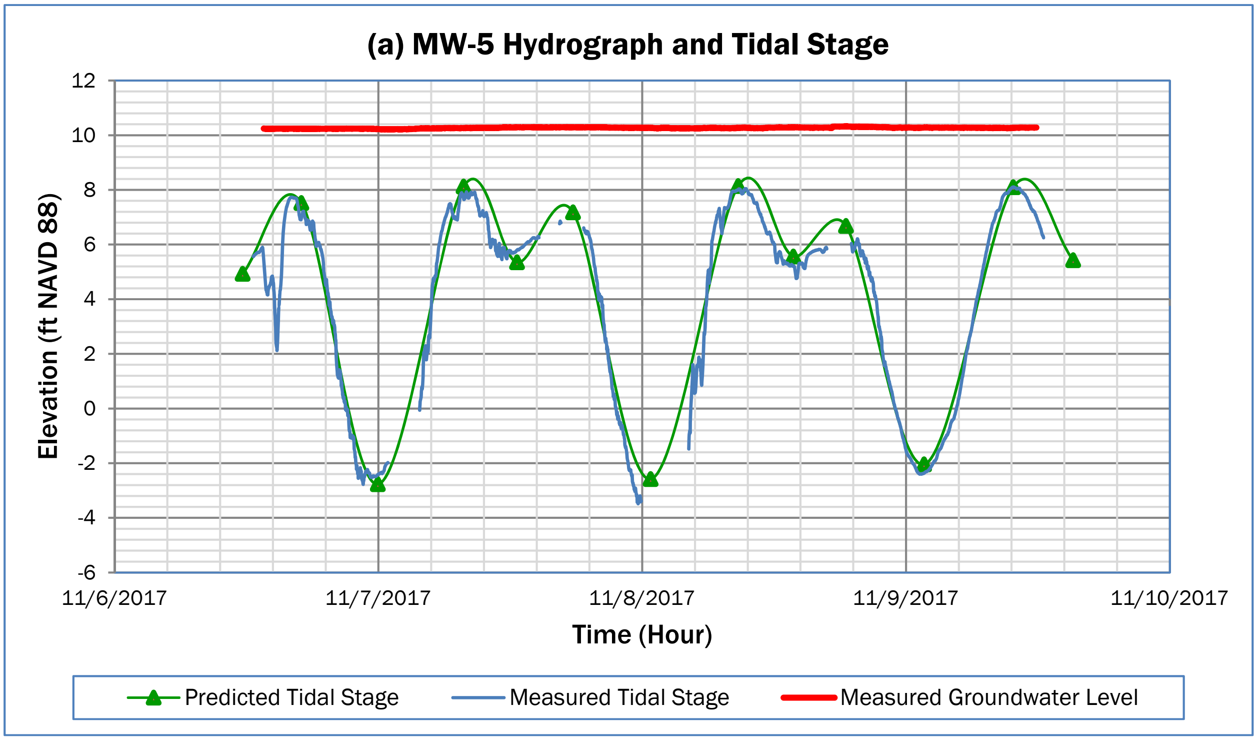
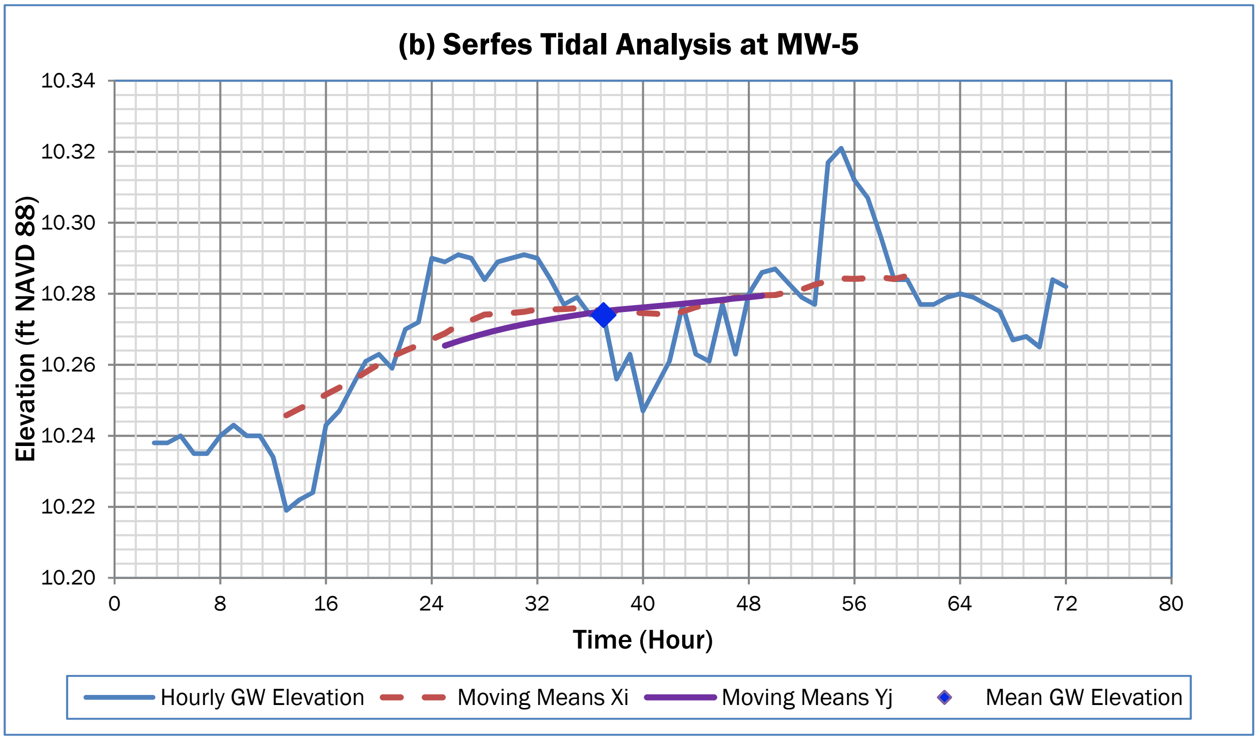
Figure 7

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18



(a) MW-5 Hydrograph and Tidal Stage



(b) Serfes Tidal Analysis at MW-5

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-5

Quiet Cove Property
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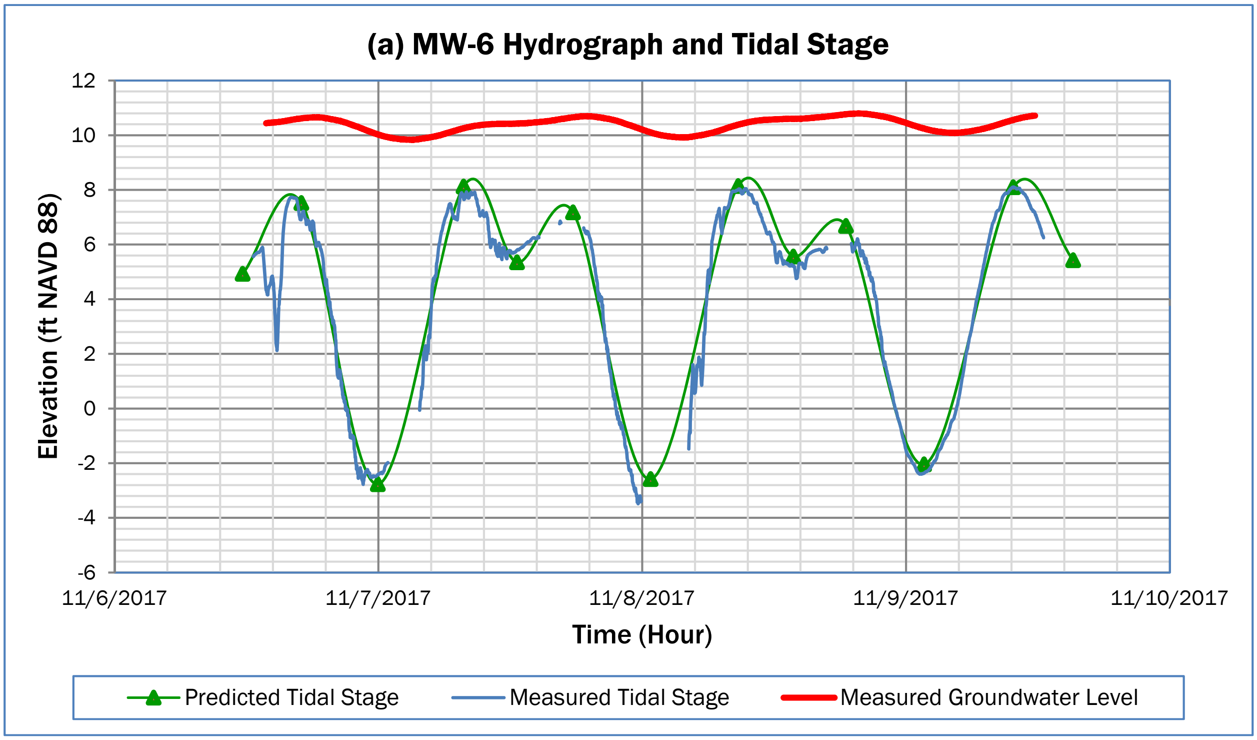
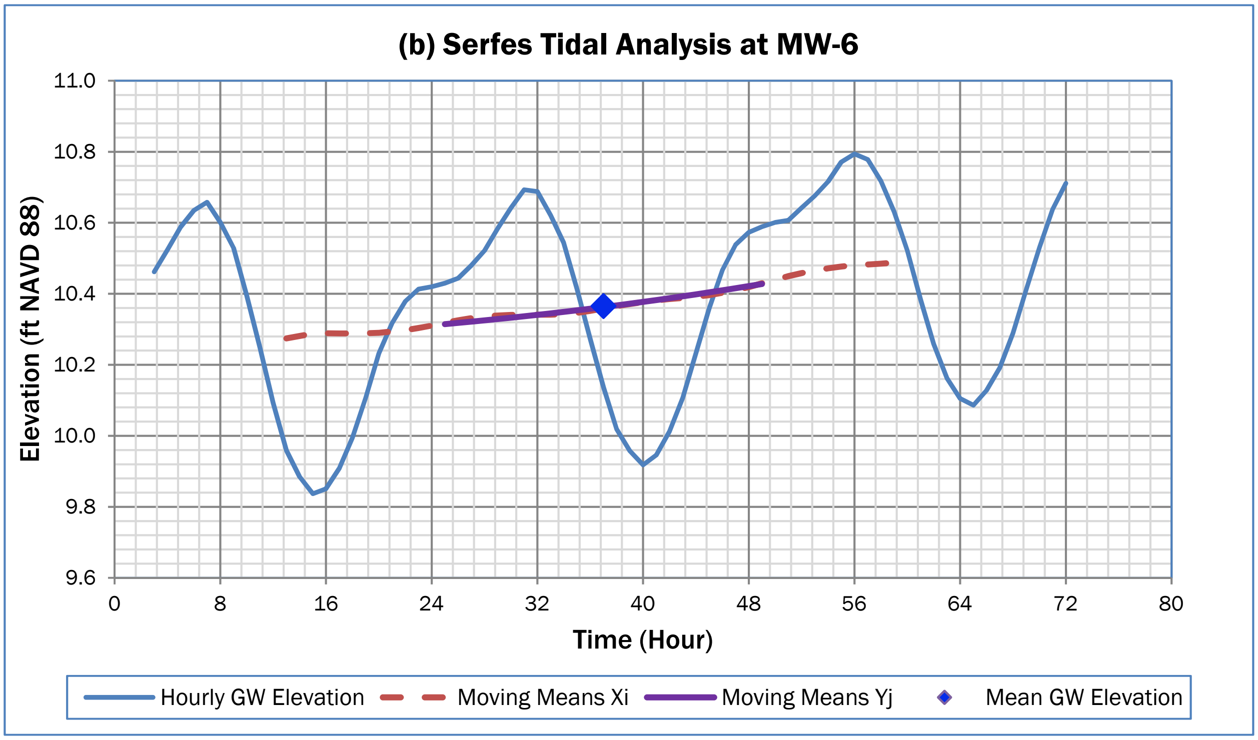
Figure 8

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18





Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-6

Quiet Cove Property
Anacortes, Washington

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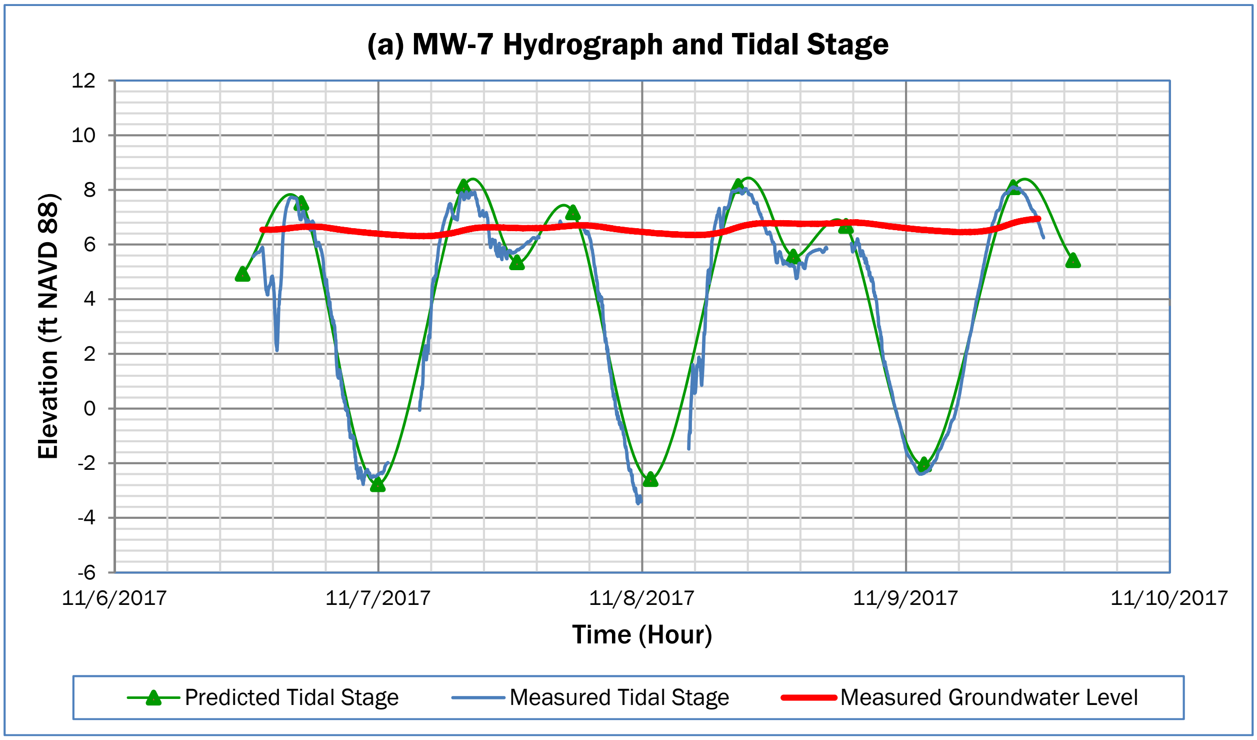
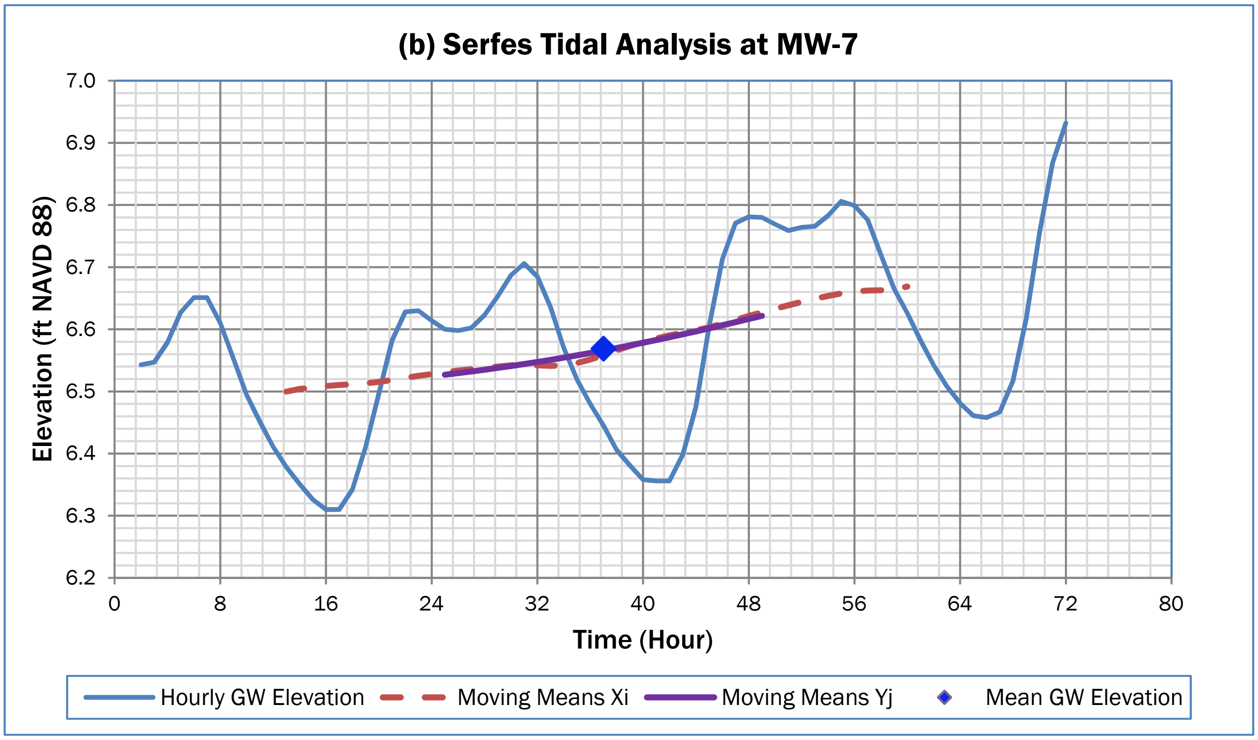
Figure 9

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18


(a) MW-7 Hydrograph and Tidal Stage


(b) Serfes Tidal Analysis at MW-7

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-7

Quiet Cove Property
Anacortes, Washington

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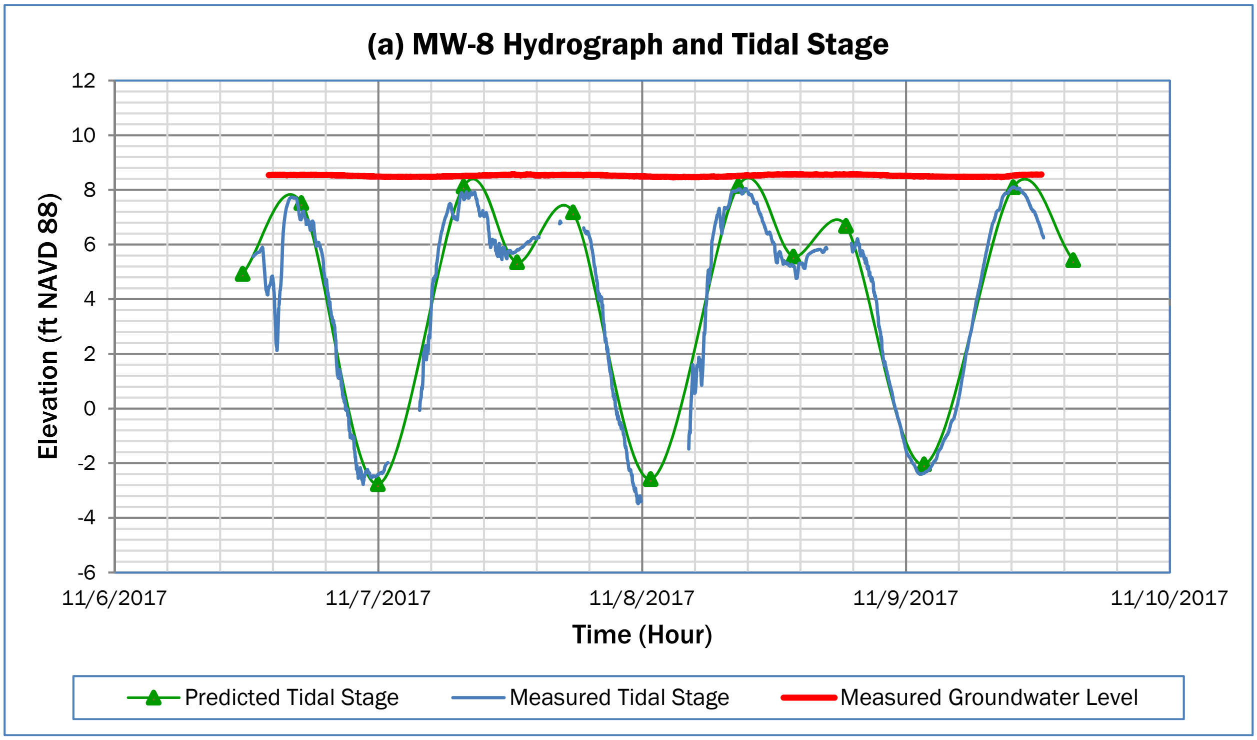
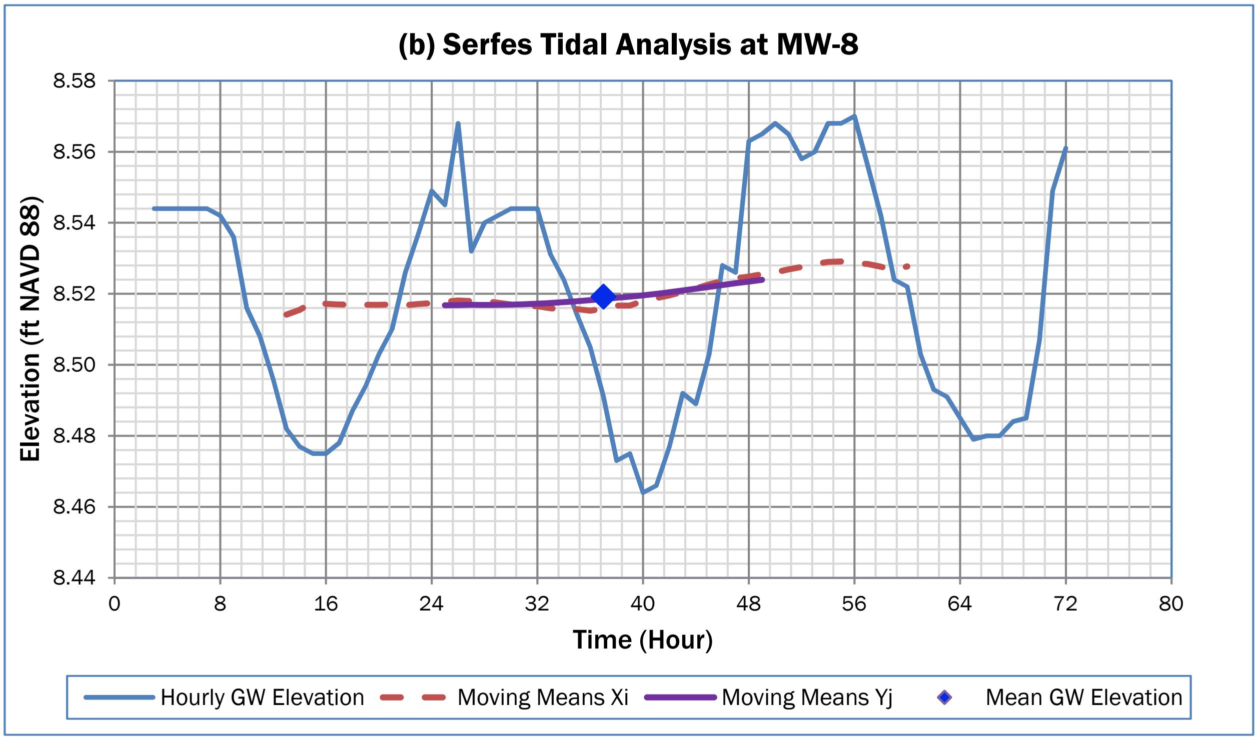
Figure 10

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18





Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-8

Quiet Cove Property
Anacortes, Washington

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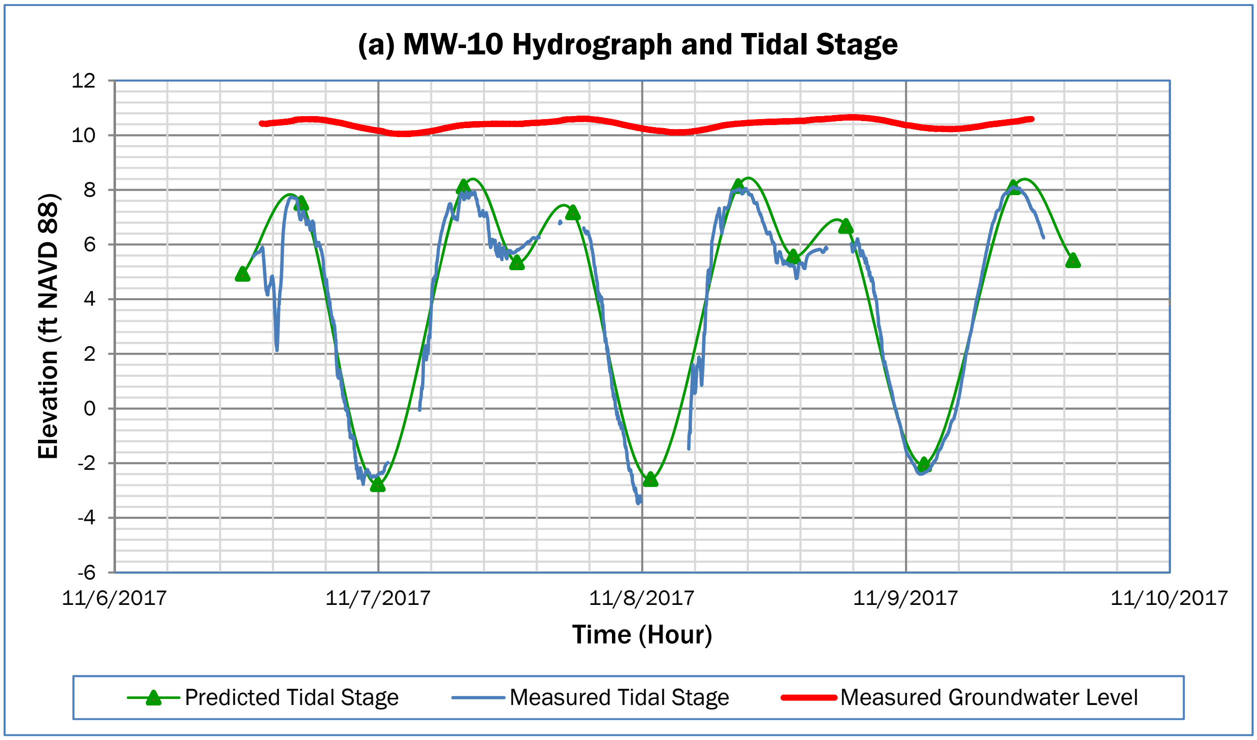
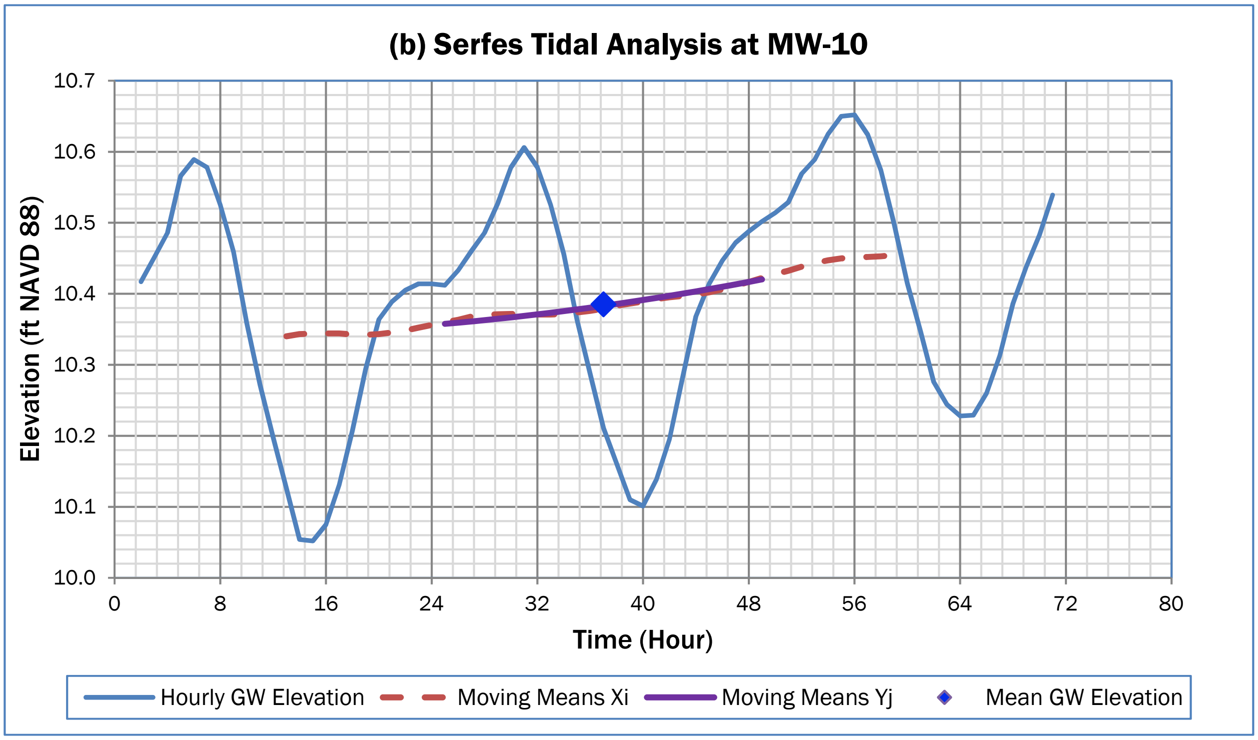
Figure 11

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18


(a) MW-10 Hydrograph and Tidal Stage


(b) Serfes Tidal Analysis at MW-10

Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-10

Quiet Cove Property
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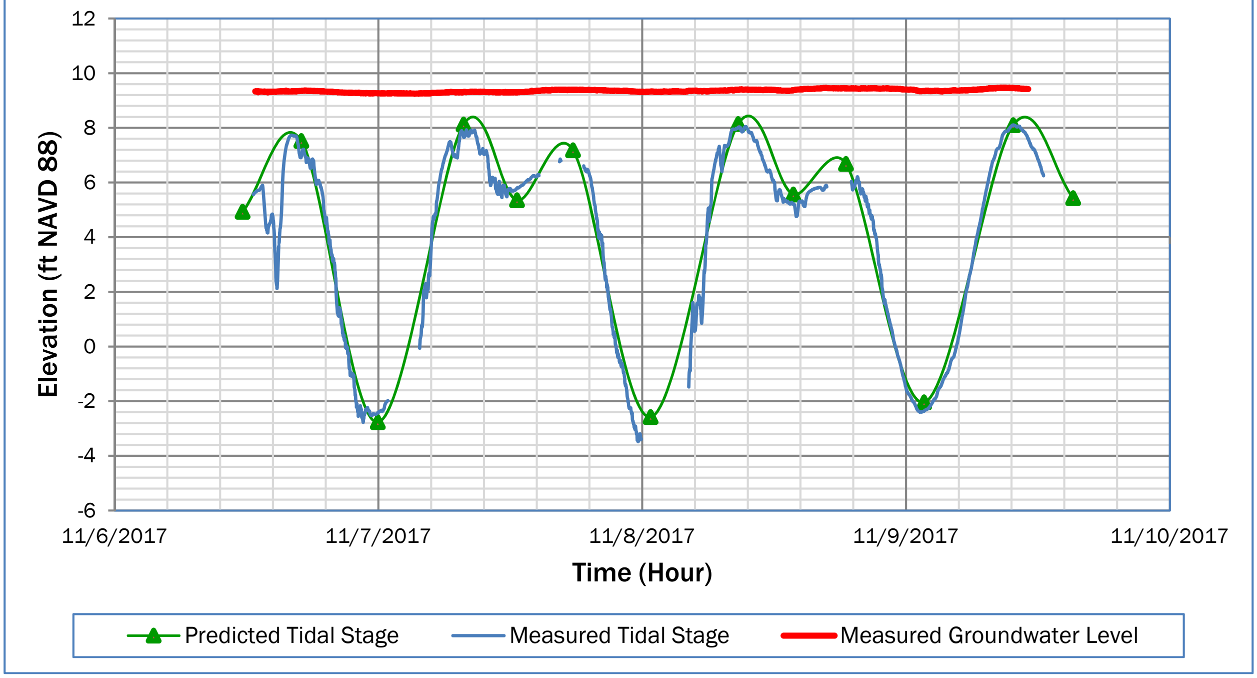
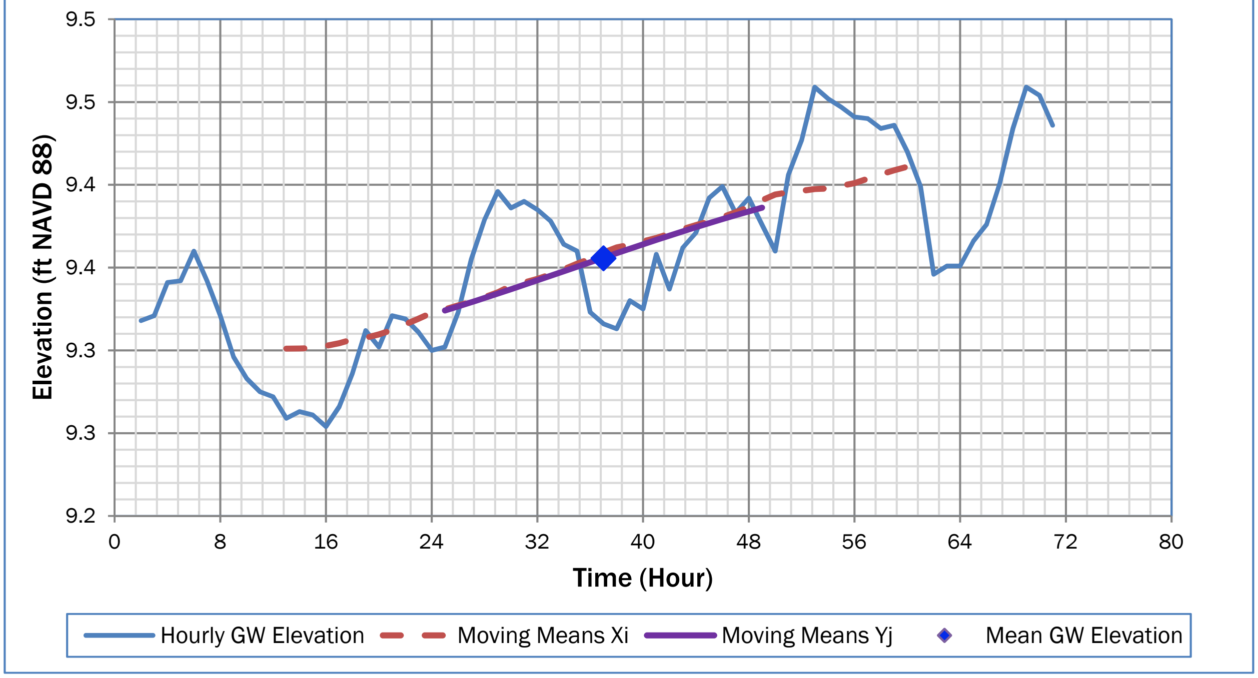
Figure 12

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18

(a) MW-11 Hydrograph and Tidal Stage



(b) Serfes Tidal Analysis at MW-11



Notes:

1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-11

Quiet Cove Property
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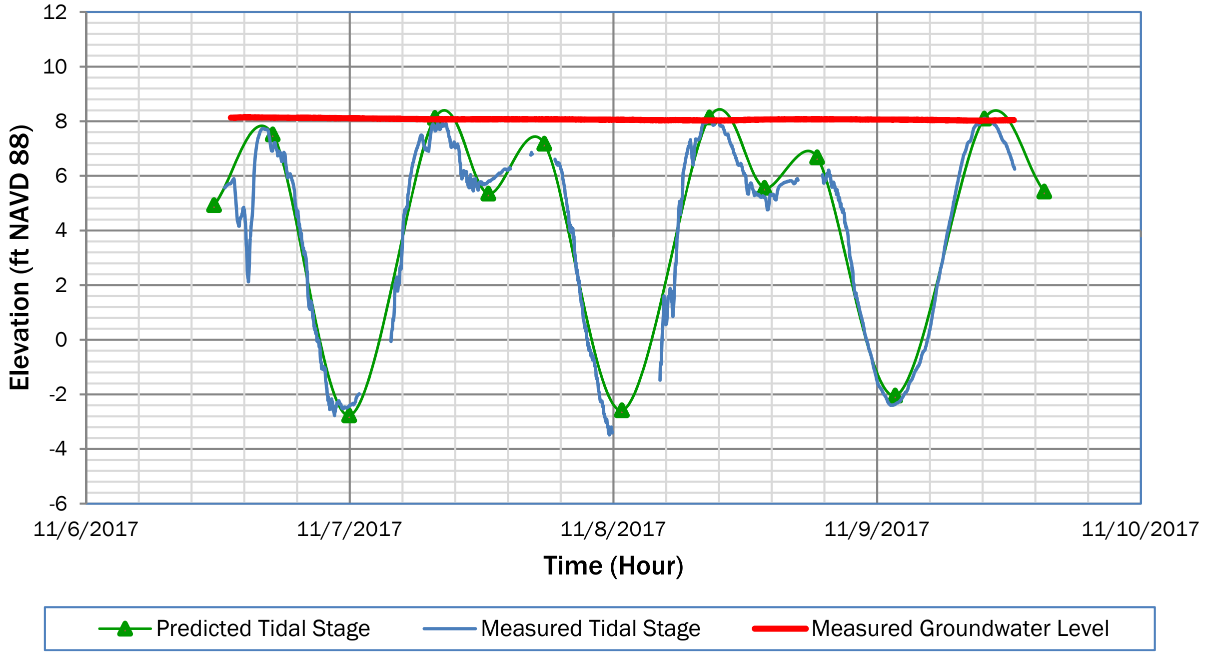
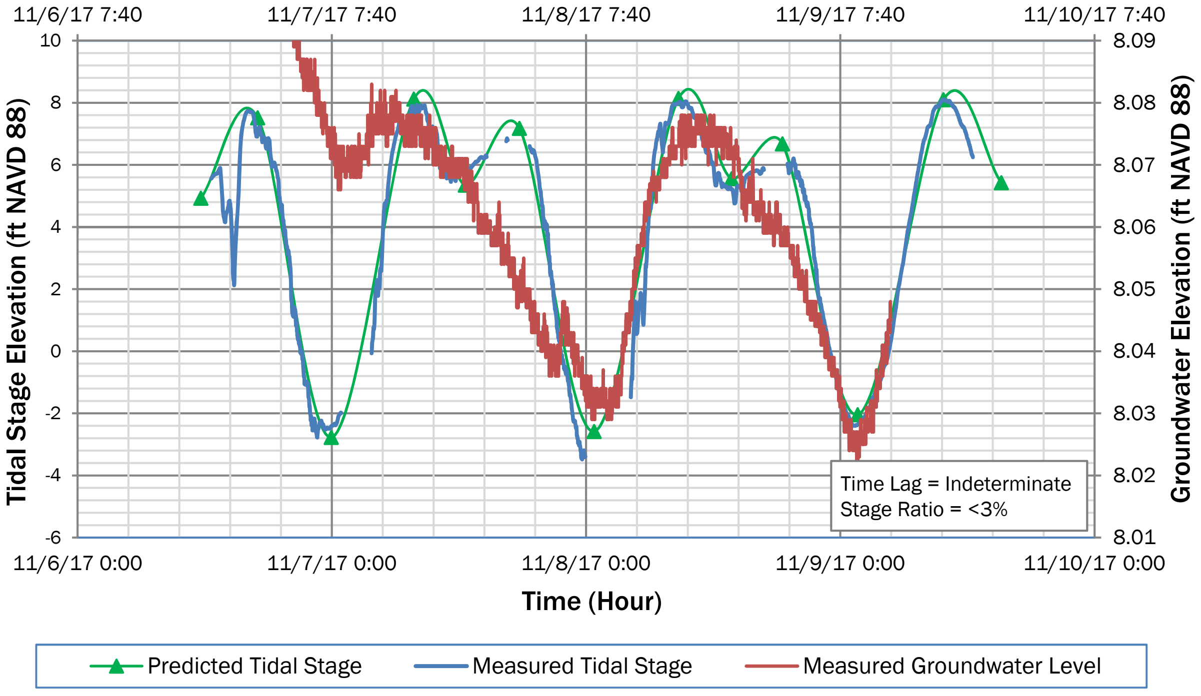
Figure 13

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 03-13 Date Exported: 04/18/18

(a) MW-1 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-1



Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 35 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-1

Quiet Cove Property
Anacortes, Washington

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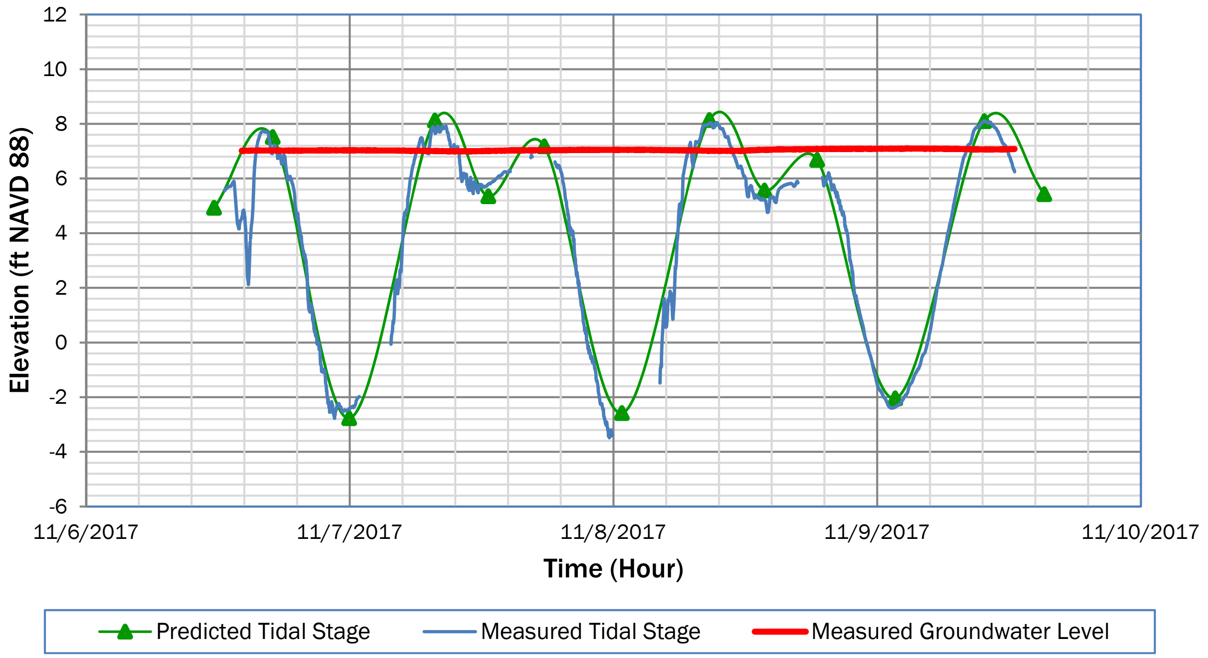
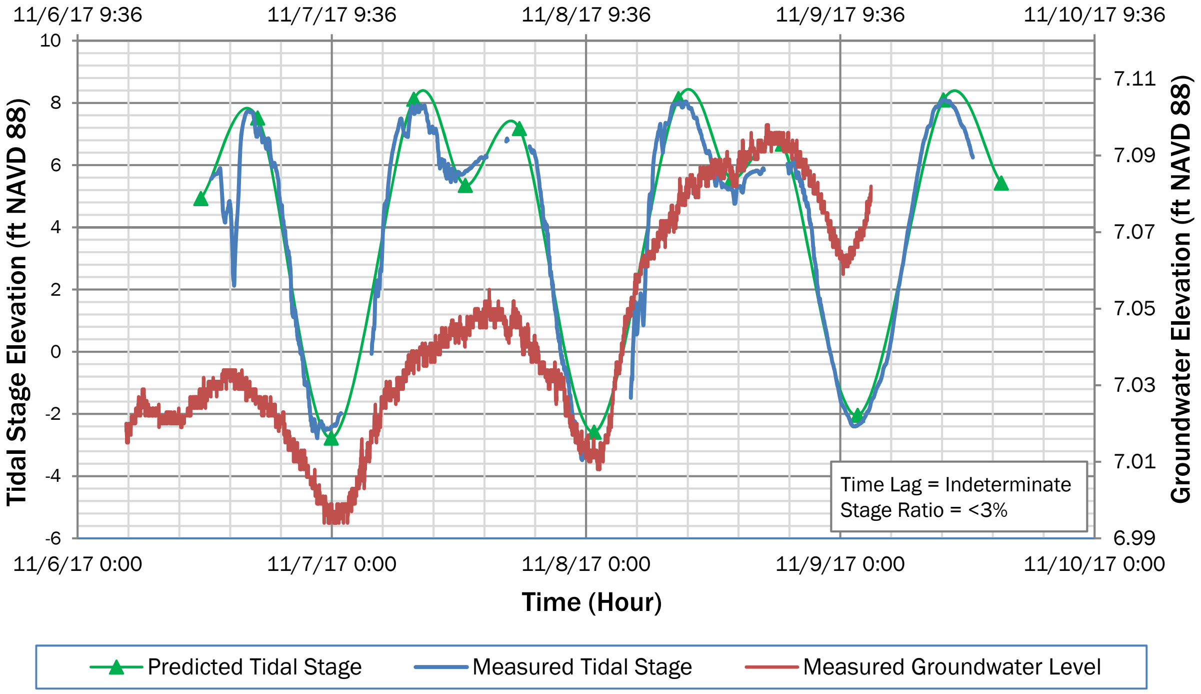
Figure 14

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18

(a) MW-2 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-2



Time Lag = Indeterminate
Stage Ratio = <3%

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 40 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Ferris Tidal Analysis at MW-2

Quiet Cove Property
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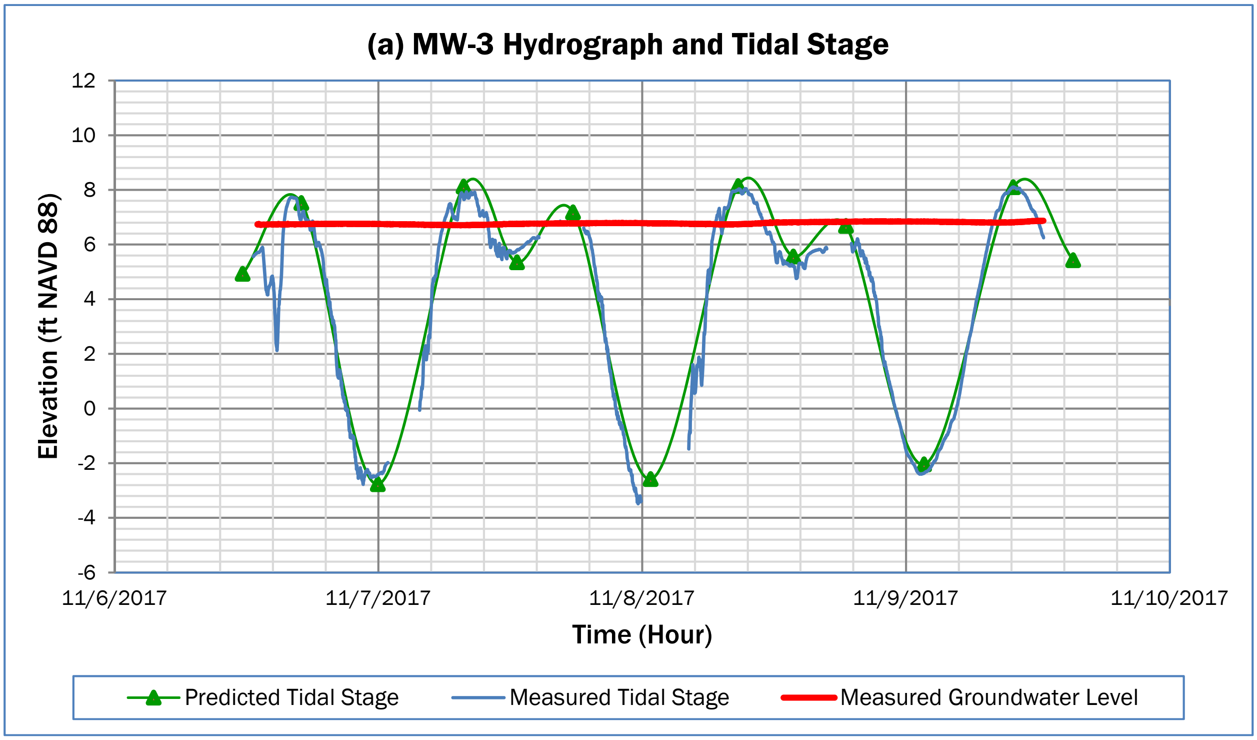
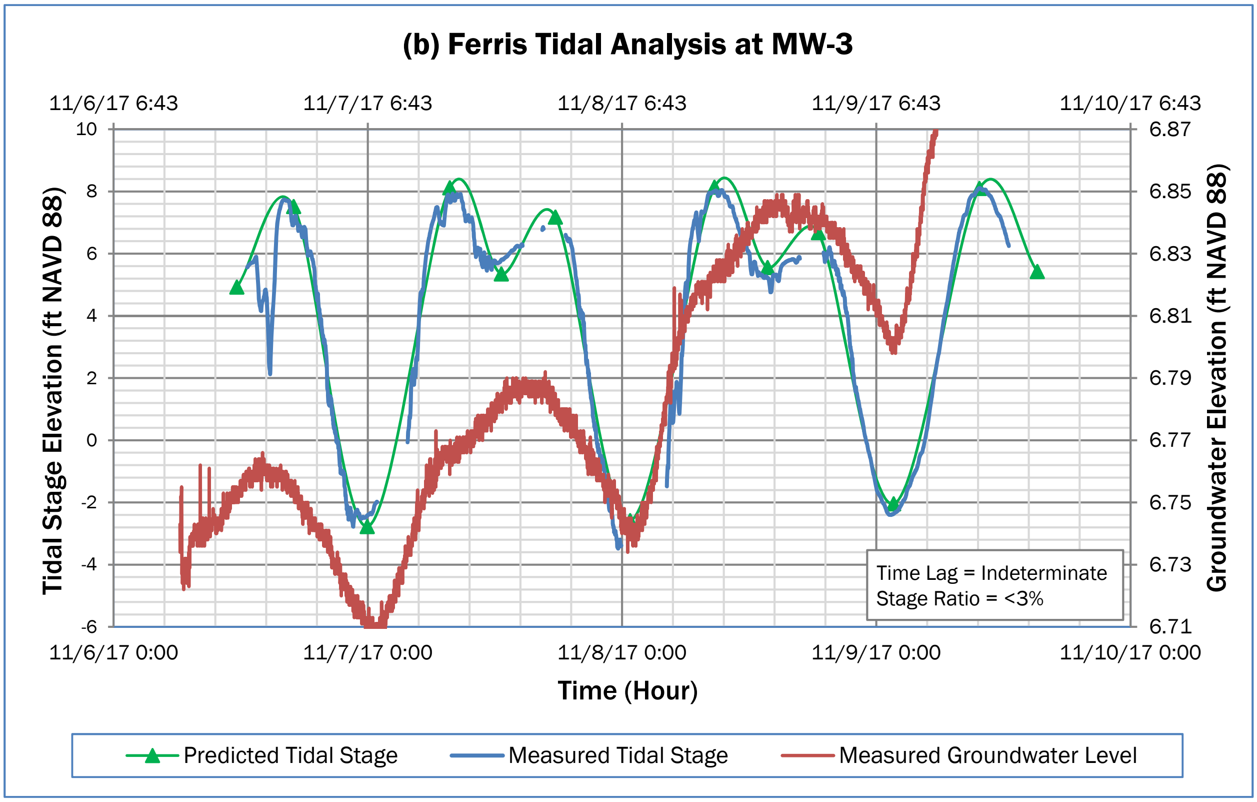
Figure 15

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18



(a) MW-3 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-3

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 45 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Ferris Tidal Analysis at MW-3

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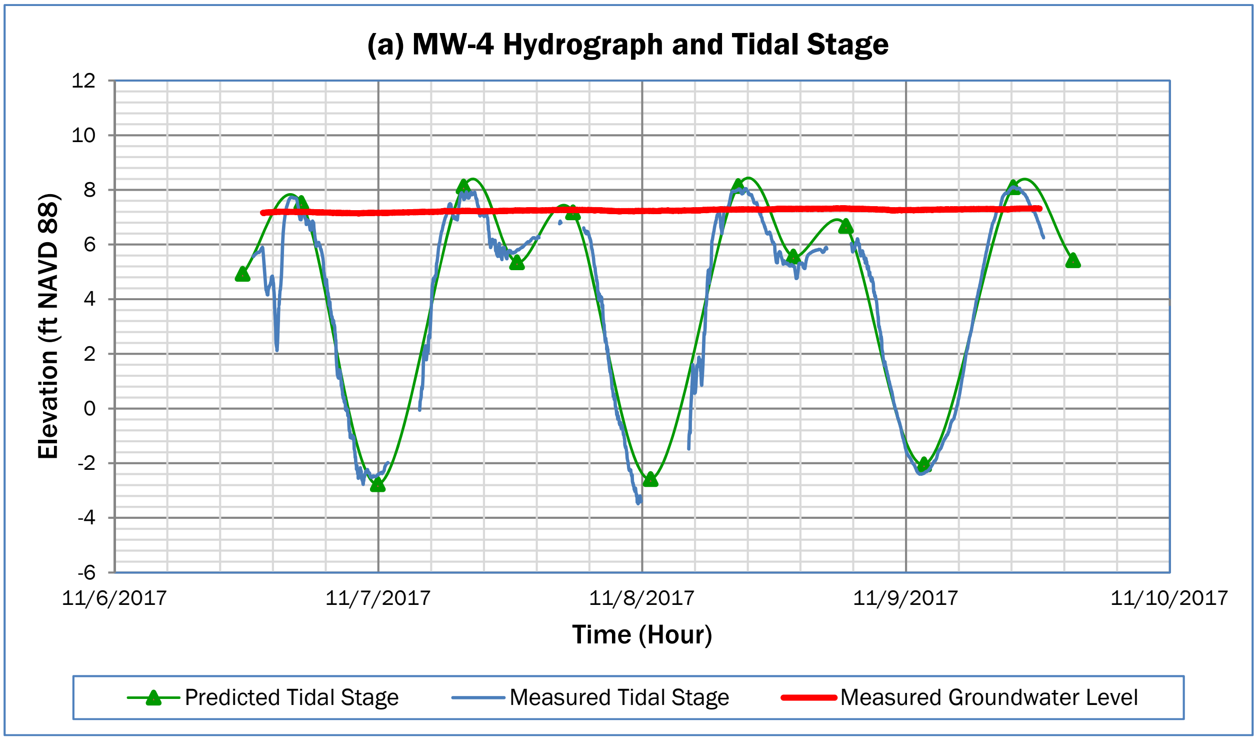
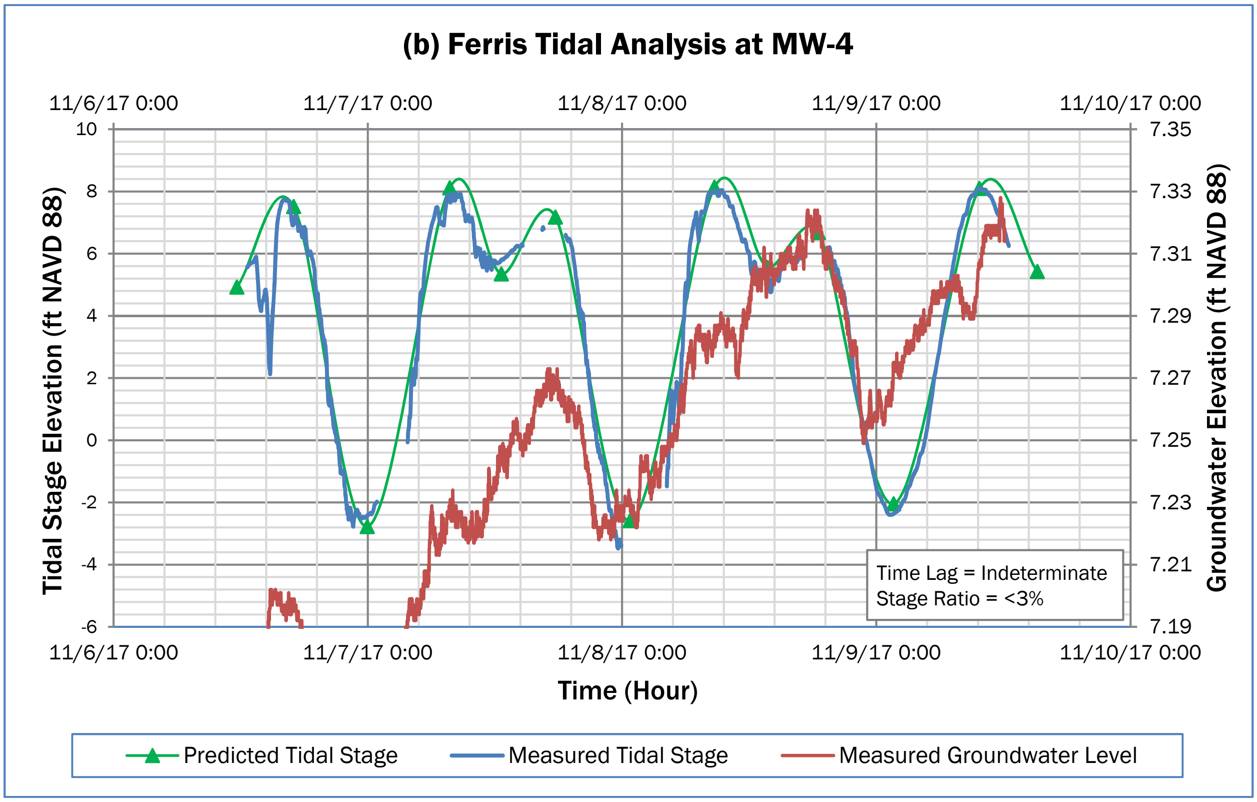
Figure 16

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18



(a) MW-4 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-4

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 190 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-4

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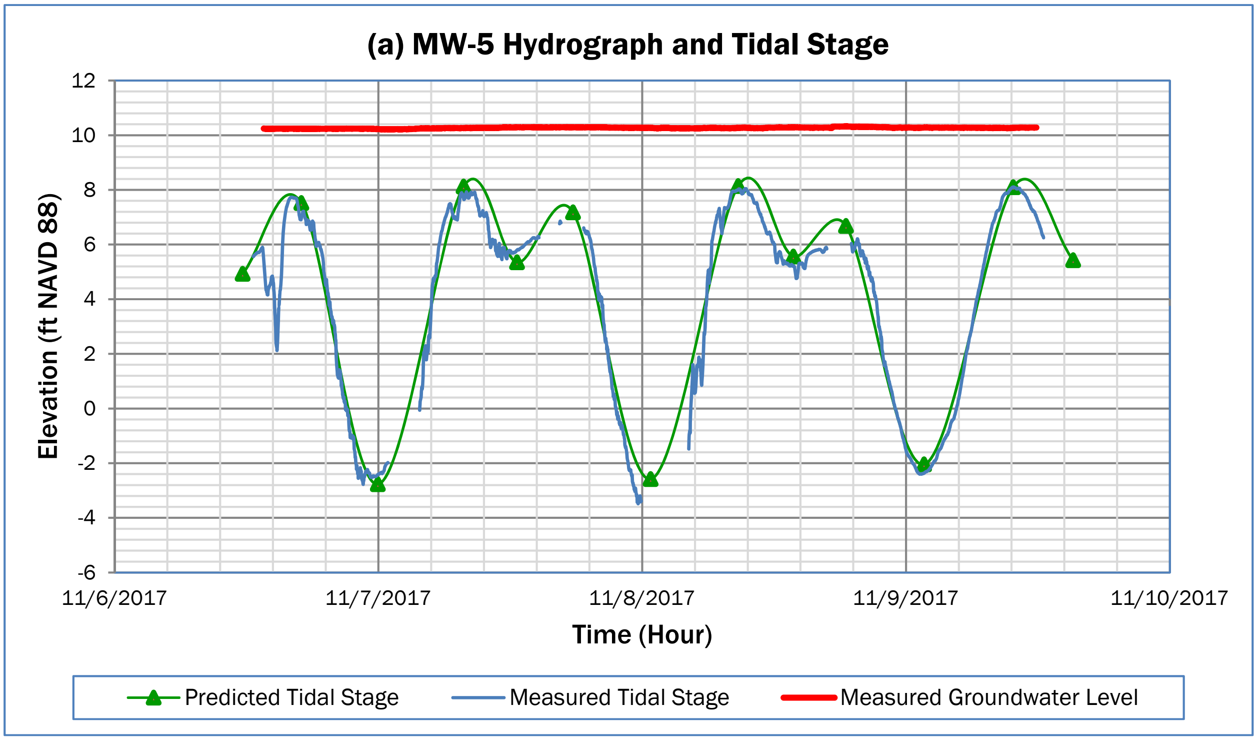
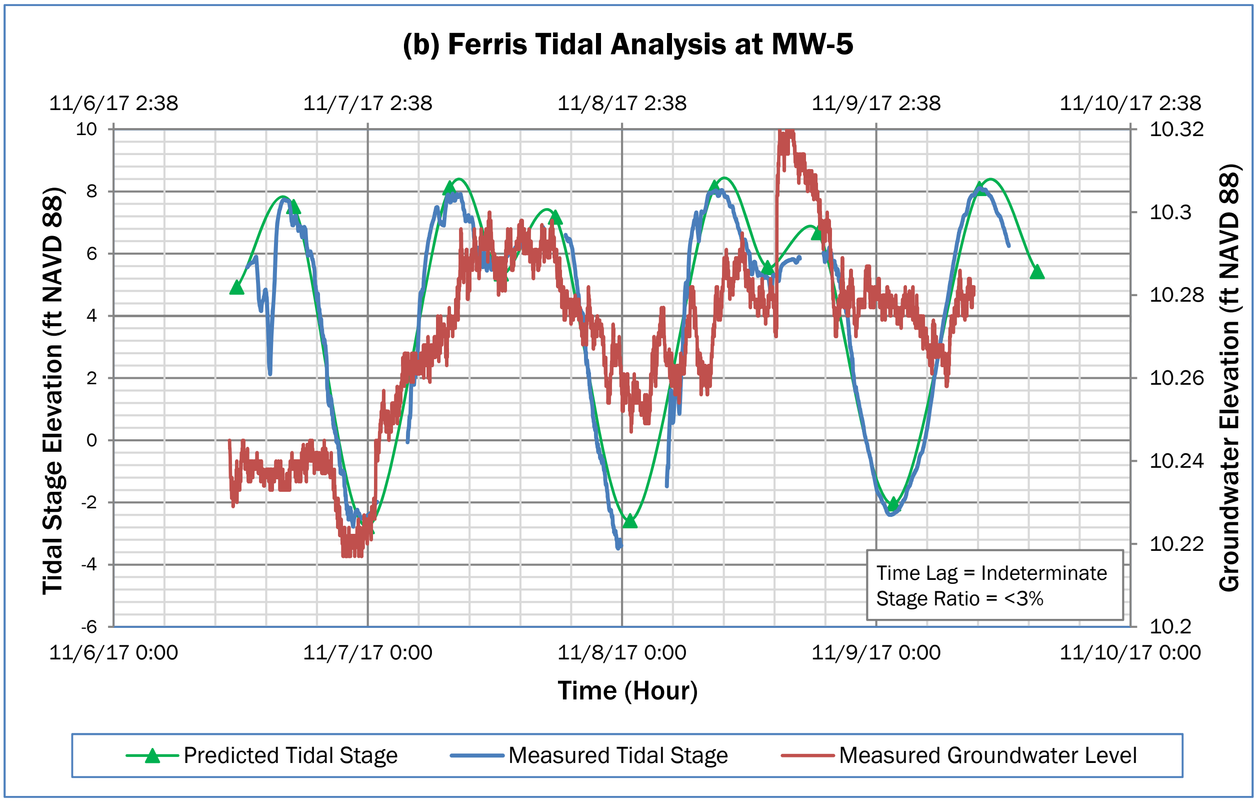
Figure 17

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18



(a) MW-5 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-5

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 260 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

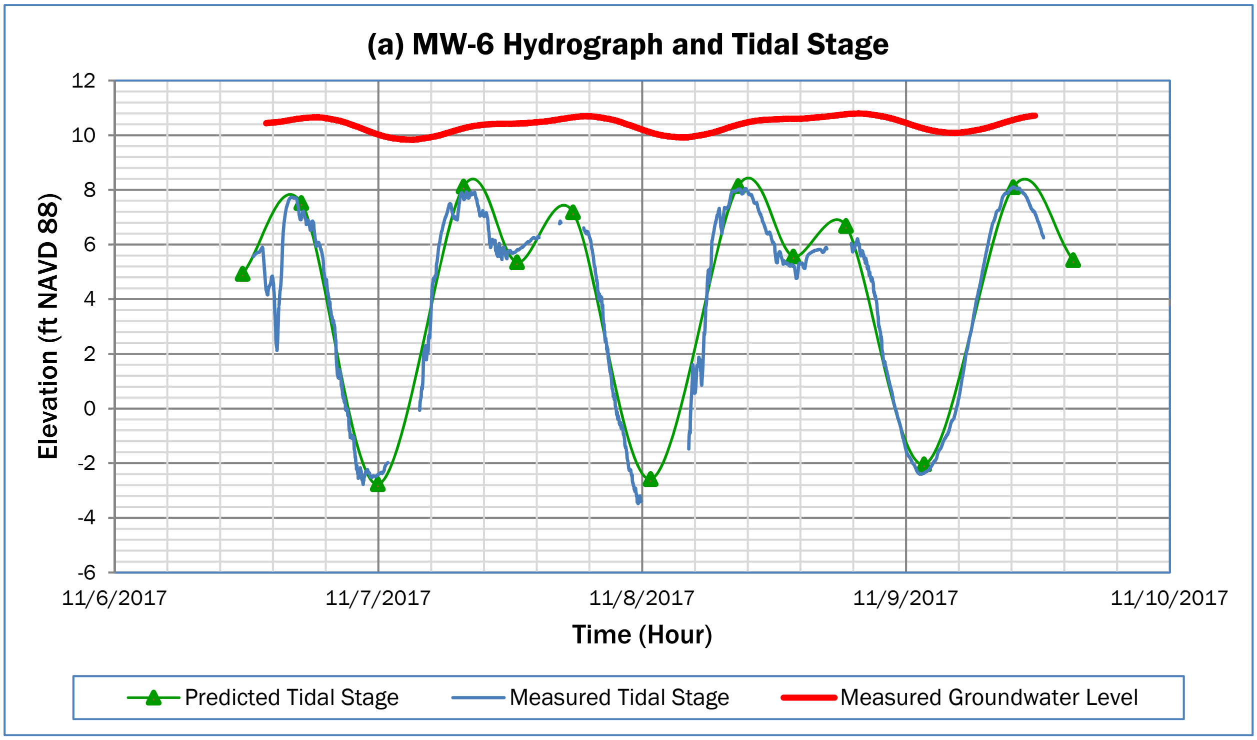
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-5

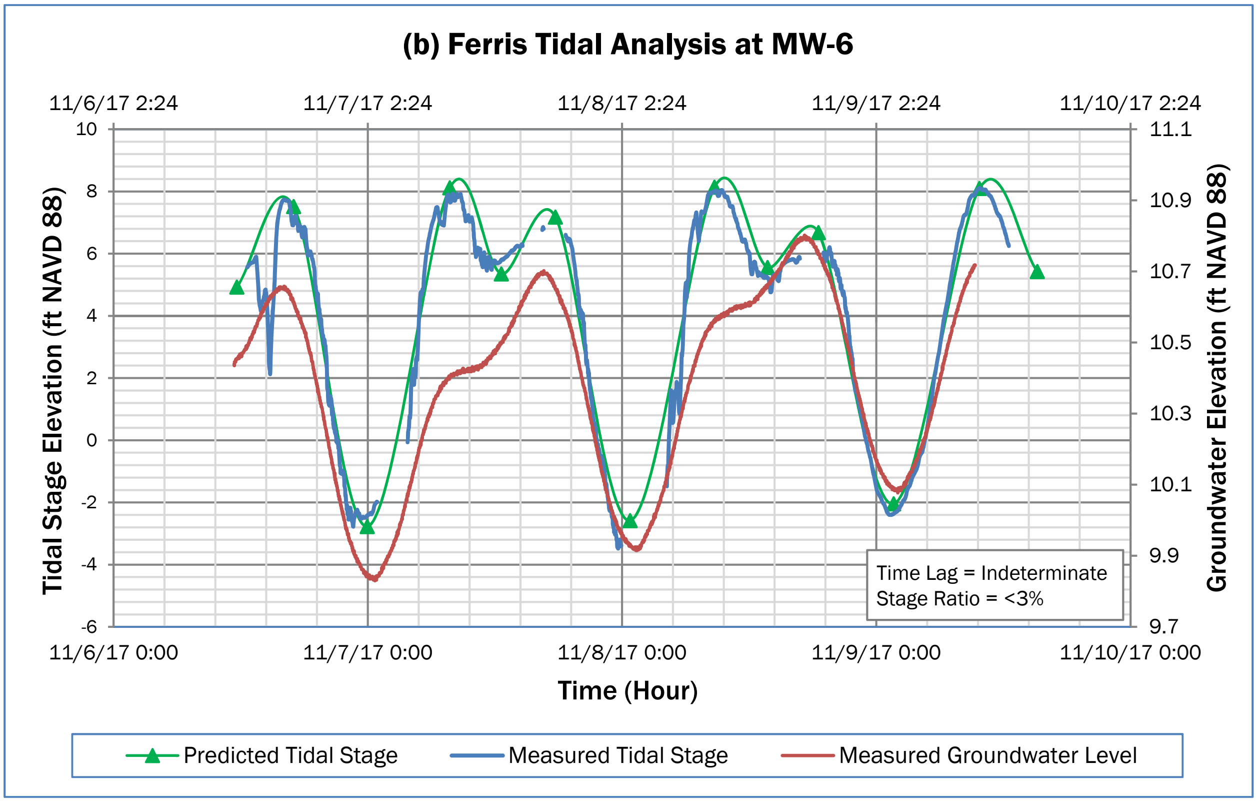
Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 18



(a) MW-6 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-6

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 380 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

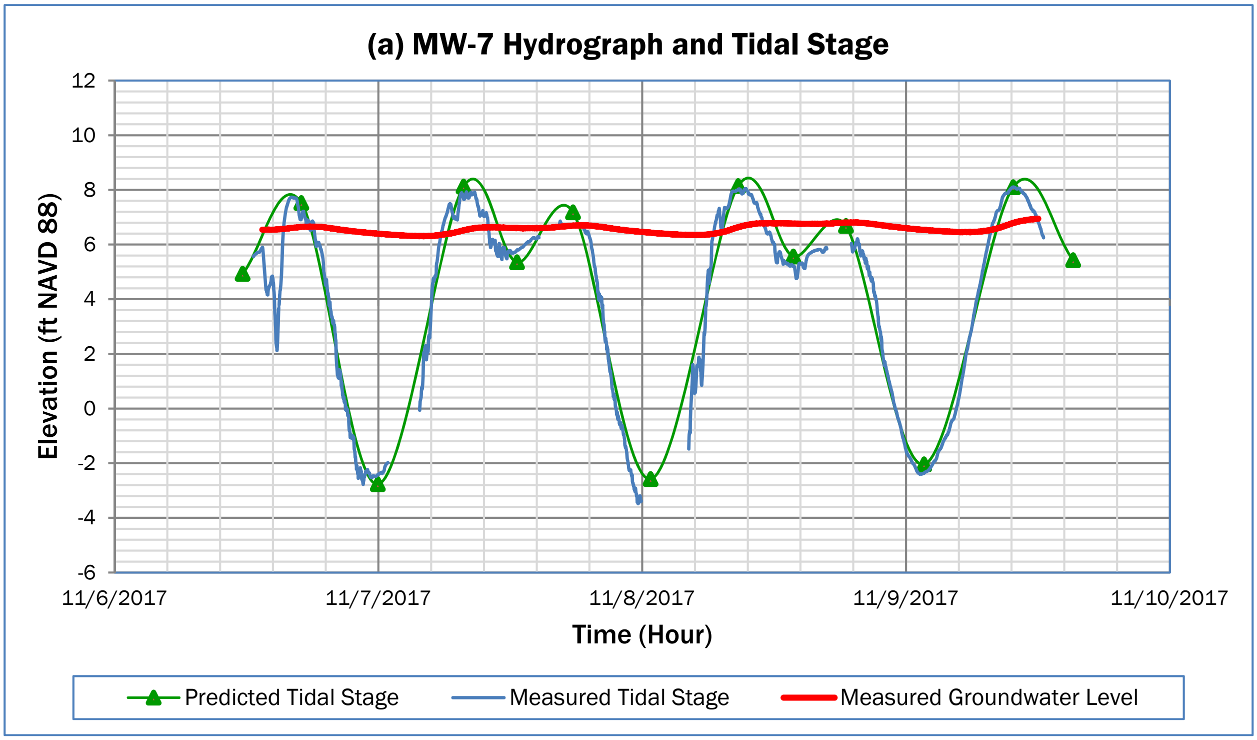
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-6

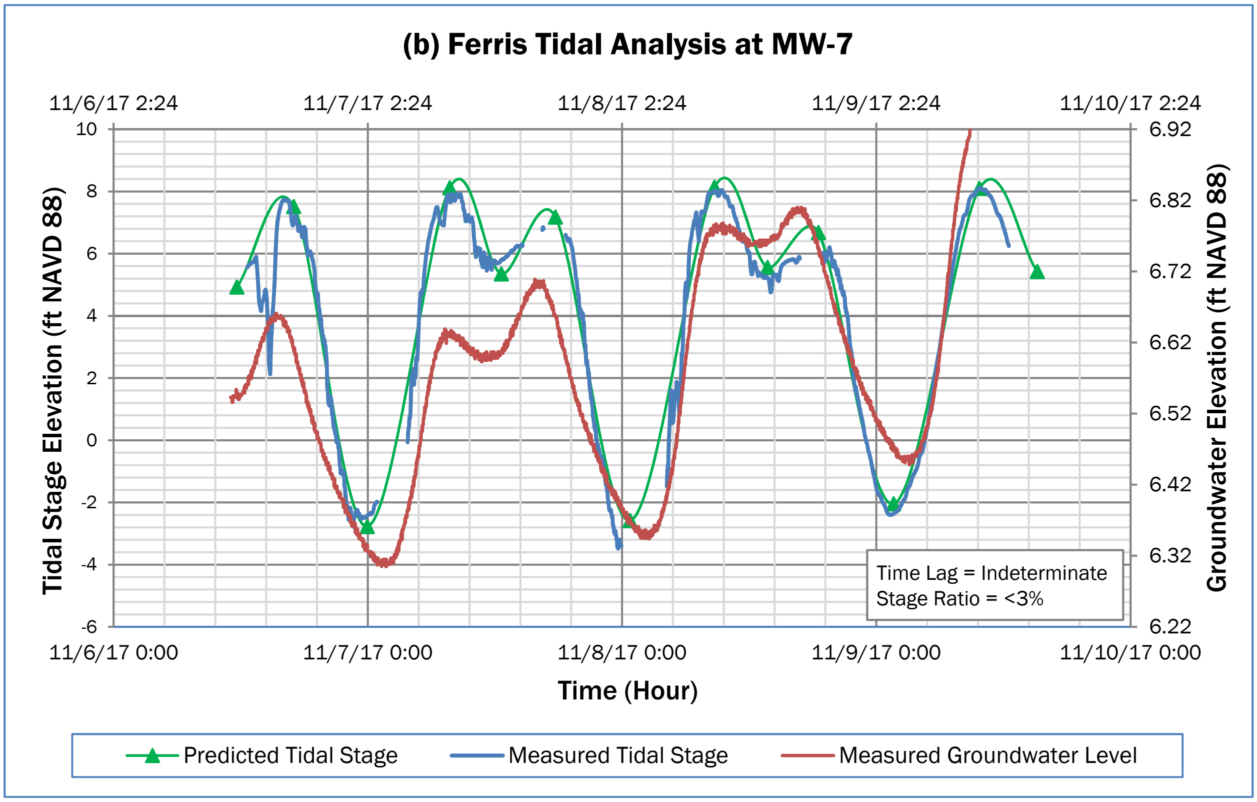
Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 19



(a) MW-7 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-7

Time Lag = Indeterminate
Stage Ratio = <3%

Notes:

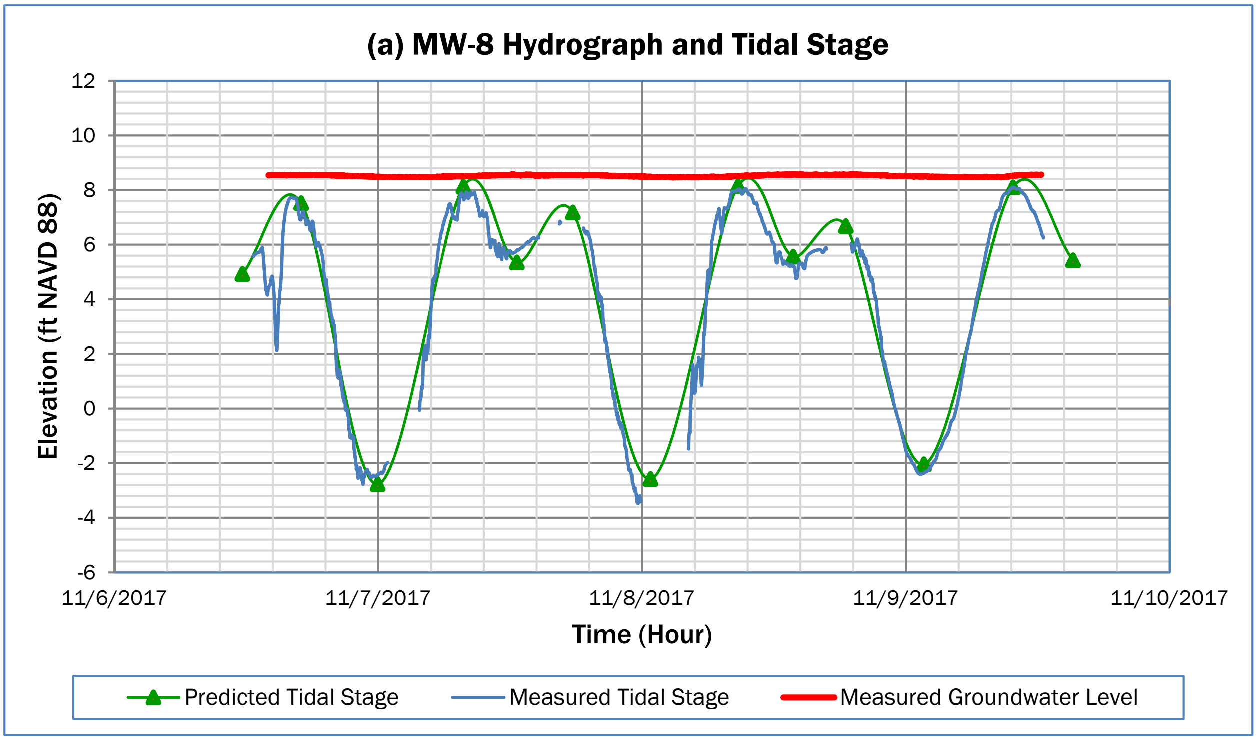
1. Method based on Ferris (1951).
2. Distance to Shoreline: 240 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Tidal Match_Quiet Cove.xlsx.

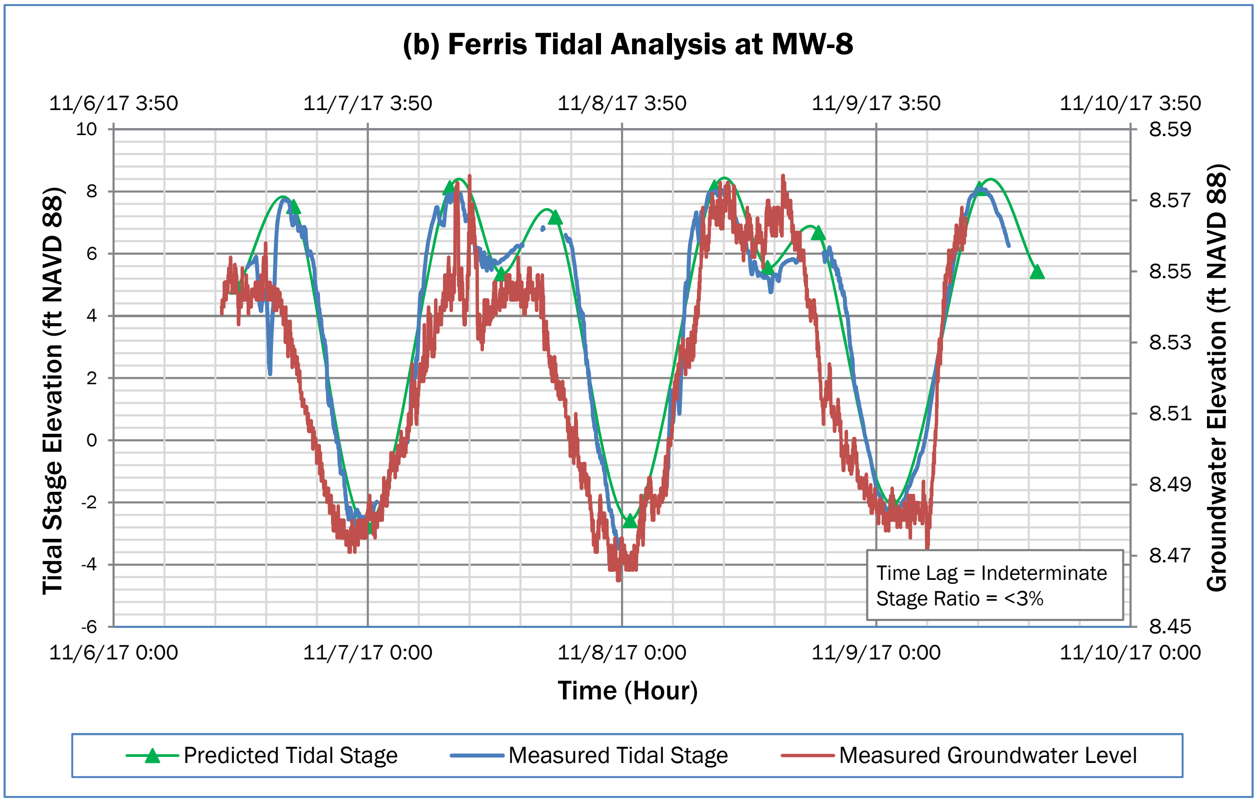
Ferris Tidal Analysis at MW-7

Quiet Cove Property
Anacortes, Washington

Figure 20



(a) MW-8 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-8

Time Lag = Indeterminate
Stage Ratio = <3%

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 80 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/ Tidal Match_Quiet Cove.xlsx.

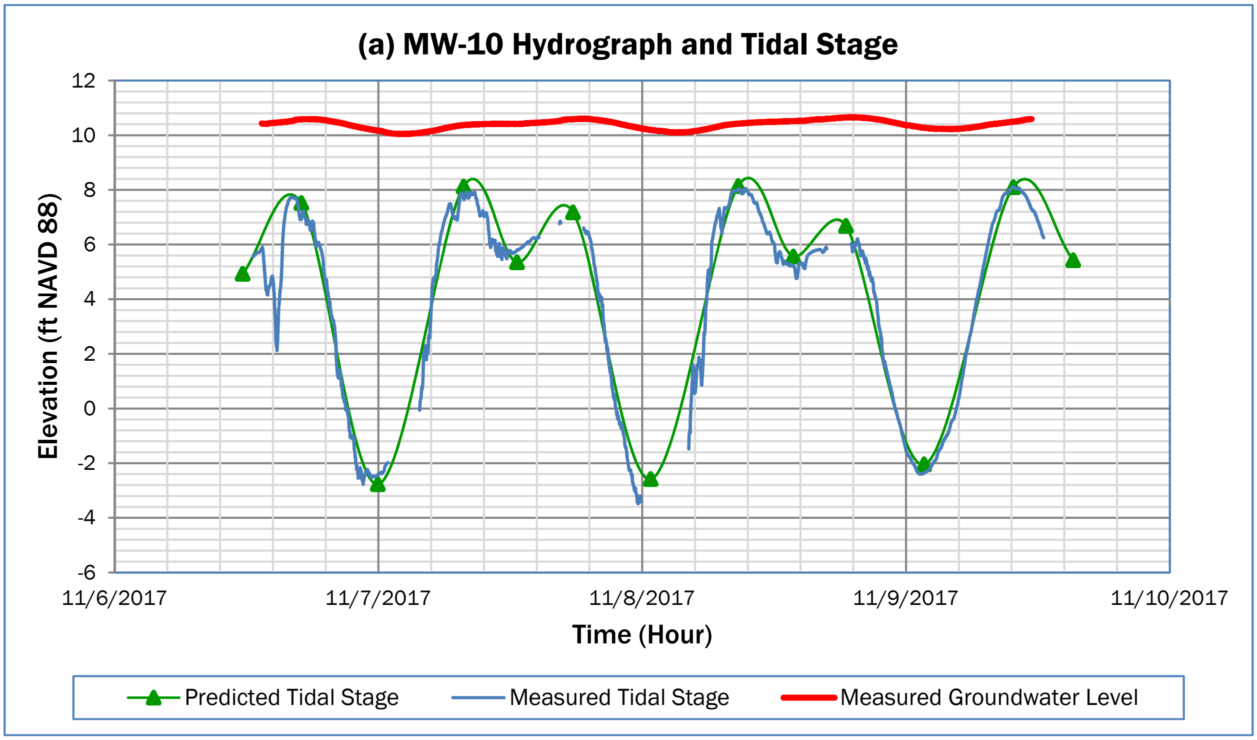
Ferris Tidal Analysis at MW-8

Quiet Cove Property
Anacortes, Washington

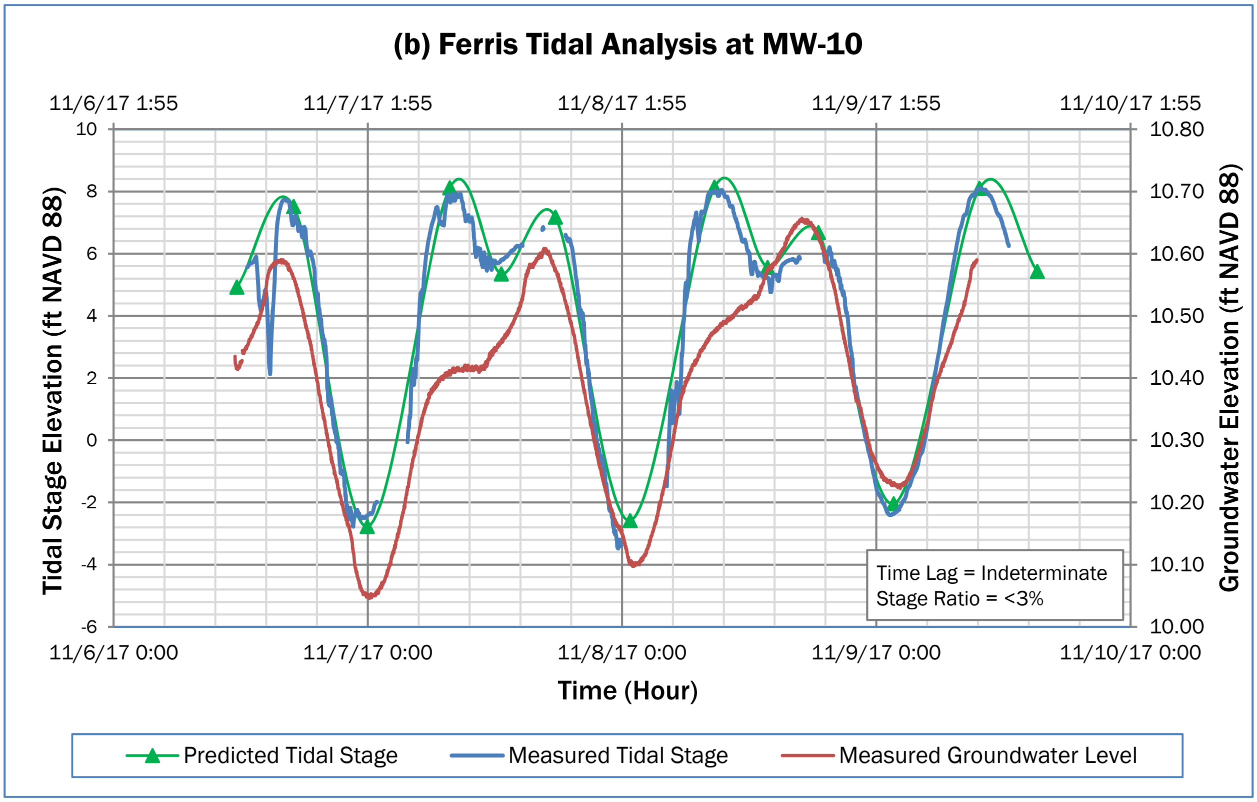
GEOENGINEERS

Figure 21

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18



(a) MW-10 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-10

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 300 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

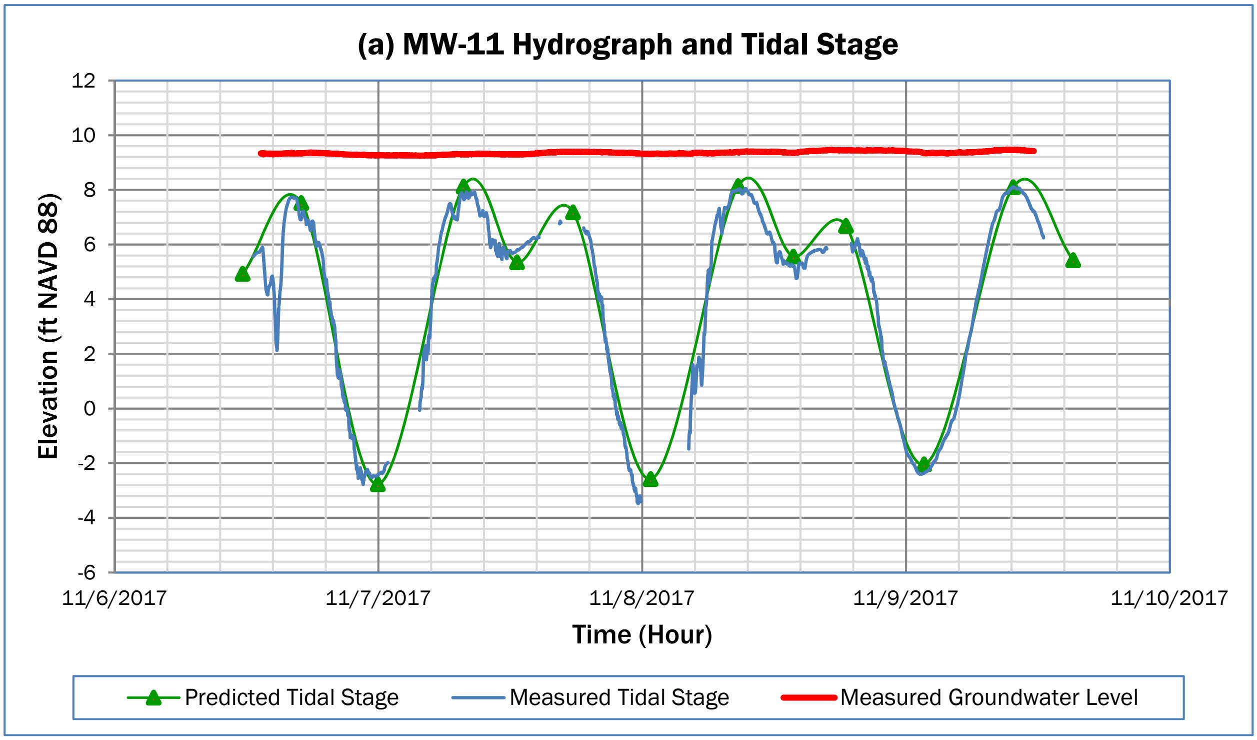
Ferris Tidal Analysis at MW-10

Quiet Cove Property
Anacortes, Washington

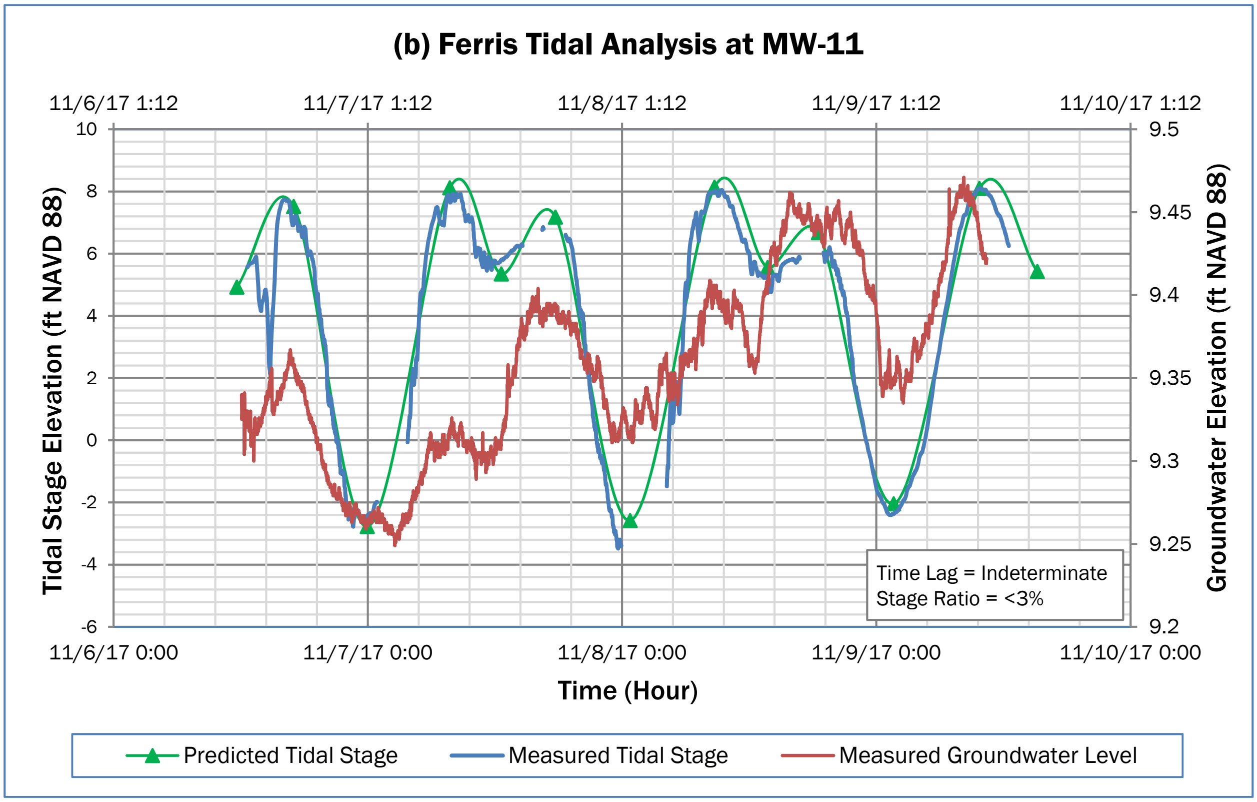
GEOENGINEERS

Figure 22

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18



(a) MW-11 Hydrograph and Tidal Stage



(b) Ferris Tidal Analysis at MW-11

Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 160 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

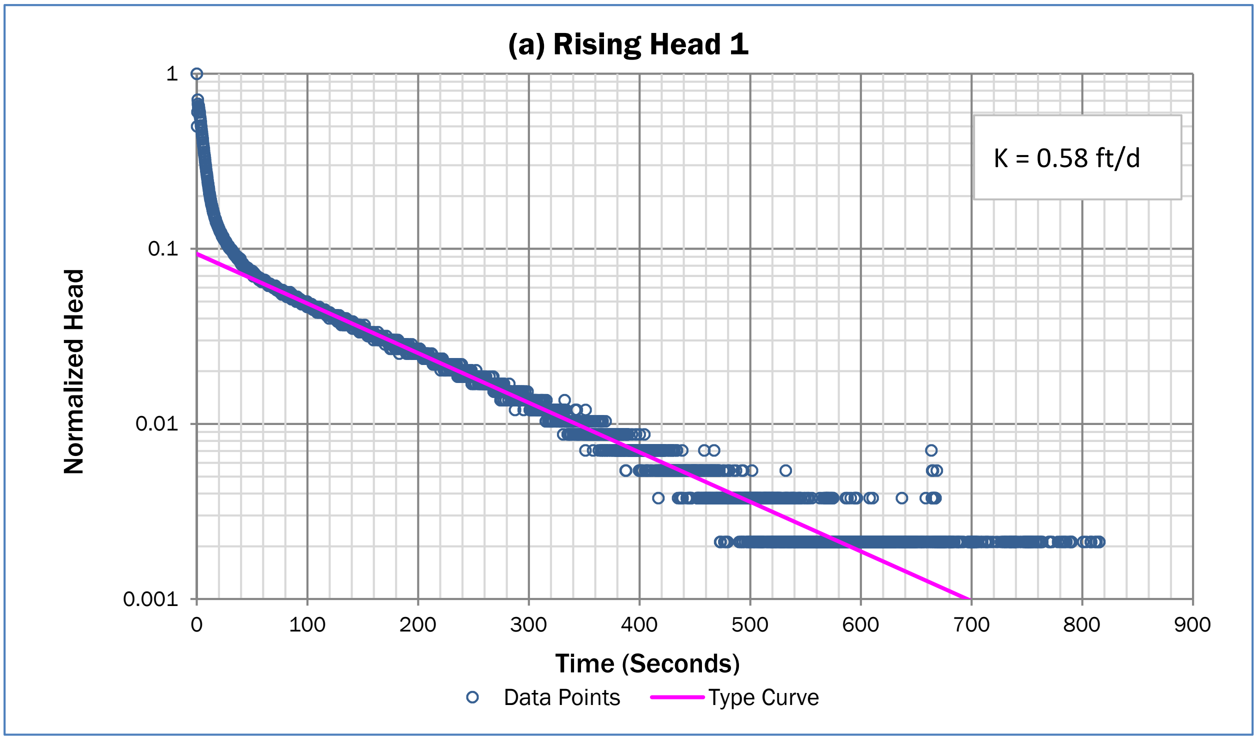
Ferris Tidal Analysis at MW-11

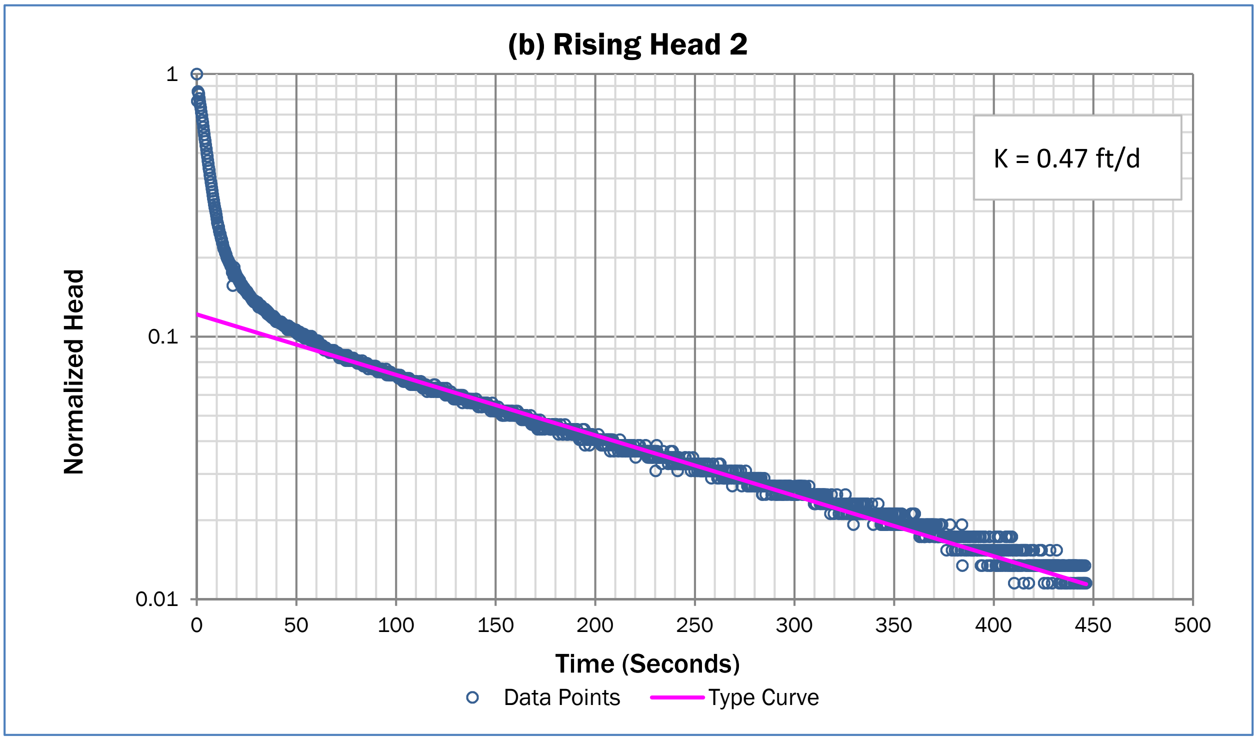
Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 23

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 14-23 Date Exported: 04/18/18





Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

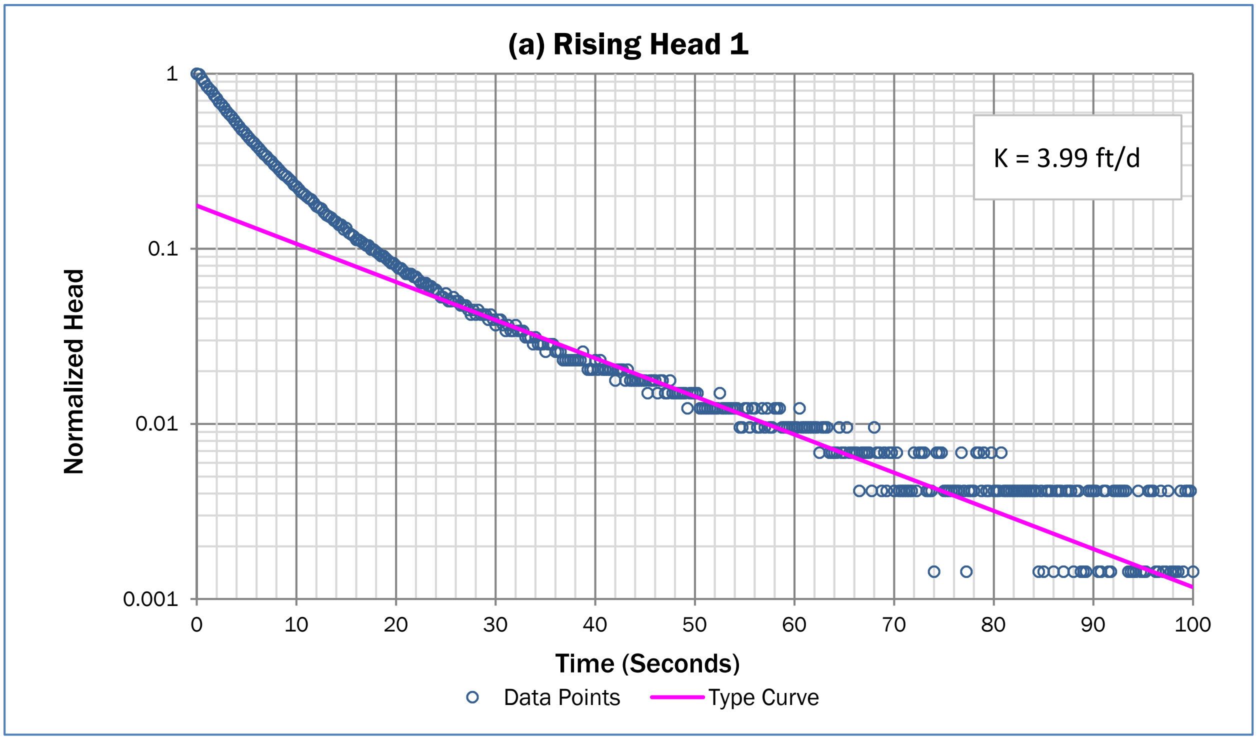
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlsx

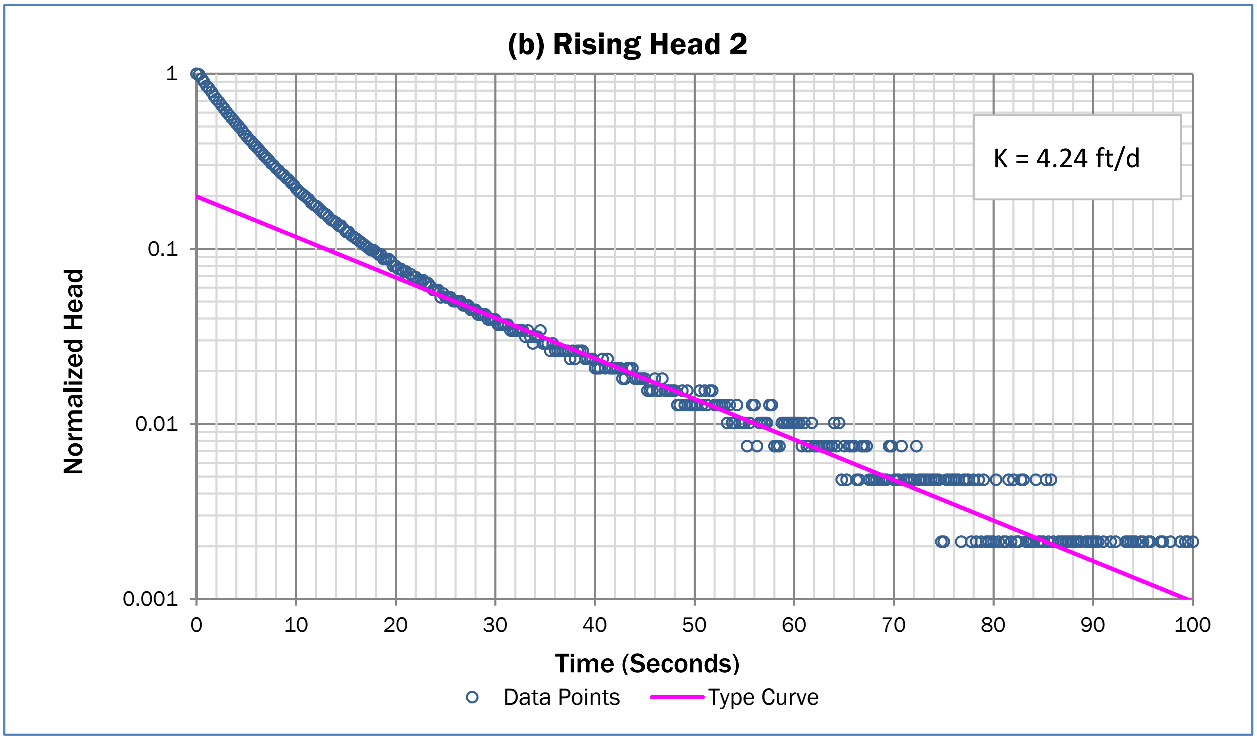
Aquifer Slug Test at MW-2

Quiet Cove Property
Anacortes, WA

GeoEngineers

Figure 24


(a) Rising Head 1


(b) Rising Head 2

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 15.7 feet below ground surface.
6. Static water level was 6.86 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-3_BouwerRice1976.xlsx

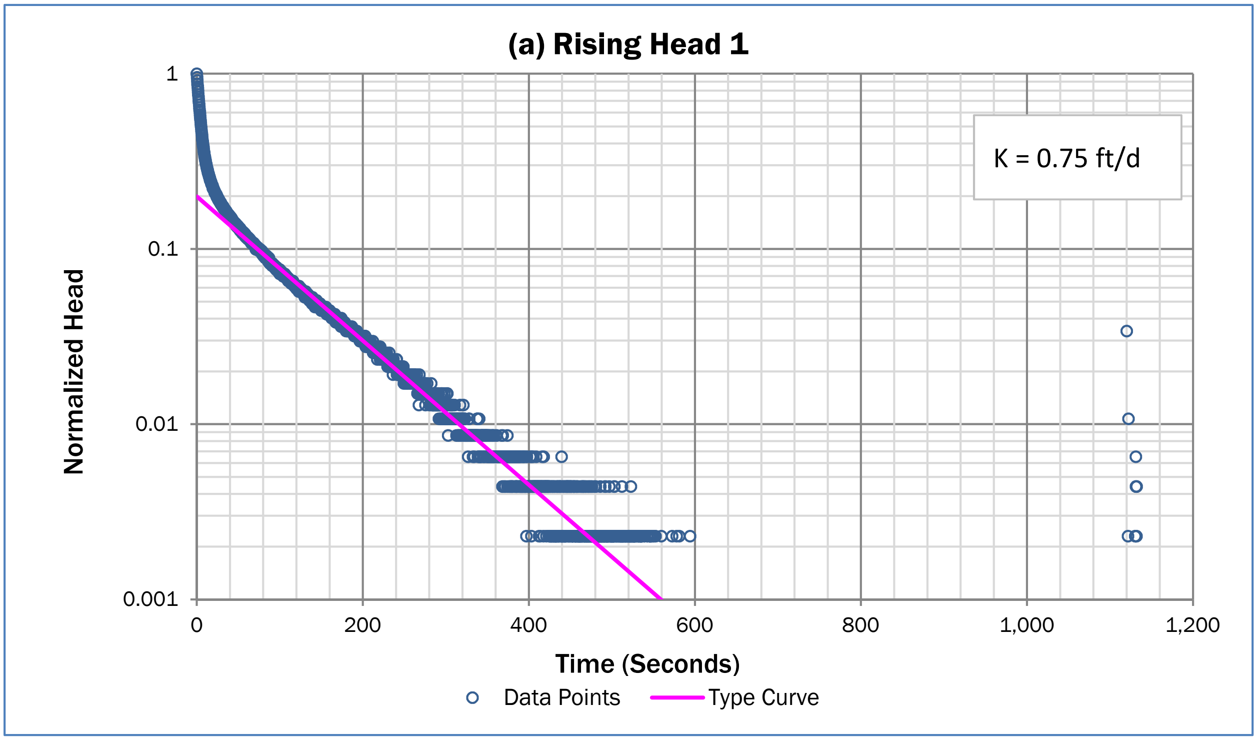
Aquifer Slug Test at MW-3

Quiet Cove Property
Anacortes, Washington

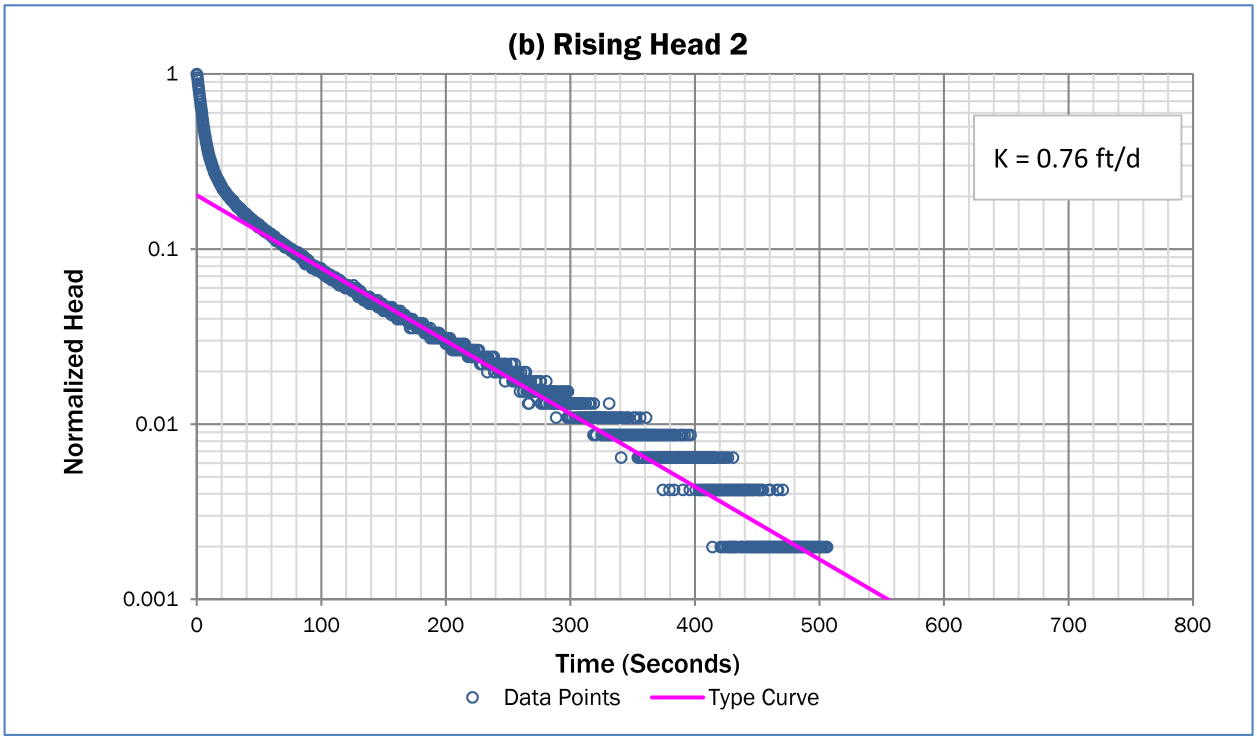
GeoEngineers

Figure 25

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 24-29 Date Exported: 04/18/18



(a) Rising Head 1



(b) Rising Head 2

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 9.2 feet.
5. Well is screened from 3.7 to 14.7 feet below ground surface.
6. Static water level was 6.3 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-4_BouwerRice1976.xlsx

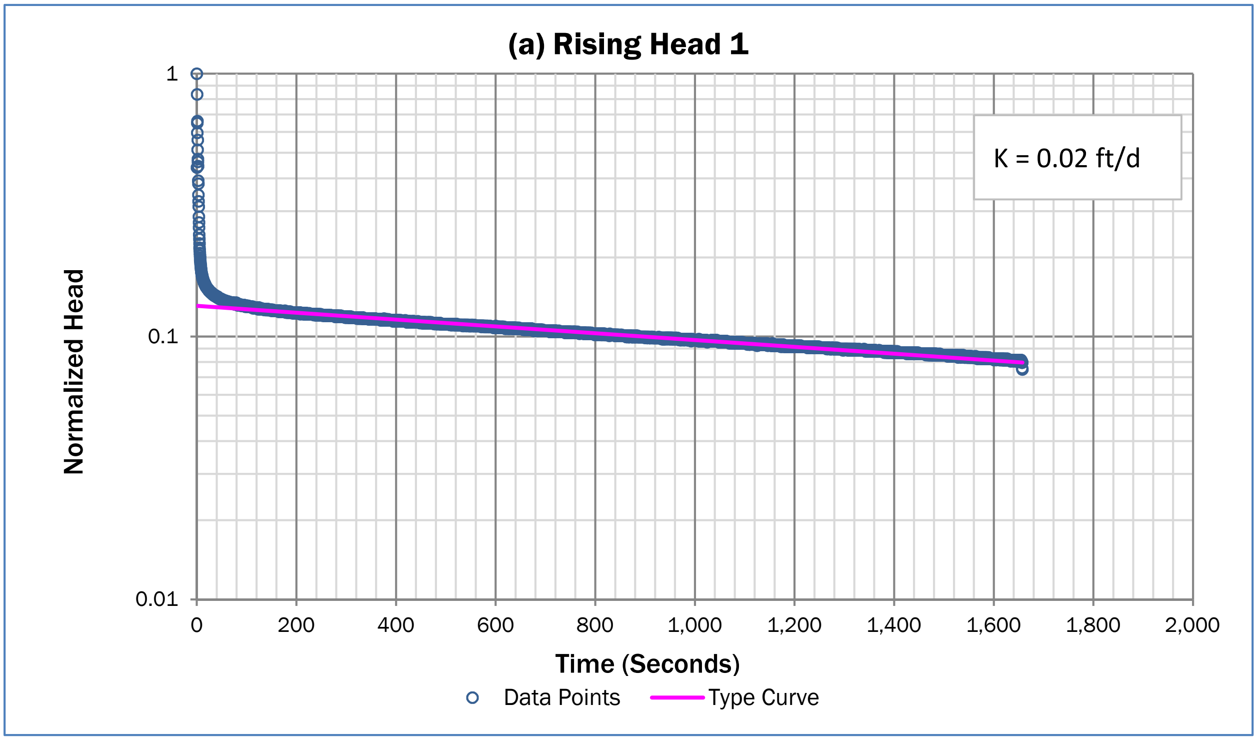
Aquifer Slug Test at MW-4

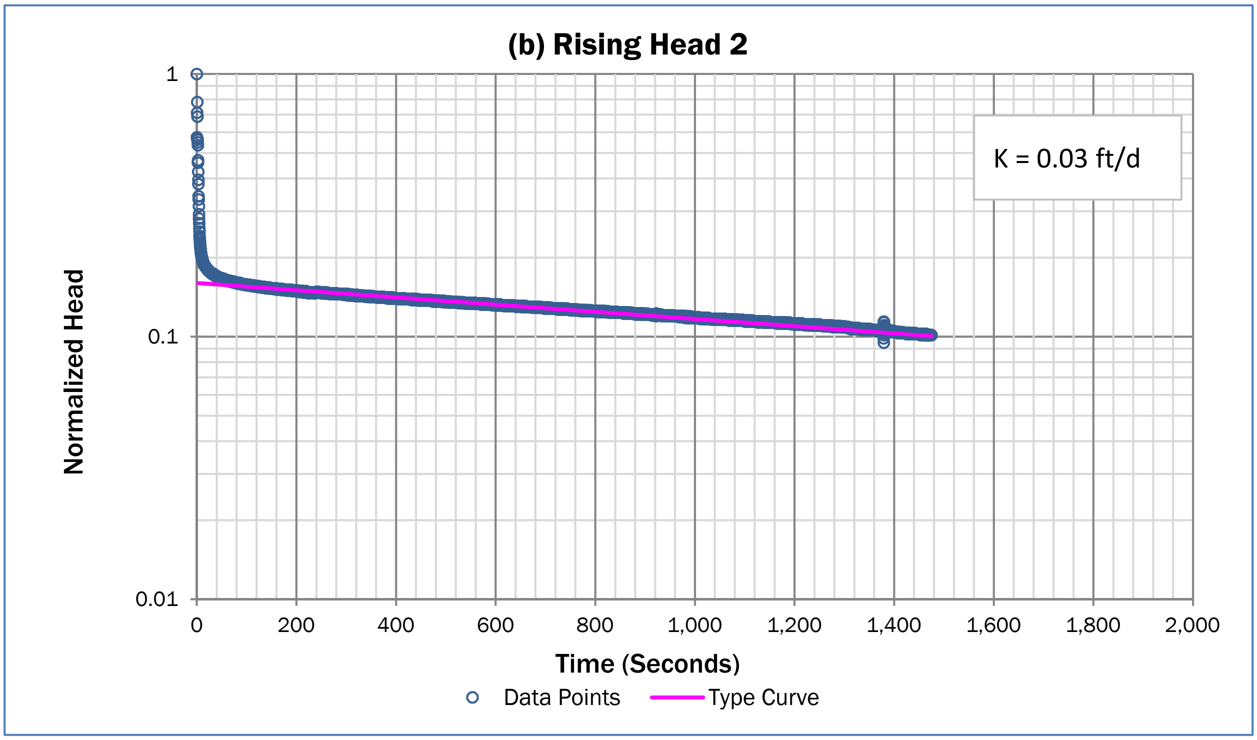
Quiet Cove Property
Anacortes, Washington

GeoEngineers

Figure 26

Project.Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo_Figs 24-29 Date Exported: 04/18/18





Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 9.07 feet.
5. Well is screened from 5 to 15 feet below ground surface.
6. Static water level was 6.43 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

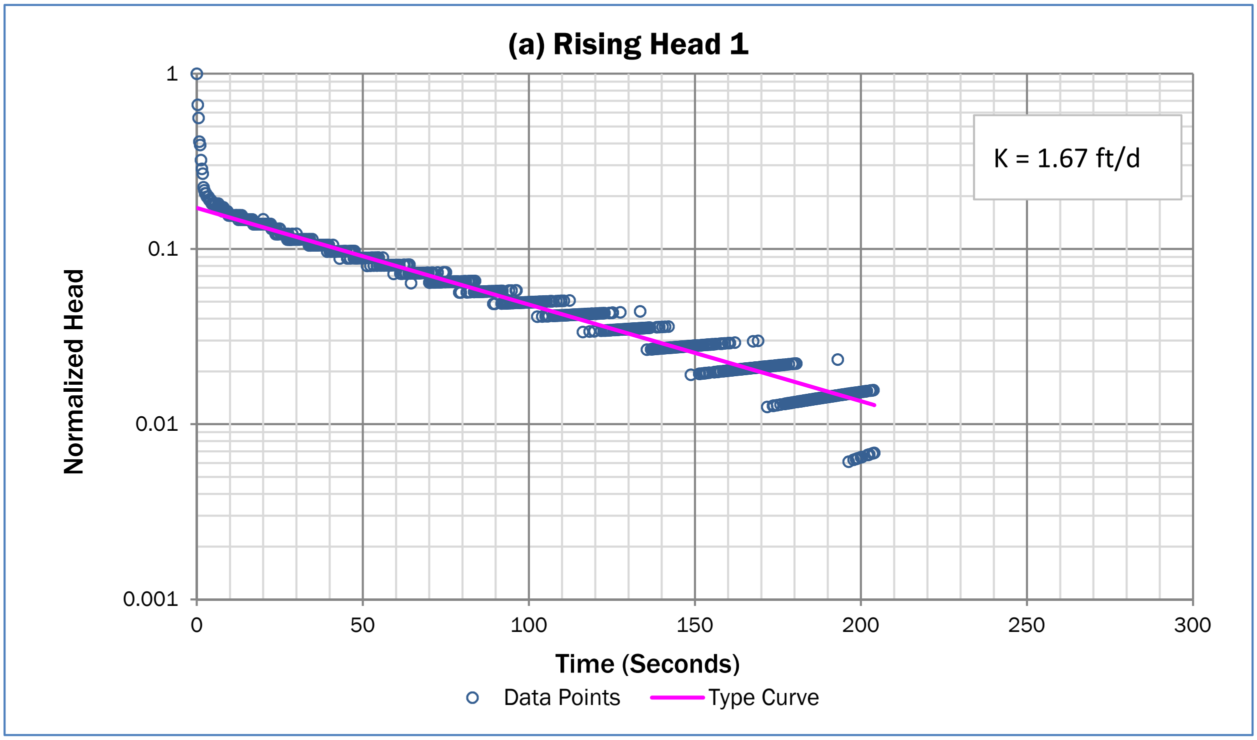
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-6_BouwerRice1976.xlsx

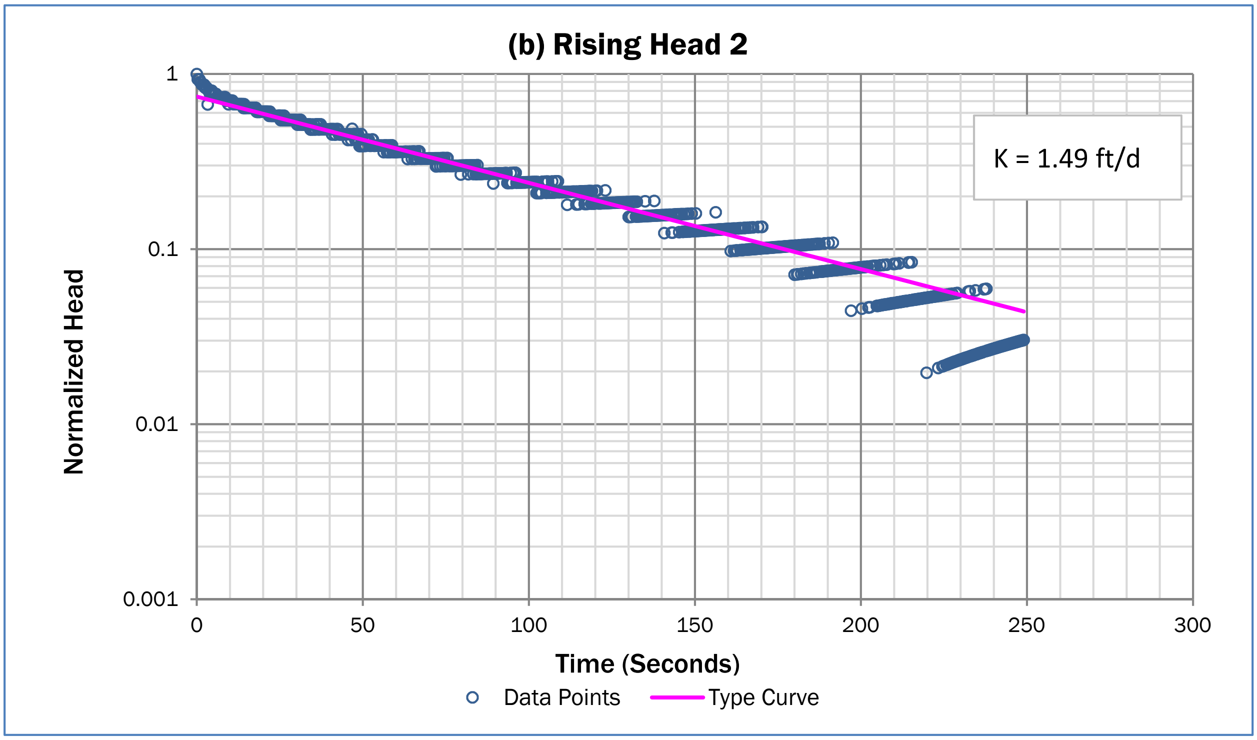
Aquifer Slug Test at MW-6

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 27





Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 8.11 feet.
5. Well is screened from 5 to 10 feet below ground surface.
6. Static water level was 7.39 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

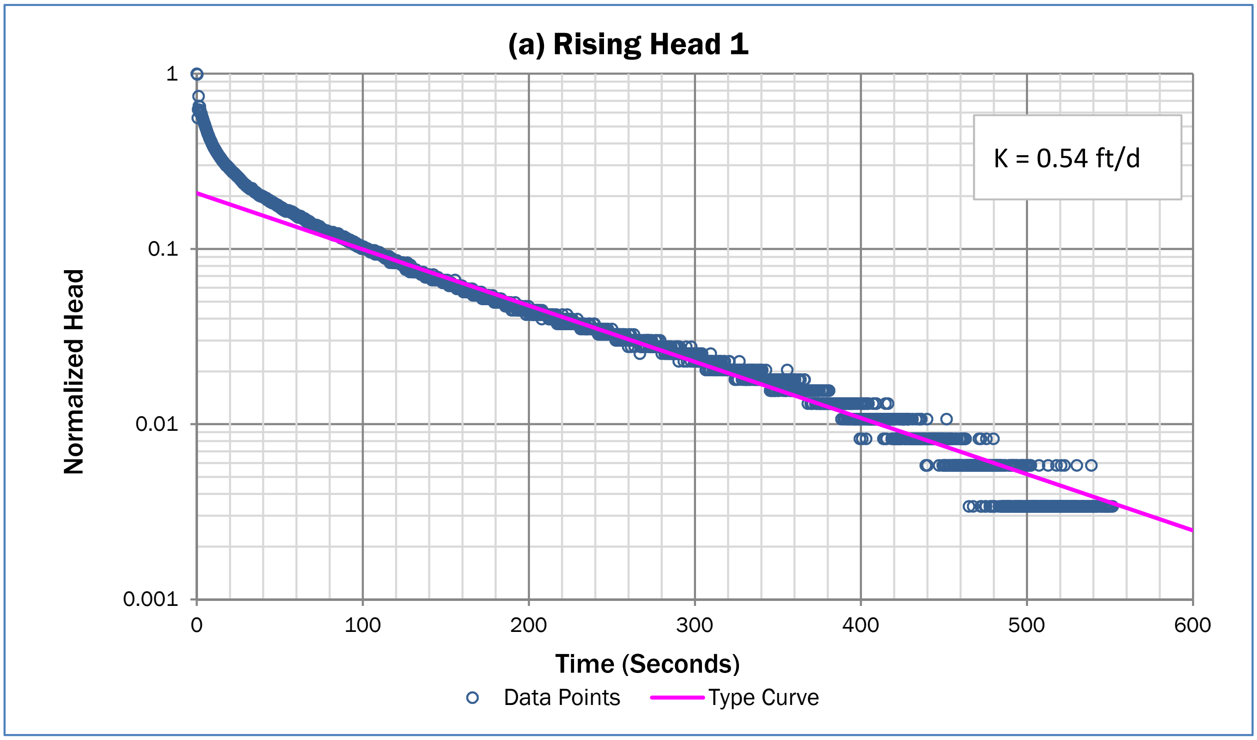
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-7_BouwerRice1976.xlsx

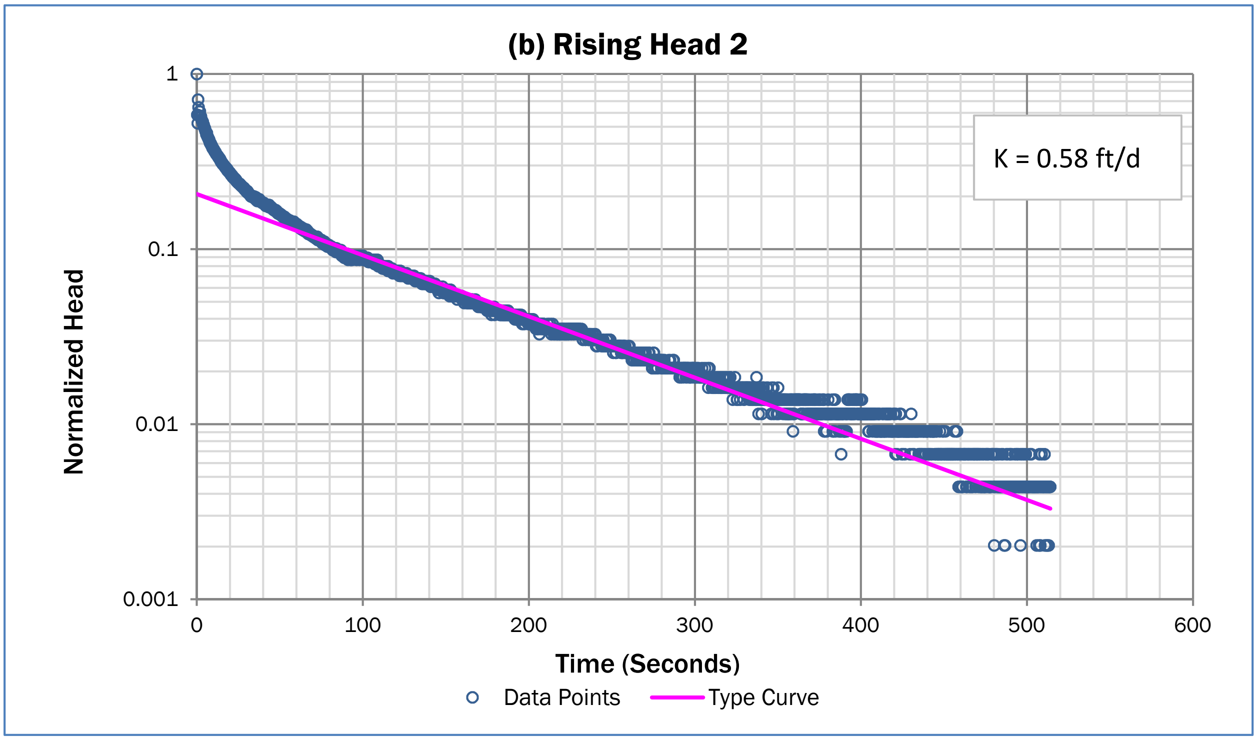
Aquifer Slug Test at MW-7

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 28





Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 10.45 feet.
5. Well is screened from 5 to 15 feet below ground surface.
6. Static water level was 5 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-11_BouwerRice1976.xlxs

Aquifer Slug Test at MW-11

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 29

ATTACHMENT 5

Investigation Derived Waste Disposal Records

~~460422~~ 460423

CWMI 3

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number: WA2000009273
2. Page 1 of 2
3. Emergency Response Phone: (800)424-9300
4. Waste Tracking Number: CWM-2-02182018

5. Generator's Name and Mailing Address
PORT OF ANACORTES
QUIET COVE: 202 O AVENUE
ANACORTES WA 98221

Generator's Site Address (if different than mailing address)

Generator's Phone: (360)299-1957

6. Transporter 1 Company Name: CHEMICAL WASTE MANAGEMENT
U.S. EPA ID Number: ORD089452353

7. Transporter 2 Company Name: UNION PACIFIC RAILROAD
U.S. EPA ID Number: NED001792910

8. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT, INC
17629 CEDAR SPRINGS LANE
ARLINGTON OR 97812-9709

Facility's Phone: (503)454-2643
U.S. EPA ID Number: ORD089452353

9. Waste Shipping Name and Description	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	
	No.	Type			
1. MATERIAL NOT REGULATED BY D.O.T OR327858	6	DM	4800	P	X004
2. MATERIAL NOT REGULATED BY D.O.T. OR327858	4	DM	2400	P	X004
3.					
4.					

13. Special Handling Instructions and Additional Information
1. OR327858- SOIL
2. OR327858- WATER

WMXU 980740

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Brad Te
Signature:
Month 2 Day 20 Year 18

15. International Shipments ☐ Import to U.S. ☐ Export from U.S.
Port of entry/exit:
Transporter Signature (for exports only):
Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Pete Gokan
Signature:
Month 2 Day 21 Year 18

Transporter 2 Printed/Typed Name: Antonio Hernandez
Signature:
Month 2 Day 26 Year 18

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)
U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator)
Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name: Pat Slider
Signature:
Month 5 Day 7 Year 18

GENERATOR
INT'L
TRANSPORTER
DESIGNATED FACILITY

169-BLC-O 6 10498 (Rev. 9/09)

DESIGNATED FACILITY'S COPY

460423

CWM 2

NON-HAZARDOUS WASTE MANIFEST (Continuation Sheet)

19. Generator ID Number WAZ000009273

20. Page 2 of 2

21. Waste Tracking Number CWM-2-02182018

22. Generator's Name PORT OF ANACORTES

23. Transporter 3 Company Name COLUMBIA RIDGE LANDFILL U.S. EPA ID Number ORD987173457

24. Transporter ____ Company Name U.S. EPA ID Number

GENERATOR

25. Waste Shipping Name and Description	26. Containers		27. Total Quantity	28. Unit Wt./Vol.	
	No.	Type			

29. Special Handling Instructions and Additional Information

WMKU 981740

TRANSPORTER

30. Transporter 3 Acknowledgment of Receipt of Materials

Printed/Typed Name Bonnie Shaw Signature B Shaw Month Day Year 13 01 18

31. Transporter ____ Acknowledgment of Receipt of Materials

Printed/Typed Name Signature Month Day Year

DESIGNATED FACILITY

32. Discrepancy

467460

CWMI

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number: N/A
2. Page 1 of 2
3. Emergency Response Phone: [illegible]
4. Waste Tracking Number: [illegible]OA121718-CWM1

5. Generator's Name and Mailing Address

PORT OF ANACORTES
QUIET COVE: 202 O AVENUE
ANACORTES, WA 98221

Generator's Site Address (if different than mailing address)

Generator's Phone: (360)[illegible]

6. Transporter 1 Company Name: CHEMICAL WASTE MANAGEMENT, INC. — U.S. EPA ID Number: ORD089452353

7. Transporter 2 Company Name: UPRR — U.S. EPA ID Number: NED001792910

8. Designated Facility Name and Site Address — U.S. EPA ID Number: ORD089452353

CHEMICAL WASTE MANAGEMENT, INC.
17629 CEDAR SPRINGS LANE
ARLINGTON OR 97812-9709

Facility's Phone: (541)454-2643

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
1.	MATERIAL NOT REGULATED BY D.O.T OR337266	5	DM	2,500	P
2.	MATERIAL NOT REGULATED BY D.O.T OR337263	4	DM	2,600	P
3.					
4.					

13. Special Handling Instructions and Additional Information

1. OR337266-STAB01-RI WATER 4-55g 1-15g
2. OR337263-LF01/STAB01-RI SOIL 3-55g 1-15g

WMKN 970252

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Edward L Jones — Signature: Edward L Jones — Month 1 Day 14 Year 19

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Pete Lavant — Signature: — Month 1 Day 14 Year 19

Transporter 2 Printed/Typed Name: James Ruppert — Signature: — Month 1 Day 16 Year 19

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) — U.S. EPA ID Number:

Facility's Phone:

17c. Signature of Alternate Facility (or Generator) — Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name: Dawn Dingo — Signature: — Month 01 Day 24 Year 19

169-BLC-O 6 10498 (Rev. 9/09)

FACILITY TO EPA'S e-MANIFEST SYSTEM

467460

CWM

NON-HAZARDOUS WASTE MANIFEST
(Continuation Sheet)

19. Generator ID Number N/A

20. Page 2 of 2

21. Waste Tracking Number PO-121718-CWM1

22. Generator's Name PORT OF ANACORTES

23. Transporter 3 Company Name COLUMBIA RIDGE LANDFILL U.S. EPA ID Number ORD987173457

24. Transporter ____ Company Name U.S. EPA ID Number

GENERATOR

25. Waste Shipping Name and Description	26. Containers		27. Total Quantity	28. Unit Wt./Vol.	
	No.	Type			

29. Special Handling Instructions and Additional Information

WMXU 970252

TRANSPORTER

30. Transporter 3 Acknowledgment of Receipt of Materials

Printed/Typed Name Jan L Gabbey Signature Jan L Gabbey Month 1 Day 18 Year 19

31. Transporter ____ Acknowledgment of Receipt of Materials

Printed/Typed Name Signature Month Day Year

DESIGNATED FACILITY

32. Discrepancy

170-BLC-O 6 10502 (Rev. 8/06)

DESIGNATED FACILITY TO GENERATOR

ATTACHMENT 6

Laboratory Data Reports

Not included in this draft. Available upon request.

ATTACHMENT 7
Data Validation Reports

Data Validation Report

Plaza 600 Building, 600 Stewart Street, Suite 1700, Seattle, WA 98101, Telephone: 206.728.2674, Fax: 206.728.2732 www.geoengineers.com

Project: Port of Anacortes – Quiet Cove RIFS
Second groundwater monitoring event

GEI File No: 005147-024-05

Date: April 17, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of groundwater samples collected as part of the Quiet Cove RIFS – second monitoring event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the RI/FS Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18C0320	MW-1_031918, MW-4_031918, MW-8_031918, MW-10_031918, and TRIPBLANK_031918
18C0338	MW-2_032018, DUP-1_032018, MW-3_032018, MW-5_032018, MW-6_032018, MW-7_032018, MW-11_032018, and TRIPBLANK_032018

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA 6020/7470

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, initialed, accurate and complete when submitted to the lab, with the exceptions noted below:

COC and Sample Container Exceptions

- **SDG 18C0320**: The laboratory noted that 3 Trip Blank vials contained large air bubbles, which was taken into consideration during the validation process. Since the trip blank is only used as a test to ascertain whether there was a source of contamination during the transportation process, qualification was determined to be unnecessary in this case. No qualifiers were applied.
- **SDG 18C0338**: The laboratory noted that 3 Trip Blank vials contained large air bubbles, which was taken into consideration during the validation process. Since the trip blank is only used as a test to ascertain whether there was a source of contamination during the transportation process, qualification was determined to be unnecessary in this case. No qualifiers were applied. It was also noted that small bubbles were observed in at least one vial each for Samples MW-5_032018, MW-6_032018, and MW-11_032018. No qualification was required for this size of bubble in the vials.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 18C0320**: One sample cooler temperature was recorded at the laboratory as 1.6° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the following exceptions:

Volatile Organic Compound (VOC) Surrogate Exceptions

- **SDG 18C0320 and 18C0338**: The %R values for 1,2-dichloroethane-d4 were greater than the control limits in Samples MW-4_031918, MW-6_032018, and MW-10_031918. No qualifiers were required as the laboratory used a total of 4 surrogates for each sample. In both cases, there were at least 3 of the 4 surrogates were within the control limits provided by the laboratory. No qualifiers were required.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18C0320**: A Trip Blank was sampled on 3/19/18 and analyzed for Gasoline Range Hydrocarbons and Volatile contaminants. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.
- **SDG 18C0338**: A Trip Blank was sampled on 3/20/18 and analyzed for Gasoline Range Hydrocarbons and Volatile contaminants. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compound (VOC) MS/MSD Exceptions

- **SDG 18C0338**: The laboratory performed a matrix spike on Sample MW-6-032018. The %Rs for m,p-xylene and 1,2-dibromomethane were greater than the control limits in either the MS or the MSD. However, in both cases, the corresponding MS/MSD %R values were within their respective control limits. No qualification was required.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18C0338: One field duplicate sample pair, MW-2-032018 and DUP-1-032018, was submitted with this SDG. The precision criteria for were met for all target analytes.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

No data points were qualified for any reason.

All data are acceptable for the intended use.

REFERENCES

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review,” EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review,” EPA-540-R-10-011. January 2010

Data Validation Report

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Project: Port of Anacortes – Quiet Cove RIFS
September 2017 Upland Sampling Event

GEI File No: 005147-024-05

Date: February 13, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of groundwater samples collected as part of the October/November 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the RI/FS Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
17J0350	MW-3_101817, MW-4_101817, MW-5_101817, MW-6_101817, and MW-7_101817
17K0171	MW-1-110917, DUP-1-110917, MW-2-110917, MW-8-110917, MW-10-110917, MW-11-110917, and TRIP_BLANKS

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA 6020/7470

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, initialed, accurate and complete when submitted to the lab, with the exceptions noted below:

COC and Sample Container Exceptions

- **SDG 17J0350**: The 'Relinquished by:' date of 10-19-2017 was corrected by the laboratory as 10-20-2017. The laboratory noted that 4 bottles were missing labels, and that the 'No. Containers' column was incorrect for MW-4_101817 and MW-7_101817. The quantity of these sample containers were switched, MW-4_101817 should be '13' samples, and MW-7_101817 should be '26' samples.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 17J0350**: One sample cooler temperature was recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.
- **SDG 17K0171**: Two sample cooler temperatures were recorded at the laboratory as 0.3° Celsius and 1.9° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Volatile Organic Compound (VOC) Method Blank Exceptions

- **SDG 17K0171**: There were positive results for m,p-xylene and n-hexane detected above the method detection limit, but below the reporting limit in the groundwater method blank prepared on 11/16/17. The positive results for these compounds were qualified (U) as not-detected only in Sample DUP-1-110917, as this was the only associated sample that reported detections for these analytes below the reporting limits.

  There were positive results for m,p-xylene, o-xylene, and n-hexane detected above the method detection limit, but below the reporting limits in the groundwater method blank prepared on

11/15/17. The positive results for these compounds were qualified (U) as not-detected only in Sample TRIP_BLANKS, as this was the only associated sample that reported detections for these analytes below the reporting limits.

Total Metals Method Blank Exceptions

- **SDG 17J0350**: There was a positive result for arsenic detected above the method detection limit, but below the reporting limit in the method blank digested on 10/26/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 17K0171**: Trip Blank sampled on 11/9/17. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Total Metal MS/MSD Exceptions

- **SDG 17K0171**: The laboratory performed a matrix spike on Sample MW-8-110917. The %R for Total silver was less than the control limits in the MS. The positive results for this silver were qualified as estimated (J) in all samples in this SDG.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 17J0350: (Total Metals) A laboratory duplicate analysis was performed on Sample MW-7_101817. The RPD values for arsenic were greater than the control limits. The positive results for this target analyte was qualified as estimated (J) in all samples in this SDG.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 17K0171: One field duplicate sample pair, MW-1-110917 and DUP-1_110917, was submitted with this SDG. The precision criteria for Total arsenic, Total copper, Total zinc, Total chromium, Total lead, Diesel-range organic and Motor oil were not met for this sample pair. the positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits, with the following exceptions:

SDG 17J0350: (PAHs) The internal standard %R for d10-phenanthrene was less than the control limits in Sample MW-4_101817. The sample was re-extracted and diluted at a factor of 3, and both results were reported. Only the re-extracted results were used for this project, the positive results and reporting limits in the initial analysis were labeled as Do-Not-Report (DNR).

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Miscellaneous

SDG 17J0350: (PAHs) The laboratory reported two sets of results for Sample MW-4-101817. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results all the PAH analytes were labeled as Do-Not-Report (DNR) in the first analysis in order to avoid redundant analyte reporting.

SDG 17K0171: (NWTPH-Dx) The laboratory reported two sets of results for Sample MW-11-110917 because Diesel-range organics exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 10 for all analytes. For this reason, the result of Diesel-range organics was labeled as Do-Not-Report (DNR) in the first analysis and the result of Motor Oil-range organics was labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified as not detected because of method blank contamination. Data were also qualified as estimated because of matrix spikes %R outliers, laboratory duplicate precision outliers, and field duplicate precision outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
DUP-1-110917	Xylene, m-,p-	U	Method Blank Contamination
DUP-1-110917	Xylene, o-	U	Method Blank Contamination
DUP-1-110917	n-Hexane	U	Method Blank Contamination
TRIP_BLANKS	Xylene, m-,p-	U	Method Blank Contamination
TRIP_BLANKS	n-Hexane	U	Method Blank Contamination
MW-1-110917	Diesel-range hydrocarbons	J	Field Duplicate Precision
MW-1-110917	Motor Oil	UJ	Field Duplicate Precision
DUP-1-110917	Diesel-range hydrocarbons	J	Field Duplicate Precision
DUP-1-110917	Motor Oil	J	Field Duplicate Precision

References

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review,” EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review,” EPA-540-R-10-011. January 2010.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove RIFS
September 2017 Upland Sampling Event

GEI File No: 005147-024-05

Date: December 15, 2017

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of soil and sediment samples collected as part of the September 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Ecology-approved Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
17I0184 (Sediments)	GEI-SED1-1-3_091517, GEI-SED1-4-6_091517, and GEI-SED-COMP-1_091517
17I0121 (Soils)	GEI-31-3-5_091117, GEI-31-6-8_091117, GEI-31-13-15_091117, GEI-32-3-4.5_091117, GEI-32-7-9_091117, GEI-32-10-12_091117, and TRIP_BLANK_170911
17I0125 (Soils)	GEI-29-5-7_091217, GEI-29-10-12_091217, GEI-29-13-15_091217, GEI-30-2-4_091217, GEI-30-6-8_091217, GEI-30-9-11_091217, and TRIP_BLANK_170912
17I0146 (Soils)	GEI-41-5-7_091317, GEI-42-1-3_091317, GEI-42-6-8_091317, GEI-43-3-5_091317, GEI-43-5-7_091317, GEI-44-2-4_091317, GEI-44-7-9_091317, and GEI-44-10-12_091317
17I0185 (Soils)	GEI-39-1-3_091517, GEI-39-5-7_091517, GEI-39-8-10_091517, and TRIP_BLANK_170916
17I0266 (Soils)	GEI-38-2-4_091917, GEI-38-5-7_091917, GEI-DUP-2_091917, GEI-38-12-14, GEI-40-2-4_091917, GEI-40-5-7_091917, and GEI-40-12-14_091917

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Semi-volatile Organic Compounds (SVOCs) by Method SW8270D;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA6010A/7471B;
- Total Organic Carbon (TOC) by Method Plumb 1981 (Combustion IR)

- Ammonia by SM4500-NH3
- Sulfides by SM4500-S2 D-00

Materials Testing & Consulting (MT&C) headquartered in Burlington, Washington, performed laboratory analysis on the soil and sediment samples using the following method:

- Grain Size analysis by Puget Sound Estuary Protocols (PSEP)

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exceptions noted below:

Sample Container Exceptions

- **SDG 17I0121:** The laboratory noted that all of the sample containers for the cooler trip blank (sampled on 9/11/17) were received with air bubbles approximately >4 mm in diameter. There were no positive results for any target analytes in the trip blank, therefore all reporting limits were qualified as estimated (UJ) in Sample TRIP_BLANK_170911.
- **SDG 17I0125:** The laboratory noted that archived Sample GEI-29-7-9_091217 (on COC) was received with Sample ID GEI-12-7-9_091217 listed on the sample jar. Samples GEI-29-5-7_091217 and GEO-30-13-15_091217 were both received by the laboratory with incorrect dates on the sample containers.

  There were also discrepencies between the amount of sample containers listed on the COC and amounts actually received:

  GEI-39-13-15_091217 listed 8 containers on COC; received 10

  Trip Blanks listed 0 containers on COC; received 4
- **SDG 17I0266:** The laboratory noted that one of two sample containers for Sample GEI-40-9-11_091917 was received broken. The soil contents of the jar were immediately transferred to a new jar and, collectively, the sample was archived at the laboraroy. No other action was taken other than to note the discrepancy here.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 17I0184:** One sample cooler temperature recorded at the laboratory was 0.5 ° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.
- **SDG 17I0125:** Two sample cooler temperatures were recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.
- **SDG 17I0185:** One sample cooler temperature recorded at the laboratory was 0.5 ° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.
- **SDG 17I0266:** Two sample cooler temperatures were recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Poly-Aromatic Hydrocarbons (PAH) Surrogate Exceptions

- **SDG 17I0266:** The %R values for surrogate dibenzo(a,h)anthracene-d14 were greater than the control limits in Samples GEI-40-2-4_091917 and GEI-40-5-7_091917; however, the samples were both spiked with two additional surrogates, all within the control limits. No action was required for these outliers.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Volatile Organic Compound (VOC) Method Blank Exceptions

- **SDG 17I0121 and 17I0125:** There were positive results for m,p-xylene and n-hexane detected above the method detection limit, but below the reporting limit in the soil method blank extracted on 9/15/17; and there were no positive results for either of these analytes in any of the associated samples; therefore, no qualifications were required.

Semi-Volatile Organic Compound (SVOC) Method Blank Exceptions

- **SDG 16G0026:** There was a positive result for diethyl phthalate detected above the method detection limit, but below the reporting limit in the method blank extracted on 7/25/2016. The positive result for diethyl phthalate was qualified as non-detected (U) in Sample EDP22_16-17.

Total Metals Method Blank Exceptions

- **SDG 17I0184:** There was a positive result for cadmium detected above the method detection limit, but below the reporting limit in the method blank digested on 9/20/2017. The associated field samples, GEI-SED-COMP-1_091517 and GEI-SED1-1-3_091517 also reported positive results at levels less than the reporting limits; therefore, these results were qualified as not-detected (U) in both samples.
- **SDG 17I0121 and 17I0125:** There were positive results for copper, chromium, lead, and zinc detected above the method detection limits, but below the reporting limits in the method blank digested on 9/15/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.
- **SDG 17I0146:** There was a positive result for copper detected above the method detection limit, but below the reporting limit in the method blank digested on 9/18/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.
- **SDG 17I0185:** There was a positive result for cadmium detected above the method detection limit, but below the reporting limit in the method blank digested on 9/20/2017. The associated field sample, GEI-39-8-10_091517 also reported a positive result at a level less than the reporting limit; therefore, this result was qualified as not-detected (U) in this sample.

  There was a positive result for zinc detected above the method detection limit, but below the reporting limit in the method blank digested on 9/21/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 17I0184:** Trip Blank sampled on 9/15/17.
- **SDG 17I0121:** Trip Blank sampled on 9/11/17.
- **SDG 17I0125:** Trip Blank sampled on 9/12/17.
- **SDG 17I0185:** Trip Blank sampled on 9/16/17.

None of the analytes of interest were detected in the trip blanks, with the following exceptions:

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compound (VOC) MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed an MS/MSD on Sample GEI-SED1-4-6 091517. The %R values for 1,2-dibromoethane were less than the control limits in the MS and MSD samples. There was no positive result for this compound in the parent sample; therefore, the reporting limit for this compound was qualified as estimated (UJ) in the parent sample.
- **SDG 17I0266:** The laboratory performed an MS/MSD on Sample GEI-40-2-4_091917. The %R values for ethylbenzene and m,p-xylene were less than the control limits in the MS. However, the %R values for these analytes were acceptable in the corresponding MSD. No qualification was required for this outlier.

Semi-Volatile Organic Compound (SVOC) MS/MSD Exceptions

- **SDG 17I0184:** (SW8270 and SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-SED1-4-6 091517. In both analyses, the %R values for 15 analytes were outside the control limits in the MS and/or MSD samples. Upon inspection it was noted that several of the native concentrations had concentrations that exceeded the calibration range of the instrument. No qualifications were required in either case.
- **SDG 17I0146:** (SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-44-7-9_091317. The %R value for dibenz(a,h)anthracene was greater than the control limits in the MS. However, the %R values for these analytes were acceptable in the corresponding MSD. No qualification was required for this outlier.
- **SDG 17I0266:** (SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-40-2-4_091917. The %R values for phenanthrene, fluoranthene, pyrene, and chrysene were greater than the control limits in the MS/MSD. The positive results for these compounds were qualified as estimated (J) in the parent sample.

Total Metal MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed a matrix spike on Sample GEI-SED1-4-6_091517. The %R for silver was less than the control limits in the MS digested on 9/21/2017. The positive results for this silver were qualified as estimated (J) in all samples in this SDG. The %R for copper was greater than the control limits in the same matrix spike. The positive results for copper were qualified as estimated (J) in all samples in this SDG.
- **SDG 17I0146:** The laboratory performed a matrix spike on Sample GEI-44-7-9_091317. The %R for chromium was greater than the control limits in the MS digested in this sample set. However, the %R values for chromium were acceptable in the corresponding MSD. No qualification was required for this outlier.

- **SDG 17I0266:** The laboratory performed a matrix spike on Sample GEI-40-2-4_091917. The %R values for chromium and copper were greater than the control limits in the MS/MSD digested in this sample set. The positive results for chromium and copper were qualified as estimated (J) in this SDG. The %R values for lead were also outside of the control limits in the MS/MSD digested in this sample set, however, the native sample concentration for lead was greater than 4 times the amount spiked into the sample. No action was required for this outlier.

Petroleum Hydrocarbon (NWTPH-Dx) MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed an MS/MSD on Sample GEI-SED1-4-6_091517. The %R for diesel-range hydrocarbons was less than the control limits in the MSD extracted on 9/20/2017; however, the native sample concentration for diesel-range hydrocarbons was greater than 4 times the amount spiked into the sample. No action was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

PAHs (8270-SIM) LCS/LCSD Exceptions

SDG 17I0121, 17I0125, 17I0146: The %R for dibenz(a,h)anthracene was greater than the control limits in the LCS extracted on 9/21/2017 (#BFI0317). The positive results for dibenz(a,h)anthracene were qualified as estimated (J) in Samples GEI-29-5-7_091217, GEI-43-3-5_091317, and GEI-44-2-4_091317.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 17I0184: (TOC) A laboratory duplicate analysis was performed on Sample GEI-SED1-4-6_091517. The RPD for TOC was greater than the control limit. The positive result for this target analyte was qualified as estimated (J) in all samples in this SDG.

(Total Metals) A laboratory duplicate analysis was performed on Sample GEI-SED1-4-6_091517. The RPD values for cadmium, copper, mercury, and lead were greater than the control limits. The positive results for these target analytes were qualified as estimated (J) in all samples in this SDG.

SDG 17I0266: (Total Metals) A laboratory duplicate analysis was performed on Sample GEI-40-2-4_091917. The RPD values for arsenic, chromium, copper, silver, and lead were greater than the control limits. The positive results for these target analytes were qualified as estimated (J) in all samples in this SDG.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 17I0266: One field duplicate sample pair, GEI-38-5-7_091917 and GEI-DUP-2_091917, was submitted with this SDG. The precision criteria for chromium, lead, and zinc were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008), with the following exceptions:

SDG 17I0184: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed on 9/19/2017. There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

(SVOCs) The %D values for butylbenzyl phthalate were lower than the control limit in the CCAL performed on 9/28/2017. The positive results and reporting limits for this compound were qualified as estimated (J/UJ) in all Samples in this SDG. The %D value for pentachlorophenol was greater than the control limit in this same CCAL. The positive result for pentachlorophenol was qualified as estimated (J) in Sample GEI-SED1-4-6_091517.

Also, the %D value for butylbenzyl phthalate and pentachlorophenol were outside of the control limits in the CCAL performed on 10/4/2017. No qualification was required because this calibration standard was only used for the diluted analytes in the sample.

(SVOC-PAHs) The %D values for hexachlorobenzene were lower than the control limit in the CCAL performed on 9/28/2017. There were no positive results for hexachlorobenzene in any of the associated samples. The reporting limits for hexachlorobenzene were qualified as estimated (UJ) in all Samples in this SDG.

SDG 17I0121, 17I0125, and 17I0146: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed Instrument NT5 (9/18/2017). There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

SDG 17I0185 and 17I0266: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed Instrument NT5 (9/19/2017). There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

Miscellaneous

SDG 17I0184: (SVOCs) The laboratory reported two sets of results for Sample GEI-SED1-4-6_091517 because phenanthrene, fluoranthene, and pyrene exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results of phenanthrene, fluoranthene, and pyrene were were labeled as Do-Not-Report (DNR) in the first analysis and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

(PAH-SIMs) The laboratory reported two sets of results for Sample GEI-SED1-4-6_091517 because 10 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 10 for all analytes. For this reason, the results of the undiluted analytes that exceededcalibration range were were labeled as Do-Not-Report (DNR) in the first analysis and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

SDG 17I0125: *(*PAH-SIMs*)* The laboratory reported three sets of results for Sample GEI-30-6-8_091217 because 12 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 5 for all analytes, and the third analysis was diluted at a factor of 20 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were were labeled as Do-Not-Report (DNR) in the first and second analyses and all other analytes were labeled as Do-Not-Report (DNR) in the third analysis in order to avoid redundant analyte reporting.

SDG 17I0185: *(PAH-SIMs)* The laboratory reported two sets of results for Sample GEI-39-5-7_091517 because 5 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 20 for all analytes, and the first analysis was diluted at a factor of 5 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were were labeled as Do-Not-Report (DNR) in the first analyses and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified as not detected because of method blank contamination. Data were also qualified as estimated because of headspace in the sample container, MS/MSD %R outliers, laboratory duplicate RPD outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
GEI-SED1-1-3_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Silver	J	Matrix Spike
GEI-SED1-1-3_091517	Cadmium	UJ	Method Blank, Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Copper	J	Laboratory Duplicate Precision, Matrix Spike
GEI-SED1-1-3_091517	Mercury	J	Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Butyl benzyl Phthalate	J	Continuing Calibration
GEI-SED1-1-3_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	1,2-Dibromoethane	UJ	Matrix Spike
GEI-SED1-4-6_091517	Butyl benzyl Phthalate	UJ	Continuing Calibration
GEI-SED1-4-6_091517	Cadmium	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Copper	J	Matrix Spike, Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Mercury	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Pentachlorophenol	J	Continuing Calibration
GEI-SED1-4-6_091517	Silver	J	Matrix Spike
GEI-SED1-4-6_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Butyl benzyl Phthalate	UJ	Continuing Calibration
GEI-SED-COMP-1_091517	Cadmium	UJ	Method Blank, Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Copper	J	Matrix Spike, Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Mercury	UJ	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Silver	J	Matrix Spike
GEI-SED-COMP-1_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
TRIP_BLANK_170911	1,2-Dibromoethane	UJ	Sample Preservation
TRIP_BLANK_170911	1,2-Dichloroethane	UJ	Sample Preservation
TRIP_BLANK_170911	Ethylbenzene	UJ	Sample Preservation
TRIP_BLANK_170911	Toluene	UJ	Sample Preservation
TRIP_BLANK_170911	n-Hexane	UJ	Sample Preservation
TRIP_BLANK_170911	Benzene	UJ	Sample Preservation
TRIP_BLANK_170911	Methyl t-butyl ether	UJ	Sample Preservation

TRIP_BLANK_170911	Xylene, m-,p-	UJ	Sample Preservation
TRIP_BLANK_170911	Xylene, o-	UJ	Sample Preservation
GEI-29-5-7_091217	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-43-3-5_091317	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-44-2-4_091317	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-40-2-4_091917	Phenanthrene	J	Matrix Spike
GEI-40-2-4_091917	Fluoranthene	J	Matrix Spike
GEI-40-2-4_091917	Chrysene	J	Matrix Spike
GEI-40-2-4_091917	Pyrene	J	Matrix Spike
GEI-39-8-10_091517	Cadmium	U	Method Blank
GEI-38-12-14	Arsenic	J	Laboratory Duplicate Precision
GEI-38-12-14	Chromium	J	Laboratory Duplicate Precision
GEI-38-12-14	Copper	J	Laboratory Duplicate Precision
GEI-38-12-14	Lead	J	Laboratory Duplicate Precision
GEI-38-12-14	Silver	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Chromium	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Copper	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Lead	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Silver	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Chromium	J	Laboratory Duplicate Precision, Field Duplicate
GEI-38-5-7_091917	Copper	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Lead	J	Laboratory Duplicate Precision, Field Duplicate
GEI-38-5-7_091917	Silver	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Zinc	J	Field Duplicate
GEI-40-12-14_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Chromium	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Copper	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Silver	J	Laboratory Duplicate Precision
GEI-40-2-4_091917	Arsenic	J	Laboratory Duplicate Precision

GEI-40-2-4_091917	Chromium	J	Laboratory Duplicate Precision, Matrix Spike
GEI-40-2-4_091917	Copper	J	Laboratory Duplicate Precision, Matrix Spike
GEI-40-2-4_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-2-4_091917	Silver	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Chromium	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Copper	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Silver	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Chromium	J	Laboratory Duplicate Precision, Field Duplicate
GEI-DUP-2_091917	Copper	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Lead	J	Laboratory Duplicate Precision, Field Duplicate
GEI-DUP-2_091917	Silver	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Zinc	J	Field Duplicate

REFERENCES

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

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U.S. Environmental Protection Agency (USEPA). “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review,” EPA-540-R-10-011. January 2010.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove RIFS
2018 Tier 2 Sediment Sampling Event

GEI File No: 005147-024-05

Date: August 21, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of soil and sediment samples collected as part of the September 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Sampling and Analysis Plan; Quiet Cove Property (GeoEngineers 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18G0186	SED-5-0-0.5, SED-5-2-4, SED-6-0-0.5, SED-7-0-0.5, DUP-1-0-0.5, SED-8-0-0.5, SED-8-3.2-4.5, SED-9-0-0.5, and TRIPBLANK_07162018
18G0206	SED-6-1-3, SED-7-0-1, DUP-2-0-1, SED-9-1.7-2.3, SED-10-2-4, and TRIPBLANK_07172018
18G0215	SED-10-0-0.5 and TRIPBLANK_07182018

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Diesel and Heavy Oil range Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Semi-volatile Organic Compounds (SVOCs) by Method SW8270D;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA6010A/7471B;
- Total Organic Carbon (TOC) by Method Plumb 1981 (Combustion IR)
- Ammonia by SM4500-NH3
- Sulfides by SM4500-S2-D00
- Total Volatile Solids by SM2540 G-97

Materials Testing & Consulting (MT&C) headquartered in Burlington, Washington, performed laboratory analysis on the soil and sediment samples using the following method:

- Grain Size analysis by Puget Sound Estuary Protocols (PSEP)

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exceptions noted below:

Sample Container Exceptions

- **SDG 18G0186**: The laboratory noted that the cooler trip blank (sampled on 7/16/18) was not listed on the COC. Also, the preservative, zinc acetate, was not included on the sample containers for the Sulfide analysis. No action was taken for these oversights, other than to note them in this document.
- **SDG 18G0206**: The laboratory noted that archived Sample SED-10-4-5.7 (on COC) was received with Sample ID SED-10-4-5.6 listed on the sample jars.

  There were also discrepencies between the amount of sample containers listed on the COC and amounts actually received:

  SED-7-0-1 listed 13 containers on COC; received 12

  DUP-2-0-1 listed 11 containers on COC; received 12
- **SDG 18G0215**: The laboratory noted that the cooler trip blank (sampled on 7/18/18) was not listed on the COC. Also, the project name was not included on the COC. No action was taken for these oversights, other than to note them in this document.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exception of cases where coolers were received at temperatures slightly below 2°. It was determined through professional judgment that since the samples were not frozen, these lower temperatures would not affect the analytical results.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Semi-Volatile Organic Compounds (SVOC) Surrogate Exceptions

- **SDG 18G0215:** The %R for surrogate 2,4,6-tribromophenol was less than the control limits in Sample SED-10-0-0.5; however, the sample was spiked with three additional acidic surrogates, all within the control limits. No action was required for this outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Metals Method Blank Exceptions

- **SDG 18G0186, 18G0206, 18G0215:** There were positive results for chromium and lead detected above the method detection limit, but below the reporting limit in the soil method blank digested on 7/27/18; and there were no results less than the reporting limits for either of these metals in any of the associated samples; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18G0186:** Trip Blank sampled on 7/16/18.
- **SDG 18G0206:** Trip Blank sampled on 7/17/18.
- **SDG 18G0215:** Trip Blank sampled on 7/18/18.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compounds (VOC) MS/MSD Exceptions

- **SDG 18G0206**: The laboratory performed an MS/MSD on Sample SED-6-1-3. The %R values for ethylbenzene were less than the control limits in the MS/MSD. There was no positive result for this compound in the parent sample. The reporting limit for ethylbenzene was qualified as estimated (UJ) in Sample SED-6-1-3.

Semi-Volatile Organic Compounds (SVOC) MS/MSD Exceptions

- **SDG 18G0206**: (SW8270 and SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample SED-6-1-3. In both analyses, the %R values for fluoranthene and pyrene were less than the control limits in the MS and/or MSD samples. The positive results for fluoranthene and pyrene were qualified as estimated (J) in Sample SED-6-1-3.

  Also, the RPD values for 2,4-dimethylphenol and benzoic acid exceeded the control limits in this same sample set, demonstrating a lack of precision for these analytes. The positive results for 2,4-dimethylphenol and benzoic acid were qualified as estimated (J) in Sample SED-6-1-3.

  The SIM analysis also performed an MS/MSD on Sample SED-6-1-3. The %R and RPD values for several analytes were outside of the control limits in this sample set. However, these samples were diluted, therefore no qualification was required.

Total Metal MS/MSD Exceptions

- **SDG 18G0206**: The laboratory performed a matrix spike on Sample SED-6-1-3. The %R for chromium was less than the control limits in the MS/MSD sample set. The positive results for chromium were qualified as estimated (J) in all samples in this SDG. Also, the %R for lead and copper were greater than the control limits in the MSD from this sample set. However, the %R value for lead was within the control limits in the corresponding MS, no qualifiers were required for this outlier.

  The RPD value for arsenic was greater than the control limits in the same MS/MSD sample set. The positive results for arsenic were qualified as estimated (J) in all samples in this SDG.

Total Organic Carbon (TOC) Exceptions

- **SDG 18G0186**: The laboratory performed a MS on Sample SED-6-0-0.5. The %R values for TOC was less than the control limits in the MS. The positive result for TOC was qualified as estimated (J) in the parent sample.
- **SDG 18G0206**: The laboratory performed a MS on Sample SED-6-1-3. The %R values for TOC was greater than the control limits in the MS/MSD. The positive result for TOC was qualified as estimated (J) in the parent sample.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

VOCs (8260) LCS/LCSD Exceptions

SDG 18G0215: The %R for methyl tert-butyl ether was less than the control limit in the LCSD extracted on 7/27/2018 (#BGG0688). However, as the %R value for this compound in the corresponding LCS was within the control limits, no action was taken.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 18G0206: (Total Metals) A laboratory duplicate analysis was performed on Sample SED-6-1-3. The RPD values for arsenic, copper, and chromium was greater than the control limits. The positive results for chromium were qualified as estimated (J) in Samples SED-6-1-3, SED-7-0-1, DUP-2-0-1, SED-9-1.7-2.3, and SED-10-2-4.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil/sediment samples is 50 percent, while the control limit for the absolute difference values is twice the reporting limit.

SDG 18G0186: One field duplicate sample pair, SED-7-0-0.5 and DUP-1-0-0.5, was submitted with this SDG. The precision criteria for Total Organic Carbon (TOC), Heavy Oil, copper, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes (total), chrysene, diethyl phthalate, fluoranthene, phenanthrene, and pyrene were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

SDG 18G0206: One field duplicate sample pair, SED-7-0-1 and DUP-2-0-1, was submitted with this SDG. The precision criteria for sulfide, copper, benzoic acid, phenanthrene, and pyrene were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008), with the following exceptions:

SDG 18G0186: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verifications (CCAL) performed on 7/21/2018 and 7/30/2018. The positive results and reporting limits for benzoic acid were qualified as estimated (J/UJ) in all samples in the SDG, with the exception of Sample TRIPBLANK_07162018.

SDG 18G0206: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verifications (CCAL) performed on 7/30/2018 and 8/1/2018. The positive results and reporting limits for benzoic acid were qualified as estimated (J/UJ) in all samples in the SDG, with the exception of Sample TRIPBLANK_07172018.

SDG 18G0215: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verification (CCAL) performed on 8/1/2018. The reporting limit for benzoic acid was qualified as estimated (UJ) in Sample SED-10-0-0.5.

Miscellaneous

SDG 18G0186: *(*PAH-SIMs*)* The laboratory reported two sets of results for Sample SED-9-0-0.5 because fluoranthene and pyrene exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were were labeled as Do-Not-Report (DNR) in the first analyses and all other analytes were labeled as Do-Not-Report (DNR) in the third analysis in order to avoid redundant analyte reporting.

ALL SDGs: *(SVOCs by* 8270*)* Several compounds were reported with the 8270-Full List analysis that were also analyzed by the SIM method. In these cases, the SIM method was chosen for reporting purposes by GeoEngineers. The redundant compounds were were labeled as Do-Not-Report (DNR) from the 8270-Full List analyses in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified because of MS/MSD %R outliers, laboratory and field duplicate precision outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
SED-7-0-0.5	Heavy Oil	J	Field Duplicate Precision
DUP-1-0-0.5	Heavy Oil	J	Field Duplicate Precision
SED-6-1-3	Ethylbenzene	UJ	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	2,4-Dimethylphenol	UJ	Precision (MS/MSD)
SED-6-1-3	Pyrene	J	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	Fluoranthene	J	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	Benzoic Acid	UJ	Precision (MS/MSD)
SED-7-0-0.5	Anthracene	J	Field Duplicate Precision
SED-7-0-0.5	Pyrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(g,h,i)perylene	J	Field Duplicate Precision
SED-7-0-0.5	Fluoranthene	J	Field Duplicate Precision
SED-7-0-0.5	Chrysene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(a)pyrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(a)anthracene	J	Field Duplicate Precision
SED-7-0-0.5	Phenanthrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzofluoranthenes (Total)	J	Field Duplicate Precision
SED-7-0-0.5	Diethyl Phthalate	J	Field Duplicate Precision
DUP-1-0-0.5	Anthracene	J	Field Duplicate Precision
DUP-1-0-0.5	Pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(g,h,i)perylene	J	Field Duplicate Precision
DUP-1-0-0.5	Fluoranthene	J	Field Duplicate Precision
DUP-1-0-0.5	Chrysene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(a)pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(a)anthracene	J	Field Duplicate Precision
DUP-1-0-0.5	Phenanthrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzofluoranthenes (Total)	J	Field Duplicate Precision
DUP-1-0-0.5	Diethyl Phthalate	J	Field Duplicate Precision
SED-5-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-5-2-4	Benzoic Acid	UJ	Calibration (continuing)
SED-6-0-0.5	Benzoic Acid	UJ	Calibration (continuing)

SED-6-1-3	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-1	Benzoic Acid	UJ	Calibration (continuing)
SED-8-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-8-3.2-4.5	Benzoic Acid	UJ	Calibration (continuing)
SED-9-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-9-1.7-2.3	Benzoic Acid	UJ	Calibration (continuing)
SED-10-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-10-2-4	Benzoic Acid	UJ	Calibration (continuing)
DUP-1-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
DUP-2-0-1	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-1	Benzoic Acid	J	Field Duplicate Precision
SED-7-0-1	Phenanthrene	J	Field Duplicate Precision
SED-7-0-1	Pyrene	J	Field Duplicate Precision
DUP-2-0-1	Benzoic Acid	UJ	Field Duplicate Precision
DUP-2-0-1	Phenanthrene	J	Field Duplicate Precision
DUP-2-0-1	Pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Copper	J	Field Duplicate Precision
DUP-2-0-1	Arsenic	J	Lab Precision
DUP-2-0-1	Chromium	J	Lab precision, MS/MSD accuracy
DUP-2-0-1	Copper	J	Lab Precision, Field Duplicate
SED-10-2-4	Arsenic	J	Lab Precision
SED-10-2-4	Chromium	J	Lab precision, MS/MSD accuracy
SED-10-2-4	Copper	J	Lab Precision
SED-6-1-3	Arsenic	J	Lab Precision
SED-6-1-3	Chromium	J	Lab precision, MS/MSD accuracy
SED-6-1-3	Copper	J	Lab Precision
SED-7-0-0.5	Copper	J	Field Duplicate
SED-7-0-1	Arsenic	J	Lab Precision
SED-7-0-1	Chromium	J	Lab precision, MS/MSD accuracy
SED-7-0-1	Copper	J	Lab Precision, Field Duplicate
SED-9-1.7-2.3	Arsenic	J	Lab Precision

SED-9-1.7-2.3	Chromium	J	Lab precision, MS/MSD accuracy
SED-9-1.7-2.3	Copper	J	Lab Precision
SED-7-0-1	Sulfide	J	Field Duplicate
DUP-2-0-1	Sulfide	J	Field Duplicate

References

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

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Data Validation Report

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Project: Port of Anacortes – Quiet Cove Property, Supplemental Data Collection
October 2018 Groundwater Samples

GEI File No: 05147-024-06

Date: November 29, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of groundwater samples collected as part of the October 2018 sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Property (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, 2017a) and Inorganic Superfund Methods Data Review (USEPA, 2017b) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property (GeoEngineers, 2017a), the Final Sampling and Analysis Plan, Quiet Cove Property (GeoEngineers, 2017b), and the Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site (GeoEngineers, 2018), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method and Trip Blanks
- Matrix Spikes/Matrix Spike Duplicates

- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Field Duplicates
- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Reporting Limits
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18J0501	MW-4_102918, MW-6_102918, MW-8_102918, MW-10_102918
18J0516	MW-3_103018, MW-7_103018, MW-12_103018, DUP-1_103018,
18J0533	MW-1_103118, MW-2_103118, MW-5_103118, MW-11_103118, TB_103118

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the groundwater samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx (with separate Silica Gel analysis);
- BTEX Compounds by Method SW8260C
- Nitrate and Sulfate by Method EPA 300.0
- Manganese by Method EPA6020
- Ferrous Iron by Standard Method SM3500FeB
- Methane by Method RSK-175
- Alkalinity as $CaCO_3$ by Standard Method SM2320B

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exception noted below:

SDG 18J0501: The laboratory noted that no trip blank was received by the laboratory; even though there was a sample with an ID of TB-102918 listed on the COC.

Also, several sample VOA vials were received with small bubble in the bottle. It was determined that the sample analyses were not affected by these bubbles as the laboratory had other viable sample containers.

SDG 18J0533: Several sample VOA vials were received with small bubble in the bottle. It was determined that the sample analyses were not affected by these bubbles as the laboratory had other containers to take samples from.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with minor exceptions where the samples were taken directly to the laboratory with 24 hours. Established holding times were met for all analyses, with the exceptions below:

SDG 18J0501: (VOCs) The ferrous iron holding time of 24 hours was exceeded for Sample MW-4_102918 by one hour. The positive result for ferrous iron was qualified as estimated (J) in this sample.

SDG 18J0516: (VOCs) The ferrous iron holding time of 24 hours was exceeded for Sample MW-3_103018, MW-12_103018, and DUP-1_103018 by one to two hours. The positive result for ferrous iron were qualified as estimated (J) in these samples.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below:

Metals (Manganese) Method Blank Exceptions

- **SDG 18J0501:** There was a positive result for manganese detected above the method detection limit, but below the reporting limit in the method blank digested on 11/1/2018. The associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.
- **SDGs 18J0516 and 18J0533:** There was a positive result for manganese detected above the method detection limit, but below the reporting limit in the method blank digested on 11/2/2018. The associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18J0533:** Trip Blank sampled on 10/31/2018.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exception noted below.

BTEX Compound MS/MSD Exceptions

- **SDG 18J0533:** The laboratory performed an MS/MSD on Sample MW-11_103118. The %R for benzene was less than the control limit in the MS extracted on 11/1/2018; however, the %R for this target analyte was within the control limits in the corresponding MSD. No qualification was required for this outlier.

Methane MS/MSD Exceptions

- **SDG 18J0516:** The laboratory performed an MS/MSD on Sample MW-3_103018. The %R values for methane were greater than the control limits in the MS/MSD analyzed on 11/1/2018; however, the native sample concentration was greater than 4 times the amount spiked into the sample. No qualification was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18J0516: One field duplicate sample pair, MW-12_103018 and DUP-1_103018, were submitted with this SDG. The precision criteria for all target analytes were met in these sample pairs, no precision qualifiers were required.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Reporting Limits

The contract required quantitation limits (CRQL) were met by the laboratory for the target analytes throughout this sampling event, with some exceptions where the CRQL was elevated due to required sample dilution.

Miscellaneous

Petroleum Hydrocarbons (NWTPH-Dx)

- SDG 18J0533: The laboratory reported two sets of results for Sample MW-11_103118 (non silica-gel cleaned), an initial and a dilution (2X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values.

Data were qualified as estimated because holding time outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
MW-4_102918	Ferrous iron	J	Holding time outlier

MW-3_103018	Ferrous iron	J	Holding time outlier
MW-12_103018	Ferrous iron	J	Holding time outlier
DUP-1_103018	Ferrous iron	J	Holding time outlier
MW-11_103018	Diesel-range hydrocarbons	DNR	Initial analysis
MW-11_103018	Lube oil-range hydrocarbons	DNR	2X dilution

References

U.S. Environmental Protection Agency (USEPA), 2009 “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA), 2017a. “Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review,” EPA-540-R-2017-002. January 2017.

U.S. Environmental Protection Agency (USEPA), 2017b. “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review,” EPA-540-R-2017-001. January 2017.

GeoEngineers, 2017a. “Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2017b. “Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2018. “Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. October 1, 2018.

Data Validation Report

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Project:	Port of Anacortes – Quiet Cove Property, Supplemental Data Collection October 2018 Soil Samples
GEI File No:	05147-024-06
Date:	November 19, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of soil samples collected as part of the October 2018 sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Property (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, 2017a) and Inorganic Superfund Methods Data Review (USEPA, 2017b) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property (GeoEngineers, 2017a), the Final Sampling and Analysis Plan, Quiet Cove Property (GeoEngineers, 2017b), and the Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site (GeoEngineers, 2018), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method and Trip Blanks
- Matrix Spikes/Matrix Spike Duplicates

- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Field Duplicates
- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Reporting Limits
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18J0352	SD-1-2-4, SD-1-5-6.5, SD-1-10-12, SD-1-13-15, SD-1-17-19, SD-2-2-3, SD-2-6-8, SD-2-11-12, SD-2-14-15, SD-3-2.5-3.5, SD-3-7-8.5, SD-3-12-13, SD-7-1-2, SD-7-2-3.5, SD-7-9-10, SD-7-15-16.5, SD-7-18.5-20, SD-8-2-4, SD-8-6-8, SD-8-9-11, SD-8-13-15, TRIPBLANK_101718
18J0365	MW-12-3-4, MW-12-7.5-9.5, MW-12-11-12, MW-12-14-15, SD-4-2.5-3.5, SD-4-6.5-7.5, SD-4-12-13, SD-DUP-1, SD-5-0.5-2, SD-5-5-6, SD-5-9-10, SD-6-1-2, SD-6-4-5, SD-6-6-7, SD-DUP-2, SD-6-9-10, SD-9-2.5-4, SD-10-4-5, TRIPBLANK_101818

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM; and
- Total Metals by Methods EPA6020A/7471B

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exception noted below:

SDG 18J0352: The laboratory noted that for Sample SD-7-1-2 the COC listed eight sample containers; however, nine sample containers were received by the laboratory.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius.

SDG 18J0352: (VOCs) The laboratory noted that for Sample TRIPBLANK_101718 all sample vials submitted were received with bubbles. The reporting limits for the VOC target analytes were qualified as estimated (UJ) in this sample, due to possible loss of analyte concentration.

SDG 18J0365: (NWTPH-Gx and VOCs) The laboratory noted that for Sample TRIPBLANK_101818 all sample vials submitted were received with bubbles. The reporting limits for gasoline-range hydrocarbons and the VOC target analytes were qualified as estimated (UJ) in this sample, due to possible loss of analyte concentration.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Volatile Organic Compounds (VOCs) Surrogate Exceptions

- **SDG 18J0352:** The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-1-5-6.5. The positive results for benzene, ethylbenzene, m,p-Xylene, and o-Xylene were qualified as estimated (J) in this sample. There were no positive results for toluene in this sample; therefore, no qualification was required.

  The %R values for surrogates 4-Bromofluorobenzene and toluene-d8 were greater than the control limits in Sample SD-1-10-12. There were no positive results for the VOC target analytes in this sample; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-2-6-8. The positive results for benzene, ethylbenzene, m,p-Xylene, o-Xylene, and toluene were qualified as estimated (J) in this sample.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Samples SD-3-7-8.5 and SD-3-12-13. The positive results for benzene, ethylbenzene, m,p-Xylene, and toluene were qualified as estimated (J) in these samples. There were no positive results for o-Xylene in these samples; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Samples SD-8-2-4 and SD-8-6-8. There were no positive results for the VOC target analytes in these samples; therefore, no qualifications were required.

- **SDG 18J0365:** The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample MW-12-7.5-9.5. There were no positive results for the VOC target analytes in this sample; therefore, no qualifications were required.

  The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-4-6.5-7.5. The positive results for ethylbenzene, m,p-Xylene, and toluene were qualified as estimated (J) in this sample. There were no positive results for benzene and o-Xylene in this sample; therefore, no qualifications were required.

  The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-10-4-5; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

  The %R for surrogate 4-Bromofluorobenzene was less than the control limits in Sample SD-9-2.5-4; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

  The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample MW-12-11-12. The positive results for benzene, m,p-Xylene, and toluene were qualified as estimated (J) in this sample. There were no positive results for ethylbenzene and o-Xylene in this sample; therefore, no qualifications were required.

Polycyclic Aromatic Hydrocarbons (PAHs) Surrogate Exceptions

- **SDG 18J0365:** The %R for surrogate 2-Methylnaphthalene-d10 was less than the control limits in Sample SD-10-4-5; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Polycyclic Aromatic Hydrocarbons (PAHs) Method Blank Exceptions

- **SDG 18J0352:** There was a positive result for 1-Methylnaphthalene and 2-Methylnaphthalene detected above the method detection limit, but below the reporting limit in the method blank extracted on 10/22/2018. The associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

- **SDG 18J0365:** There was a positive result for 2-Methylnaphthalene, anthracene, and pyrene detected above the method detection limit, but below the reporting limit in the method blank extracted on 10/23/2018. The positive result for 2-Methylnaphthalene was qualified as non-detected (U) in Sample MW-12-14-15. The remaining associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18J0352:** Trip Blank sampled on 10/17/2018.
- **SDG 18J0365:** Trip Blank sampled on 10/18/2018.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exception noted below.

Petroleum Hydrocarbons (NWTPH-Dx) MS/MSD Exceptions

- **SDG 18J0365:** The laboratory performed an MS/MSD on Sample SD-9-2.5-4. The %R for diesel-range hydrocarbons was less than the control limits in the MS extracted on 10/26/2018; however, the %R for this target analyte was within the control limits in the corresponding MSD. No qualification was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compounds (VOCs) LCS/LCSD Exceptions

- **SDG 18J0352**: The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0813); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

  The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0814); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

- **SDG 18J0365**: The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0813); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

  The %R for methyl tert-butyl ether was greater than the control limits in the LCSD extracted on 10/26/2018 (#BGJ0884); however, the %R for this target analyte was within the control limits in the corresponding LCS. No action was required for this outlier.

Polycyclic Aromatic Hydrocarbons (PAHs) LCS/LCSD Exceptions

- **SDG 18J0365**: The %R for 1-Methylnaphthalene was less than the control limits in the LCS extracted on 10/23/2018. The positive results for 1-Methylnaphthalene were qualified as estimated (J) in Samples MW-12-3-4, MW-12-7.5-9.5, MW-12-11-12, MW-12-14-15, SD-9-2.5-4, and SD-10-4-5.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18J0365: Two field duplicate sample pairs, SD-4-12-13/SD-DUP-1 and SD-6-6-7/DUP-2, were submitted with this SDG. The precision criteria for the target analytes were met in these sample pairs, with the exception of gasoline-range hydrocarbons in Samples SD-4-12-13 and SD-DUP-1. The positive result and reporting limit for this target analyte were qualified as estimated (J and UJ, respectively) in this sample pair.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits, with the following exceptions:

Volatile Organic Compounds (VOCs) Internal Standards Exceptions

- SDG 18J0352: The internal standard recovery for d4-1,4-Dichlorobenzene was outside the control limits in Sample SD-2-6-8. The corresponding analytes for this internal standard were not reported target analytes for this sample; therefore, no qualification was required.
- SDG 18J0365: The internal standard recovery for d4-1,4-Dichlorobenzene was outside the control limits in Samples SD-9-2.5-4 and SD-10-4-5. The corresponding analytes for this internal standard were not reported target analytes for these samples; therefore, no qualifications were required.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a), with the following exceptions:

Volatile Organic Compounds (VOCs) CCALs Exceptions

- SDG 18J0352: The %D value for benzene was greater than the control limit in the continuing calibration verification (CCAL) performed on 10/24/2018. The positive results for benzene were qualified as estimated (J) in Samples SD-1-2-4, SD-2-2-3, SD-2-11-12, SD-2-14-15, SD-3-2.5-3.5, SD-7-1-2, and SD-7-2-3.5. There were no positive results for this analyte in Samples SD-1-10-12, SD-1-17-19, SD-7-18.5-20, SD-8-2-4, SD-8-6-8, SD-8-9-11, and SD-8-13-15; therefore, no qualifications were required.
- SDG 18J0365: The %D value for benzene was greater than the control limit in the continuing calibration verification (CCAL) performed on 10/24/2018. The positive result for benzene was

qualified as estimated (J) in Sample SD-5-5-6. There were no positive results for this analyte in Samples SD-4-12-13, SD-DUP-1, and SD-5-9-10; therefore, no qualifications were required.

Reporting Limits

The contract required quantitation limits (CRQL) were met by the laboratory for the target analytes throughout this sampling event, with some exceptions where the CRQL was elevated due to required sample dilution.

Miscellaneous

Gasoline-range Hydrocarbons (NWTPH-Gx)

- SDG 18J0352: The laboratory reported two sets of results for Samples SD-1-5-6.5, SD-3-2.5-3.5, SD-3-7-8.5, SD-8-2-4, and SD-8-6-8, an initial and a dilution (500X, 1000X, or 2000X, depending on the sample), because the results for gasoline-range hydrocarbons exceeded the linear calibration range in the initial samples. The initial reported results for gasoline-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- SDG 18J0365: The laboratory reported two sets of results for Sample MW-12-11-12, an initial and a dilution (500X), because the result for gasoline-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for gasoline-range hydrocarbons was labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Petroleum Hydrocarbons (NWTPH-Dx)

- SDG 18J0352: The laboratory reported two sets of results for Sample SD-3-12-13, an initial and a dilution (2X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- SDG 18J0365: The laboratory reported two sets of results for Sample SD-10-4-5, an initial and a dilution (50X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Volatile Organic Compounds (VOCs)

- SDG 18J0352: The laboratory reported two sets of results for Sample SD-1-5-6.5 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The sample was re-analyzed with similar %R for the surrogate; however, the %D for benzene was within the control limit in the CCAL in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

  The laboratory reported two sets of results for Sample SD-2-6-8 because the %R values for surrogates 4-Bromofluorobenzene and toluene-d8 were greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The sample was re-analyzed with %R for the surrogate toluene-d8 and the %D for benzene in the CCAL within the control limits in the second analysis. For this reason, the results from the first analysis were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Samples SD-3-7-8.5 and SD-3-12-13 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The samples were re-analyzed with similar %R for the surrogate; however, the %D for benzene was within the control limit in the CCAL in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- SDG 18J0365: The laboratory reported two sets of results for Samples MW-12-7.5-9.5 and SD-4-6.5-7.5 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits in the first analysis. The samples were re-analyzed with similar %R for the surrogate in the second analysis. For this reason, the results from the second analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

  The laboratory reported two sets of results for Sample SD-9-2.5-4 because the %R for surrogate 4-Bromofluorobenzene was less than the control limits and the internal standards for 1,4-Dichlorobenzene-d4 and chlorobenzene-d5 were outside the control limits in the first analysis. The sample was re-analyzed with similar %R for the surrogate and the internal standard 1,4-Dichlorobenzene-d4; however, the %R for internal standard chlorobenzene-d5 was within the control limit in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

  The laboratory reported two sets of results for Sample SD-10-4-5 because the results for m,p-Xylene and n-Hexane exceeded the linear calibration range and the %R values for surrogates 1,2-Dichloroethane-d4 and 4-Bromofluorobenzene were greater than the control limits in the first analysis. The sample was re-analyzed with m,p-Xylene and n-Hexane within the calibration range and the %R for surrogate 1,2-Dichloroethane-d4 was within the control limits. For this reason, the results from the first analysis were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Polycyclic Aromatic Hydrocarbons (PAHs)

- SDG 18J0352: The laboratory reported two sets of results for Sample SD-7-1-2, an initial and a dilution (5X), because the results for five analytes exceeded the linear calibration range in the initial sample. The initial reported results for the five analytes that exceeded calibration range and the dilution report results for all other PAH target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

  The laboratory reported two sets of results for Sample SD-7-2-3.5, an initial and a dilution (3X), because the result for 2-Methylnaphthalene exceeded the linear calibration range in the initial sample. The initial reported result for 2-Methylnaphthalene and the dilution reported results for all other PAH target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- SDG 18J0365: The laboratory reported two sets of results for Sample MW-12-7.5-9.5, an initial and a dilution (10X), because the results for 1-Methylnaphthalene and 2-Methylnaphthalene exceeded the linear calibration range in the initial sample. The initial reported results for 1-Methylnaphthalene and 2-Methylnaphthalene and the dilution report results for all other PAH target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values, with the exceptions noted above.

Data were qualified as non-detected because of method blank contamination. Data were also qualified as estimated because of bubbles in the sample containers, surrogate and LCS %R outliers, field duplicate RPD outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
SD-1-2-4	Benzene	J	CCAL %D
SD-1-5-6.5	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	o-Xylene	J	Surrogate Recovery
SD-2-2-3	Benzene	J	CCAL %D
SD-2-6-8	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	o-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-2-11-12	Benzene	J	CCAL %D
SD-2-14-15	Benzene	J	CCAL %D
SD-3-2.5-3.5	Benzene	J	CCAL %D
SD-3-7-8.5	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-3-12-13	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-4-6.5-7.5	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-4-12-13	Gasoline-range hydrocarbons	J	Field Duplicate RPD
SD-DUP-1	Gasoline-range hydrocarbons	UJ	Field Duplicate RPD
SD-5-5-6	Benzene	J	CCAL %D

SD-7-1-2	Benzene	J	CCAL %D
SD-7-2-3.5	Benzene	J	CCAL %D
SD-9-2.5-4	1-Methylnaphthalene	J	LCS Recovery
SD-10-4-5	1-Methylnaphthalene	J	LCS Recovery
MW-12-3-4	1-Methylnaphthalene	J	LCS Recovery
MW-12-7.5-9.5	1-Methylnaphthalene	J	LCS Recovery
MW-12-11-12	1-Methylnaphthalene	J	LCS Recovery
	Benzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
MW-12-14-15	1-Methylnaphthalene	J	LCS Recovery
	2-Methylnaphthalene	U	Method Blank Contamination
TRIPBLANK_101718	All VOC target analytes	UJ	Sample Preservation
TRIPBLANK_101818	Gasoline-range hydrocarbons	UJ	Sample Preservation
	All VOC target analytes	UJ	Sample Preservation

References

U.S. Environmental Protection Agency (USEPA), 2009 “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

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U.S. Environmental Protection Agency (USEPA), 2017b. “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review,” EPA-540-R-2017-001. January 2017.

GeoEngineers, 2017a. “Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2017b. “Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2018. “Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. October 1, 2018.

ATTACHMENT 8

Supplemental Investigation Work Plan Addendum

GEOENGINEERS

2101 4th Avenue, Suite 950 Seattle, Washington 98121 P: 206.278.2674 www.geoengineers.com

Memorandum

To: Arianne Fernandez – Washington State Department of Ecology

From: John Herzog and Brian Tracy – GeoEngineers, Inc.

cc: Brenda Treadwell and Brad Tesch – Port of Anacortes

Date: October 1, 2018

File: 5147-024-06

Subject: Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington

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This memorandum provides an addendum to the Quiet Cove Remedial Investigation/Feasibility Study (RI/FS) Work Plan (GeoEngineers 2017a) and Sampling and Analysis Plan (SAP; GeoEngineers 2017b) for the Quiet Cove Site (Site). This Work Plan Addendum is being provided on behalf of the Port of Anacortes (Port) and describes supplemental soil and groundwater sample collection and chemical analysis activities that will be completed at the Site. This Work Plan addendum has been prepared to collect supplemental data utilizing procedures specified in the RI/FS Work Plan.

The supplemental sample collection and chemical analysis described in this Work Plan addendum is being performed to further characterize soil and groundwater conditions at the Site. To date, limited data have been collected from the interior area of the Site near the potential tank sources. The majority of the upland investigation has focused on defining the outer limits of contamination. Results of the RI field study completed to date indicate the presence of petroleum contamination, including free product, in the northern portion of the Quiet Cove property. Based on review of the existing data, supplemental data items have been identified that can better define the nature and extent of contamination, help identify appropriate remedial action levels and overall, inform the disproportionate cost analysis and remedial alternative selection for the Site.

The new data will supplement the existing soil and groundwater RI field study. The supplemental field investigation described in this Work Plan Addendum will provide data to help refine the selection of cleanup actions in the upland portion of the Site. The Port has coordinated with Washington State Department of Ecology (Ecology) for this work primarily through emails, phone calls and review of the existing data for the Site.

The supplemental data collection described in this Work Plan Addendum includes the collection of subsurface soil samples from eleven (11) new locations and up to three (3) quarterly groundwater monitoring events.

BACKGROUND

The Site is subject to formal cleanup under the regulatory authority of Ecology. The Site is generally located at 202 O Avenue in Anacortes, Washington. The Property consists of three parcels containing a total acreage of approximate 0.82 acres. The boundaries of the Site will be defined by the extent of contamination caused by the historical release of hazardous substances.

An initial RI field study of the upland area and the marine area was completed. As required by the Agreed Order a Data Report Technical Memorandum is being developed to document the findings of the RI field study. This document is in progress and will include the upland and marine area field study results.

Upland Area Remedial Investigation Field Study

The soil and groundwater portion of the RI field study was completed in accordance with the approved RI/FS Work Plan. Soil sampling was completed in September 2017. Additional monitoring wells were constructed and developed along with the soil sampling. Groundwater monitoring was completed during a dry season event in October/November 2017 and a wet season event in March 2018. The initial analytical results of the RI field study were submitted to Ecology via email on December 28, 2017. A hydrogeologic study was completed in October and November 2017 per the RI/FS Work Plan to evaluate tidal influence and determine the hydraulic conductivity and groundwater flow direction throughout the Site.

Marine Area Remedial Investigation Field Study

In September 2017 Tier 1 composite sediment samples were collected in the beach area of the Site in accordance with the RI/FS Work Plan. Analytical results of the upland soil samples adjacent to the beach and the composite sediment samples triggered the need to collect additional sediment data. The Tier 2 sediment sampling scope was determined through discussions with Ecology and field work was completed in July 2018. Results from this Tier 2 sediment sampling are forthcoming.

SUPPLEMENTAL SOIL SAMPLING AND ANALYSIS

Additional soil sampling and analysis is being proposed to further characterize contaminated soil in the upland area of the Site. The proposed sample locations are presented in Figure 1. The additional sampling and analysis activities include:

- A total of eleven (11) soil core sampling locations and collection of samples for analysis.
- Ten (10) core locations completed using direct-push drilling (DP) methods.
- One (1) core location completed using hollow-stem auger drilling methods.

The soil sample collection and analysis that will be completed as part of this Work Plan Addendum is summarized in the following sections.

Soil Sample Collection and Processing

Similar to the previous RI field study, DP borings for obtaining soil samples will be drilled using a truck-mounted direct-push drilling rig. It is anticipated that the DP borings at the Site will be advanced at least 3 feet into the native soil or to approximately 15 feet below ground surface (bgs), whichever occurs first. If evidence of petroleum contamination is observed, the boring will be advanced to at least 3 feet below the observed depth of contamination, or until refusal. DP borings will be completed by a licensed driller in the State of Washington. A representative from GeoEngineers' staff will be present to examine and classify the soils encountered and prepare a detailed boring log of each exploration. Continuous soil samples in 2-foot intervals will be obtained from the DP borings using a "macrocore" sampler or equivalent in direct pushes up to 5 feet in length. Push length may be reduced if recovery is poor. Soil from each sample interval will be visually classified, field screened and logged in the same manner in accordance with the RI/FS Work Plan.

Similar to the initial RI field study, hollow-stem auger (HSA) borings for obtaining soil samples will be drilled using a truck-mounted HSA drilling rig. It is anticipated that the HSA borings at the Site will be advanced at least 3 feet into the native soil or to approximately 15 feet bgs, whichever occurs first. Soil samples will be obtained from the HSA borings on a 2.5-foot interval using a 2.5-inch-diameter split-barrel sampler or equivalent. The sampler will be advanced a maximum of 18 inches at each sample interval. The number of hammer blows to advance the sampler will be recorded on a boring log across 6-inch intervals.

Using the same approach as the initial RI field study, samples will be collected that are representative of contaminated or potentially contaminated materials and/or different material types. A minimum of three soil samples will be retained from each boring for laboratory analysis. Samples collected from the borings not submitted for chemical analysis will be archived for potential follow-up testing.

For each full-length core (SD-1 through SD-8 and MW-12) samples will be collected for analysis at up to four (4) separate intervals as summarized in Table 1. The samples intervals for collection and analysis include:

- Non-saturated fill material that overlays contaminated soils;
- Soil with the highest photoionization detector (PID) reading and/or evidence of petroleum contamination;
- Saturated fill material at the water table level; and
- Native material without evidence of petroleum contamination and at least 1 foot below the fill/native soil interface.

Based on previous studies at the Site it is possible that the interval with the highest PID reading may also be at the water level. In this case the interval below the water level would be collected and analyzed.

For the two (2) shallow cores (SD-9 and SD-10) the cores will be penetrated to approximately 4 feet bgs. One sample interval from 0 to 2 feet bgs will be collected for analysis at each location as detailed in Table 1.

Sample intervals will be individually homogenized and placed into the appropriate laboratory-supplied sample containers. Samples for volatile analysis (i.e., gasoline and/or volatile organic compounds [VOCs]) will be collected from the center of the sampling interval from undisturbed soil sample prior to homogenization using U.S. Environmental Protection Agency (EPA) Method 5035A sampling procedures consistent with Ecology guidance to reduce volatilization and biodegradation of the sample constituents. Immediately upon collection of the samples, the samples will be placed into a cooler with ice and logged on the chain-of-custody using quality assurance and control procedures in accordance with the RI/FS Work Plan.

Soil Sample Laboratory Analysis

Soil samples will be submitted to Analytical Resources Inc. (ARI) of Tukwila, Washington, for chemical analysis. Table 1 identifies the proposed sample locations, target sample horizons, laboratory analysis and rationale for the data that will be collected to further characterize the nature and extent of contamination of soil in the primary source area of the Site. Table 2 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient material will be collected from each sample interval to perform each of the listed analysis in accordance with the RI/FS Work Plan and SAP. Selected soil samples as identified in Table 1 will be submitted for a combination of the following:

- Gasoline-range total petroleum hydrocarbons (TPH) by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx;
- BETX by EPA 8260;
- Ethylene dibromide (EDB), ethylene dichloride (EDC), methyl tert-butyl ether (MTBE) and n-Hexane by EPA 8260;

- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA 6000/7000;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA 8270-SIM; and/or
- Naphthalenes by EPA 8270-SIM.

SUPPLEMENTAL GROUNDWATER MONITORING

Additional groundwater monitoring is being proposed to further characterize groundwater at the Site. The proposed sample locations are presented in Figure 1. The additional groundwater monitoring activities include:

- Construction and development of one (1) new permanent monitoring well for groundwater sampling and analysis.
- Installation of two (2) pre-pack monitoring wells using DP drilling methods for measurement of potential product in groundwater.
- Groundwater monitoring of ten (10) monitoring wells for up to three (3) rounds on a quarterly basis. Each quarter will include:
    - Water and product level measurements;
    - Sampling and analysis of a combination of VOCs and TPH in groundwater;
    - Comparison of TPH analyses with and without silica gel cleanup (first round only); and
    - Sampling and analysis of geochemistry parameters to evaluate potential for natural attenuation of contaminants in groundwater.

The groundwater monitoring activities that will be completed as part of this Work Plan Addendum are summarized in the following sections.

Monitoring Well Construction

A new monitoring well will be constructed following soil sampling and processing at MW-12 (see Figure 1). Monitoring well construction will follow the same procedures completed for the RI field study. Drilling and construction of the monitoring well will be conducted by a Washington State licensed driller in general accordance with the Minimum Standards for Construction and Maintenance of Wells (Washington Administrative Code [WAC] 173-160). It is anticipated that the monitoring wells will be completed at least 5 feet below the observed water level at the time of drilling. Installation of the monitoring wells will be observed by a GeoEngineers representative who will maintain a detailed log of the materials observed and depths of the wells. Monitoring well borings will be drilled using a truck mounted HSA drill rig or similar equipment. Soil cuttings from borings completed for the monitoring well installation will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

The monitoring well will be constructed of 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010-inch). The top of the well screens will be located approximately 5 feet above the observed groundwater level, or within 3 feet of the ground surface, whichever is deeper. The well screen intervals may be modified based on field screening results or variations in soil type. Screened intervals of approximately 10 feet (ft) length are anticipated.

Following placement of the well screen and casing in the borehole, a filter pack will be installed around the well screen. The filter pack will extend from the bottom of the well to approximately 2 feet above the top of the well screen. It is anticipated that filter pack material will consist of commercially prepared 10-20 silica sand. However, an alternate sand size/gradation may be used to minimize the turbidity of water entering the wells depending on the materials observed at the time of drilling.

A bentonite annular seal at least 1-foot thick will be placed above the sand pack to a depth of about 1-foot bgs. Each well will be completed with a concrete surface seal, and either a flush-mount or above-ground steel or aluminum monument. The monument will be cemented in place from the surface to a depth of about 1-foot bgs.

Monitoring Well Development

Monitoring well development will follow the same procedures that were utilized in the initial RI field study. Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. The well screen interval will be gently surged with a decontaminated bailer or surge block and the well will be purged of water.

Development will continue until a minimum of five casing volumes of water have been removed and turbidity of the discharged water is relatively low. The goal of well development will be to reduce the turbidity content of the water to approximately 10 nephelometric turbidity unit (NTU) if practical. Up to 10 well volumes of water will be removed from the wells in an effort to attain the 10 NTU goal. The removal rate and volume of groundwater removed will be recorded during well development procedures. Water that is removed from the well during well development activities will be stored temporarily at a secure location on Port property in labeled 55-gallon drums, pending receipt of analytical results and off-site disposal at a permitted facility. Depths to water in the monitoring wells will be measured prior to development.

Temporary Pre-Pack Well Installation

Pre-pack wells have not been previously used at the Site. The following procedures will be utilized to complete these temporary groundwater monitoring points. At soil sample locations SD-2 and SD-8 (see Figure 1), temporary pre-pack well points will be installed in the borehole from the direct-push cores. These temporary wells will be installed by Washington State licensed driller. The pre-pack wells will not be developed and will only be used to measure water and product levels.

Survey

A licensed surveyor will be contracted to survey the new monitoring well and pre-pack well points. The surveyor will measure the elevation of the top of casing of these well points in the North American Vertical Datum of 1988 (NAVD 88). The top of casing will be surveyed on the north rim of the casing. Existing monitoring wells at the Site were surveyed during previous investigations.

Water and Product Level Measurements

Water and product level measurements will be completed using the procedures established in the initial RI field study. Prior to each groundwater sampling event, a groundwater level “snapshot” will be performed by measuring water and product levels in all wells within an approximate one-hour duration. Water and product levels will be measured using an electronic oil-water interface probe and will be recorded to the nearest 0.01 foot. The measurement point will be the north rim of the top of the well casing. Well casing and ground surface elevations will be referenced from temporary or permanent benchmarks.

Groundwater Sample Collection and Processing

Groundwater samples will be collected using the same procedures as were utilized for the initial RI field study. Groundwater samples will be collected from existing and new Site monitoring wells for chemical analysis of hazardous substances as identified in Table 3.

Sampling of monitoring wells located adjacent to the shoreline (i.e., tidally influenced wells) will be performed within 1 hour before and 3 hours after the day-time low tide to the extent practicable. Wells nearest the shoreline will be sampled first. Groundwater samples will be obtained by field personnel using low-flow/low-turbidity sampling techniques (EPA 2010) to minimize the suspension of sediment in the samples. The wells will be purged and groundwater samples will be obtained from the wells using a peristaltic or submersible pump and disposable polyethylene tubing. Groundwater will be purged from the wells at a rate not to exceed 0.5 liter per minute. A Horiba U-50 (or similar) water quality measuring system with a flow-through cell will be used to monitor the following water quality parameters during purging:

- Electrical conductivity;
- Dissolved oxygen;
- pH;
- Salinity;
- Turbidity;
- Total dissolved solids;
- Oxidation-reduction potential; and
- Temperature.

Samples will be collected from the wells after these parameters vary by less than 10 percent on three consecutive measurements or after five well volumes have been removed, whichever occurs first. The field measurements will be documented on the field log.

Groundwater samples will be collected in laboratory-supplied containers, placed into a cooler with ice and logged on the chain-of-custody using quality control and assurance procedures in accordance with the RI/FS Work Plan SAP. Attempts will be made to fill containers for gasoline-range TPH, VOCs and dissolved methane analyses (“VOA” vials) with no head space remaining. The goal will be “no head space.” Note that the presence of several very small air bubbles (less than several millimeters in diameter) are occasionally unavoidable.

Groundwater Sample Laboratory Analysis

Groundwater samples will be submitted to ARI of Tukwila, Washington, for chemical analysis. Table 3 identifies the monitoring well locations and laboratory analysis that will be performed to further characterize the nature and extent of contamination of soil in the primary source area of the Site. The purpose of analyzing geochemical parameters is to provide data on the groundwater conditions that will inform evaluation of cleanup alternatives at the Site. Additional groundwater data for petroleum compounds will inform the extent of residual contamination in groundwater.

Table 4 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient water will be collected from each well to perform each of the listed analysis in accordance with the RI/FS Work Plan and SAP. Groundwater samples as identified in Table 3 will be submitted for a combination of the following:

- Gasoline-range TPH by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx (no silica gel cleanup);
- Duplicate heavy oil- and diesel-range TPH by NWTPH-Dx with silica gel cleanup procedures;
- BETX by EPA 8260;
- Total alkalinity by SM 2420 B-97;
- Ferrous iron by SM 3500-Fe B-97;
- Nitrate and sulfate by EPA 300.0;
- Dissolved manganese by EPA 6020A; and
- Dissolved methane by EPA RSK-175.

DATA QUALITY OBJECTIVES

The specific data quality objectives (DQOs) for soil and groundwater sampling and analysis are detailed in the Ecology-approved RI/FS Work Plan. An EPA-defined Stage 2B validation will be performed on organic and inorganic analytical data in general accordance with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 2004) and EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 2008). Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and quality assurance/quality control (QA/QC) information requested are present. At a minimum, the following items will be reviewed to verify the data as applicable:

- Data Package Completeness,
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Internal Standards
- Instrument Tunes
- Reporting Limits

REPORTING

Upon completion, supplemental data collection activities and laboratory results will be transmitted to Ecology. Depending on timing and Ecology's preference this supplemental data will be included in the Data Report Technical Memorandum or provided as a separate memorandum. Chemical analytical data for soil and groundwater samples will be submitted to Ecology in electronic format in accordance with Ecology's Environmental Information Management (EIM) Policy 840 following review and validation.

SCHEDULE

This supplemental sampling and analysis will be performed following Ecology approval of this Work Plan Addendum. The additional soil and groundwater sampling and analysis will be completed as soon as possible upon Ecology approval of the Work Plan Addendum to evaluate the possibility of an upland area interim cleanup action. Field sampling would occur in September 2018 pending Ecology approval and driller availability. Analytical results would be expected about a month later in October 2018.

REFERENCES

U.S. Environmental Protection Agency (EPA), "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA 540-R-04-004, Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated October 2004.

U.S. Environmental Protection Agency (EPA), 2008, "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-08-01," Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated June 2008.

U.S. Environmental Protection Agency (EPA), "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells," EQASOP-GW-001, US Environmental Protection Agency, Washington, DC, dated January 2010.

GeoEngineers 2017a. Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346. Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers 2017b. Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346. Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

BJT:JMH:leh

Attachments:
Table 1. Soil Sampling and Analysis Plan Addendum
Table 2. Soil Test Methods, Sample Size, Containers, Preservation and Holding Times
Table 3. Groundwater Sampling Analysis Plan Addendum
Table 4. Groundwater Test Methods, Sample Size, Containers, Preservation and Holding Times
Figure 1. Proposed Supplemental Data Collection Locations

Table 1

Soil Sampling and Analysis Plan Addendum

Quiet Cove Property
Anacortes, Washington

Sample Location[1]	Target Sample Interval [2,3] (feet bgs)	Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)		Purpose of Supplemental Data Collection Sampling Locations
		Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals[4] (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	
Direct-Push (DP) Sample Location									
SD-1	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the Integrated Planning Grant (IPG) and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-2	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-3	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-4	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-5	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-6	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. This location is meant to provide confirmation of the extent of soil contamination to the east.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-7	0-2	S	S	S			S	S	Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. Also analyzing PAHs due to existing data indicating PAH contamination in this area of the Site.
	2-4								
	4-6	X	X	X			X	X	
	6-8	W	W	W			W	W	
	8-10								
	10-12	N	N	N			N	N	
	12-14								
SD-8	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
SD-9	0-2	S	S	S	S	S	S	S	Collect and analyze for characterization of soil overlying contaminated soil.
	2-4								
SD-10	0-2	S	S	S	S	S	S	S	Collect and analyze for characterization of soil overlying contaminated soil.
	2-4								
Hollow-Stem Auger Sample Location									
MW-12	0-2	S	S	S			S	S	Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. Monitoring well installed to determine if free product exists in groundwater.
	2-4								
	4-6	X	X	X			X	X	
	6-8	W	W	W			W	W	
	8-10								
	10-12	N	N	N			N	N	
	12-14								

Notes:

[1] The approximate sample locations are shown on Figure 1.

[2] Sample intervals may be adjusted based on observed field conditions to collect samples representative of the fill and native soil horizon, and interface between the saturated and vadose zone. Samples will be collected for analysis based on (1) shallow soil approximately 0-2 feet; (2) highest PID reading; (3) interval at the interface of the saturated and vadose zone and; (4) deepest sample in the boring (native material). If the highest PID reading and water table sample interval overlap, only 3 samples will be collected for analysis. The sample intervals for analysis are anticipated in the table. The exploration will be advanced to at least three feet into native soil or to approximately 14 feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, or until refusal.

<u>Sample for analysis (approximate in table)</u>

S = Shallow Sample
X = Highest PID Reading Sample
W = Water Table Sample
N = Selected sample for initial chemical analysis .

[3] Field screening will be completed for each 2-foot interval throughout the boring in accordance with the approved RI/FS Work Plan.

[4] MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.

<u>Sample for analysis (approximate interval location in table)</u>

S = Shallow Sample
X = Highest PID Reading Sample
W = Water Table Sample
N = Selected sample for initial chemical analysis .

bgs = below ground surface
BETX = Benzene, Ethylbenzene, Toluene and Xylenes
EDB = 1,2-Dichloroethane
EDC = 1,2-Dichloroethane
EPA = Environmental Protection Agency
MTBE = Methyl t-Butyl Ether
MTCA = Model Toxics Control Act

Table 2

Soil Sample Test Methods, Sample Size, Containers, Preservation and Holding Times

Quiet Cove Property
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time[1]
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/ 7470/7471	100 g	4-oz glass WM with Teflon-lined lid	Cool ≤6°C	180 days/28 days for Mercury
Gasoline-Range Hydrocarbons	NWTPH-Gx	5 g	Two 40mL glass vial (VOA)	Cool ≤6°C	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6°C	14 days to extraction/analysis
VOCs (Including Volatile Petroleum Compounds	EPA 8260	5 g	Three 40mL glass vial (VOA)	Cool ≤6°C Two VOAs - Sodium Bisulfate One VOA - Methanol	14 days to extraction/analysis
SVOCs (Including PAHs)	EPA 8270/SIM	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6°C	14 days to extraction, 40 days from extraction to analysis

Notes:

[1] Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Dx = diesel-range extended

EPA = Environmental Protection Agency

SIM = selected ion mode

g = gram

Gx = gasoline-range extended

mL = milliliter

oz. = ounce

SVOC = semi-volatile organic compound

VOC = volatile organic compound

WM = wide mouth

Table 3

Groundwater Sampling and Analysis Plan Addendum

Quiet Cove Property
Anacortes, Washington

	Petroleum Hydrocarbons (TPH)			Volatile Organic Compounds (VOCs)	Geochemical Parameters					
Sample Location[1]	**Gasoline-Range (NWTPH-Gx)**	**Diesel- and Heavy Oil-Range (NWTPH-Dx) - with silica gel cleanup**	**Diesel- and Heavy Oil-Range (NWTPH-Dx) - no silica gel cleanup**	**BETX[2] (EPA 8260)**	**Total Alkalinity (SM 2420 B-97)**	**Ferrous Iron (SM3500-Fe B-97)**	**Nitrate (EPA 300.0)**	**Sulfate (EPA 300.0)**	**Dissolved Mangenese (EPA 6020A)**	**Dissolved Methane (EPA RSK-175)**
Existing Monitoring Well										
MW-1		X	X		X	X	X	X	X	X
MW-2		X	X		X	X	X	X	X	X
MW-3		X	X		X	X	X	X	X	X
MW-4		X	X		X	X	X	X	X	X
MW-5		X	X		X	X	X	X	X	X
MW-6		X	X		X	X	X	X	X	X
MW-7		X	X		X	X	X	X	X	X
MW-8	X	X	X	X	X	X	X	X	X	X
MW-10		X	X		X	X	X	X	X	X
MW-11	X	X	X	X	X	X	X	X	X	X
New Monitoring Well										
MW-12		X	X		X	X	X	X	X	X

Notes:

[1] The approximate sample locations are shown on Figure 1.

[2] BETX = Benzene, ethylbenzene, toulene, xylene

Table 3 provides the chemical analysis for one groundwater sampling event. Up to three (3) quarterly events are planned for the supplemental data collection effort.

X = Selected sample for chemical analysis.

Table 4

Groundwater Sample Test Methods, Sample Size, Containers, Preservation and Holding Times

Quiet Cove Property
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time[1]
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	14 days to extraction 40 days from extraction to analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx with silica gel cleanup				
Total Alkalinity	SM 2420 B-97	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	14 days to extraction 40 days from extraction to analysis
Ferrous Iron	SM 3500-Fe B-97				
Sulfate/Nitrate	EPA 300.0	250 mL	One 500 mL HDPE no headspace	Cool ≤6°C No Headspace	14 days to analysis
Dissolved Manganese	EPA 6020A				
Dissolved Methane	EPA RSK-175	250 mL	One 250mL amber glass with Teflon-lined lid, HCl preserved	Cool ≤6°C	24 hours to analysis

Notes:

[1] Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

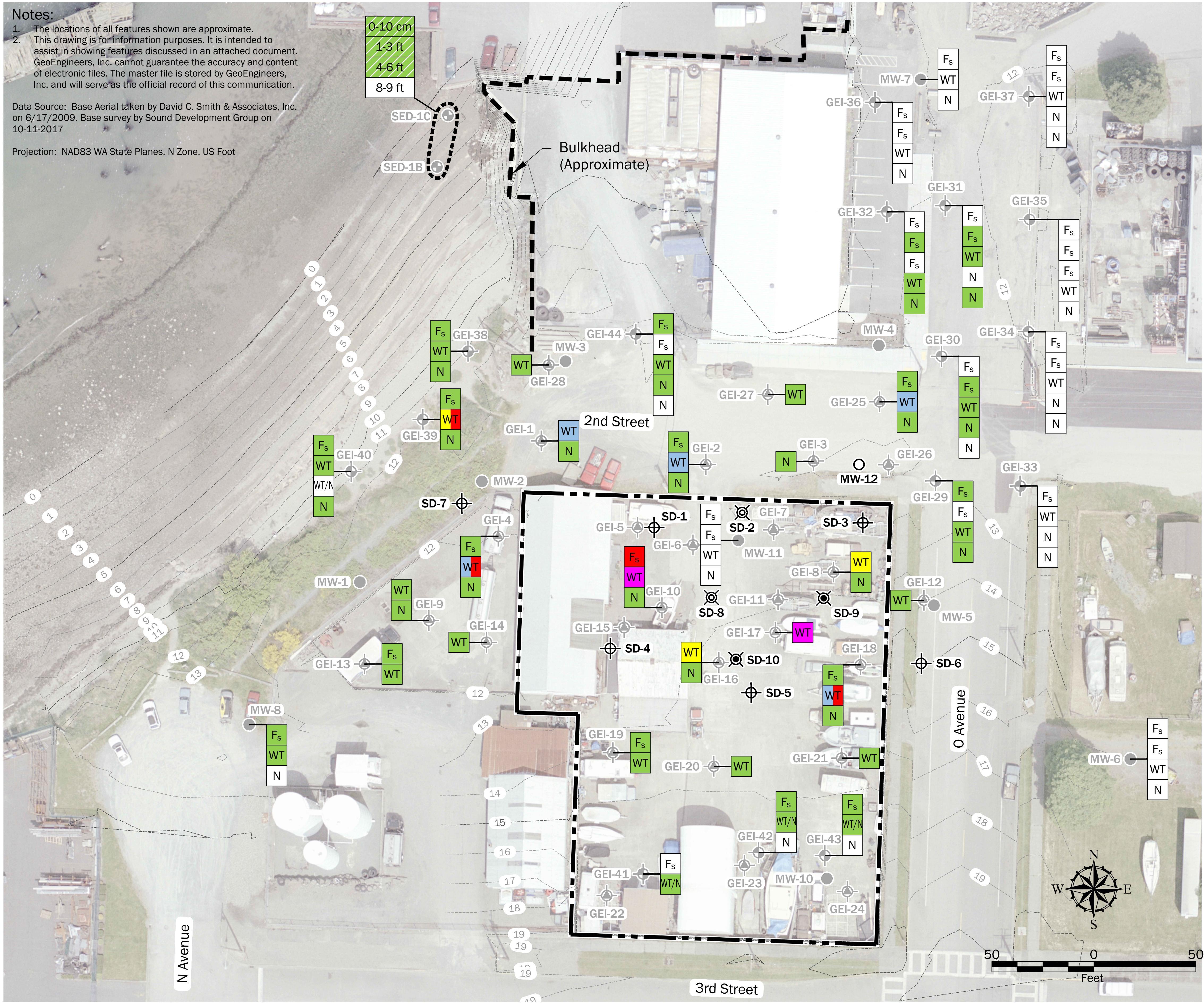
Dx = diesel-range extended	L = liter
EPA = Environmental Protection Agency	mL = milliliter
EPH = extractable petroleum hydrocarbons	PCBs = polychlorinated biphenyls
Gx = gasoline-range extended	SIM = selected ion mode
HCl = hydrocloric acid	SVOC = semi-volatile organic compound
HDPE = high density polyethylene	VOC = volatile organic compound
HNO_3 = nitric acid	VPH = volatile petroleum hydrocarbons

Notes:

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

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

Site Boundary

Supplemental Data Sample Locations

SD-1 Proposed Supplemental Data Soil Boring Location

SD-2 Proposed Supplemental Data Soil Boring Location and Temporary Well Screen

SD-9 Proposed Supplemental Data Shallow Soil Boring Location

MW-12 ○ Proposed Supplemental Data Monitoring Well

Previous Sample Locations

GEI-31 RI Soil Boring Location, 2017

SED-1A Tier 1 Sediment Sample, September 2017

GEI-1 Integrated Planning Grant Soil Boring Location, 2014

MW-10 ● Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

10 Contour (Feet, NAVD 88)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

🟨	Gasoline-Range TPH	🟨🟥	Gas+Heavy-Oil TPH
🟦	Diesel-Range TPH	🟦🟥	Diesel+Heavy Oil TPH
🟥	Heavy-Oil-Range TPH	🟩	No Exceedance for TPH
🟪	Gas, Diesel and Heavy-Oil TPH	☐	Sample Not Analyzed, Archived
🟨🟦	Gas+Diesel TPH		

Soil Site Stratigraphy

F_s Surface Fill WT Water Table

N Native

Sediment Sample Results

0-10 cm
1-3 ft
4-6 ft
8-9 ft
SED-1 Sample Interval Depth (bml)

▨ No Exceedance

▨ Human Health Exceedance

▨ Benthic and Human Health Exceedance

☐ Sample Not Analyzed, Archived

Supplemental Data Collection Sample Locations

Quiet Cove Property
Anacortes, Washington

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Figure 1

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