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BNSF Wishram Railyard, Wishram, Washington

Inundated Lands Initial Investigation Report

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BNSF Wishram Track Switching Facility, Wishram, Washington

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Executive Summary

Petroleum sheening and nonaqueous phase liquid (NAPL) droplets have been observed occasionally along the approximate 300-foot stretch of the Columbia River adjacent to the site. An initial investigation of the nearshore area adjacent to the BNSF Wishram Railyard was performed in accordance with the Washington State Department of Ecology-approved Nearshore Sediment Initial Investigation Work Plan (CH2M, 2018). The purpose of the nearshore sediment initial investigation was to investigate the potential presence of NAPL in the identified area, characterize the nature and extent of NAPL, if present, and evaluate sediment in the inundated lands against applicable sediment cleanup standards. The initial investigation work involved the following activities:

- Thirty Darts were advanced between 1.5 and 6.0 feet below sediment surface (bss) across the initial nearshore study at a spacing of approximately 20 to 30 feet.
- Five surface sediment grab samples and one sediment core were collected from nearshore locations within the initial study area as well as at the upstream background location (BG-US01).
- Observation of sheens farther from shore than previously reported prompted a sheen survey to determine the outboard extent of the sheens and allow an estimate of those areas likely to be associated with the origin of these impacts.
- Seven sediment cores were advanced in those areas farther from shore that were suspected to be sourcing observed sheens.
- Two offshore locations, where visual, olfactory, and photoionization detector (PID) screening of the recovered sediment core materials indicated the greatest NAPL impacts, were selected for follow-on NAPL mobility core collection and in-laboratory screening and mobility testing.

Key findings from the field and follow-on laboratory analyses performed in the nearshore and offshore areas as part of the initial investigation are as follows:

- Nearshore Area (Initial Study Area)
  - In general, the riprap embankment at the shoreline extends approximately 15 feet south of the shoreline.
  - Dart deployments and associated pre-probing indicated the thickness of soft, penetrable materials beyond the riprap ranges from several inches to approximately 6 feet. Refusals are believed to be due to the presence of buried riprap (within approximately 15 feet of shoreline) or denser alluvial deposits.
  - The fluorescence responses associated with Dakota Technologies, Inc.'s scan of the Darts deployed within the initial study area were notably low and not indicative of the presence of NAPL; the maximum responses at individual locations across the study area ranged from 2.0 to 18.1 percent reference emitter.
  - Nearshore sediment samples obtained through grab sampling and coring indicated the presence of a micaceous fine sand to silty fine sand extending to depths between 0.5 foot and 4.3 feet bss. These fine sands were observed to extend across the entire length of the core advanced within the nearshore area (D200).
  - No visual, olfactory, or PID evidence of NAPL or petroleum-related impacts were encountered within the samples collected from the nearshore areas.
  - Total petroleum hydrocarbons (TPH), diesel-range organics (TPH-DRO), TPH-residual-range organics (TPH-ORO), and polycyclic aromatic hydrocarbons (PAHs) in nearshore surface sediment samples were all below the applicable Sediment Cleanup Objectives (SCOs) with the exception of TPH-DRO at the nearshore core location D200, where a result of 459 milligrams per kilogram (mg/kg) was measured in the non-silica gel treatment/cleanup (SGC) sample here. While this result was in excess of the SCO of 340 mg/kg, the same sample run with SGC was below the SCO at an estimated concentration (J-flagged) of 57.6 mg/kg. In accordance with

cleanup provisions of the Sediment Management Standards under Washington Administrative Code (WAC) 173-204, as described in *Sediment Cleanup User's Manual II: Guidance for Implementing the Cleanup Provisions* (Ecology, 2017b), the three highest concentrations from the available nearshore surface sediment data set were averaged for comparison against the Washington Freshwater Sediment Cleanup Screening Levels (CSLs). The average of the three highest TPH-DRO results for the nearshore area were below the CSL for both SGC and non-SGC samples.

  - The comparison of measured TPH concentrations in collocated surface sediment samples collected subsequently confirmed that the Dart response data is an effective indicator of total TPH concentrations in site sediments and that the Dart survey effectively screened for NAPL and petroleum impacts in sediment across the initial study area.
  - The absence of NAPL in the nearshore areas adjacent to the riprap embankment and physical separation of the defined extent of upland NAPL (KJ, 2019) and the shoreline to the south, suggest that seep migration from the upland portions of the site is not contributing to the observed sheens.
  - Based on this information, the nearshore area does not qualify as a sediment site under applicable standards. Impacts from groundwater discharge, if present, have not affected surface sediment concentrations above standards.

- Offshore Area (Expanded Study Area)
  - The sediment samples obtained through core sampling throughout the offshore area indicated the presence of a micaceous fine sand that extended to depths between 0.5 foot (J260) and 5.5 feet bss (I400). No visual, olfactory, or PID evidence of NAPL or petroleum-related impacts were encountered within these materials. Similar to nearshore core D200, these fine sands were observed to comprise the majority of the material in three of the seven cores.
  - At the remaining 4 locations (G200, G260, J260, and F360), a 2- to 3.5-foot interval of fill material with black, tacky NAPL and an abundance of organic debris consisting of wood and roots was observed at approximately 0.5 foot to 2.5 feet bss.
  - The nearshore Dart, sediment grab sampling, and coring results suggest that the NAPL present below the river is distinct and separate from the upland NAPL, and that it may be associated with historical filling that occurred before the inundation of these lands in 1957.
  - Mobility testing, performed on the most heavily NAPL-impacted intervals associated with the fill, indicate that NAPL is hydraulically immobile, which is consistent with its highly viscous and tacky appearance.
  - Observations indicate that the surface sheens observed at the site are driven by ebullition in areas of the submerged NAPL-affected fill layer away from the shoreline. The presence and abundance of sheens is a function of the organics present, the depth of NAPL bss, the temperature of the sediments, the height of the overlying water column (river stage), and other factors. Once at the surface of the water, the distribution of the sheens is dictated by a combination of the river currents and wind direction, which under the right conditions, drives the sheens to the north and east in the direction of the shoreline where they have typically been observed in the past.
  - A comparison of the offshore surface sediment analytical results against Washington Freshwater SCOs indicate TPH-DRO and TPH-oil (or residual)-range organics (ORO) exceeded their applicable criteria. Specifically, 1 of the 5 samples collected across the expanded study area exceeded the SCO for TPH-DRO (340 mg/kg) and TPH-ORO (3,600 mg/kg) (with and without SGC). This sample was located proximal to the outboard extents of observed sheens at approximately 130 feet from shore at location J260 where the shallowest NAPL-impacted fill materials were observed (0.5 foot bss). At the remaining 3 core locations, NAPL observed was at least 2 feet bss, and concentrations of petroleum-related constituents were all below applicable SCOs.

- The average of the 3 highest TPH results from all samples collected from the offshore area (consistent with expanded study area where some locations showed buried NAPL) exceeded the CSL of 510 mg/kg for TPH-DRO for both SGC and non-SGC samples and the CSL of 4,400 mg/kg for TPH-ORO for the non-SGC results only.
- PAHs measured in surface samples were mostly non-detect or had low level detections. The sum of the 17 PAHs for all samples was below the SCO of 17,000 micrograms per kilogram.

While the general location of the submerged NAPL and the extent of affected surface sediments exceeding criteria has been identified, additional data are required to refine these extents. An addendum to the initial investigation work plan, that details the specific objectives, data collection activities, and means and methods for addressing these data gaps, is being prepared as a separate document. The same data quality objectives of the nearshore inundated land initial investigation will apply but to a different target area. The deeper water in this area will require that some methods for data collection be modified, but not the overall objective.

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Acronyms and Abbreviations

%PV	percent of the pore volume
%RE	percent of the reference emitter
µg/kg	microgram(s) per kilogram
BNSF	BNSF Railway Company
bss	below sediment surface
cm/sec	centimeter(s) per second
COD	chemical oxygen demand
CSL	Cleanup Screening Level
CSM	conceptual site model
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbons
g/cm^3	gram(s) per cubic meter
GPS	global positioning system
Jacobs	Jacobs Engineering Group Inc.
LIF	laser-induced fluorescence
LNAPL	light nonaqueous phase liquid
mg/kg	milligram(s) per kilogram
mL/min	milliliter(s) per minute
NAPL	nonaqueous phase liquid
PAH	polycyclic aromatic hydrocarbon
PCC	Pollution Control Commission (State of Washington)
PFS	pore fluid saturations
PID	photoionization detector
RI	remedial investigation
SCO	Sediment Cleanup Objective
SCUM II	*Sediment Cleanup User's Manual II: Guidance for Implementing the Cleanup Provisions*
SGC	silica gel treatment/cleanup
SMS	Sediment Management Standards
SP&S	Spokane, Portland, and Seattle Railway
TOC	total organic carbon
TPH	total petroleum hydrocarbon(s)
TPH-DRO	total petroleum hydrocarbons, diesel-range organics
TPH-ORO	total petroleum hydrocarbons, oil-range or residual-range organics
USACE	U.S. Army Corps of Engineers

UV	ultraviolet
UVOST	Ultra-Violet Optical Screening Tool
VPH	volatile petroleum hydrocarbons
WAC	Washington Administrative Code

1. Introduction

This report presents the results of the initial investigation of the inundated lands adjacent to the BNSF Railway Company (BNSF) Wishram Railyard (site), in Wishram, Washington (Figure 1-1). Petroleum sheening and nonaqueous phase liquid (NAPL) droplets have been observed occasionally along an approximately 300-foot stretch of the Columbia River adjacent to the site (Figure 1-2) (Ecology, 2017a). The site upland is the subject of remedial investigation (RI), with work being performed pursuant to an Agreed Order (No. DE 12897) between the Washington State Department of Ecology (Ecology) and BNSF, dated October 7, 2015. The initial study area shown on Figure 1-2 was developed to include the nearshore areas, where sheens were identified by Ecology in its March 3, 2017 letter, and additional areas to the east and west. During the work, the study area was expanded to include areas farther offshore as shown on Figure 1-2.

Initial investigation activities were conducted in accordance with the Ecology Model Toxics Control Act regulations published in Washington Administrative Code (WAC) 173 340 (Ecology, 2007) and the cleanup provisions of the Sediment Management Standards (SMS) under WAC 173 204, as described in the *Sediment Cleanup User's Manual II: Guidance for Implementing the Cleanup Provisions* (SCUM II) (Ecology, 2017b). All activities were performed in accordance with the means and methods described in the Ecology-approved work plan (CH2M, 2018).

1.1 Site Overview

Wishram is in Klickitat County, Washington, approximately 13 miles northeast of The Dalles, Oregon, and 0.75 mile south of Washington State Route 14, within the southwestern quarter of Section 17, Township 2 north, Range 15, east of the Willamette Meridian. The site location is shown on Figure 1-1. The location of petroleum sheening and approximate area of interest for the nearshore initial investigation is shown on Figure 1-2.

The railyard is approximately 2,000-feet long and ranges from 150- to 720-feet wide. The upland RI area encompasses the westernmost portion of the railyard. This portion of the site is approximately 350-feet long (east to west) and 450-feet wide (north to south) and covers an area of approximately 3.6 acres. The upland portion of the site is bounded by the town of Wishram to the north, the railyard to the east, Lake Celilo to the south and southwest, and the railroad right-of-way to the west. Onsite structures include storage buildings, a maintenance shop (office and tool storage), two mainline tracks, and an active yard track. Current site features are shown on Figure 1-3.

The site was originally developed by the Spokane, Portland, and Seattle Railway between 1910 and 1912. The Spokane, Portland, and Seattle Railway merged with other railroads in 1970 to become the Burlington Northern Railroad, which merged with the Santa Fe Railroad in 1995 to become what is now BNSF. The primary historical use of the railyard was railcar switching. Historically, locomotive fueling/watering and repairs also occurred at Wishram. Most track spurs, early structures, and infrastructure no longer remain. Prominent site features believed to have been present during some portions of the time between 1910 and the present are shown on Figure 1-3.

At the time the railyard was constructed, the Columbia River was free-flowing and occupied a channel approximately 300 feet south and 40 to 50 feet lower than the railyard. Construction of The Dalles Dam in 1957 impounded the Columbia River to create Lake Celilo. As a result, the lands along the southern portion of the railyard were inundated and remain submerged today. The area of interest that was the focus of the nearshore initial investigation is within these inundated lands, the approximate extent of which are shown on Figure 1-3.

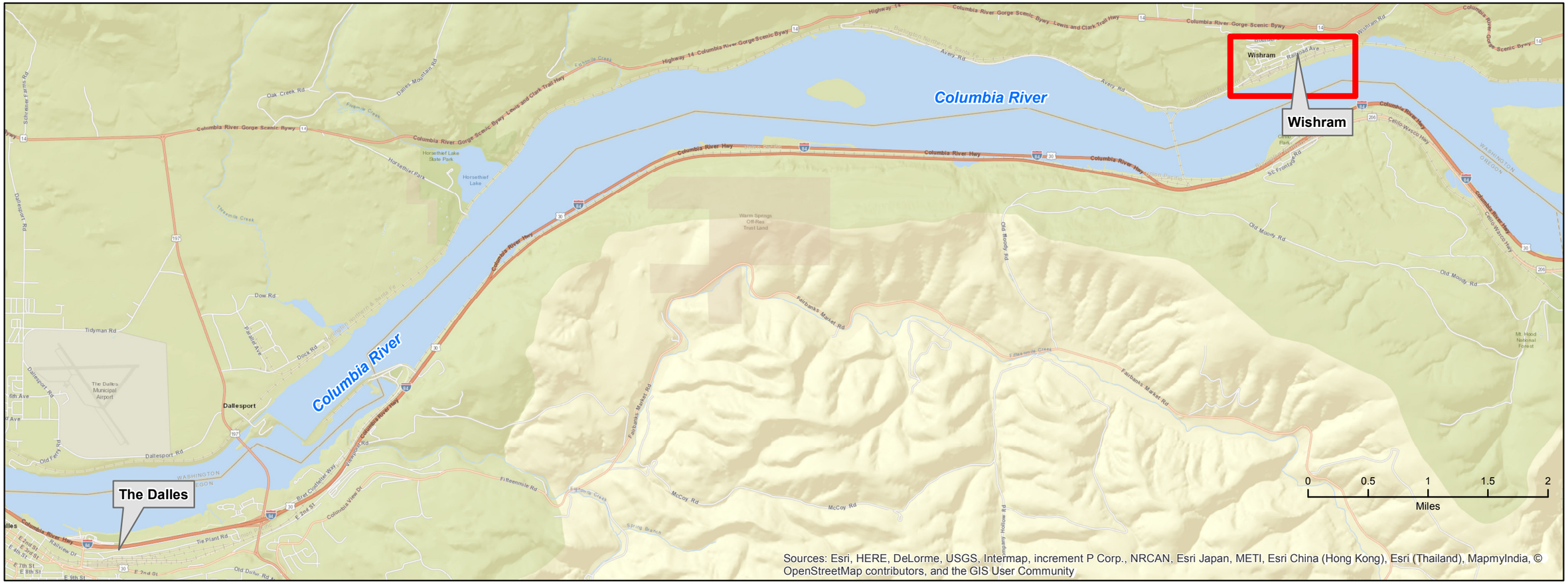
Additional details regarding historical site activities, including historical plat maps, are presented in the site investigation and forthcoming RI report (KJ, 2012, 2019).

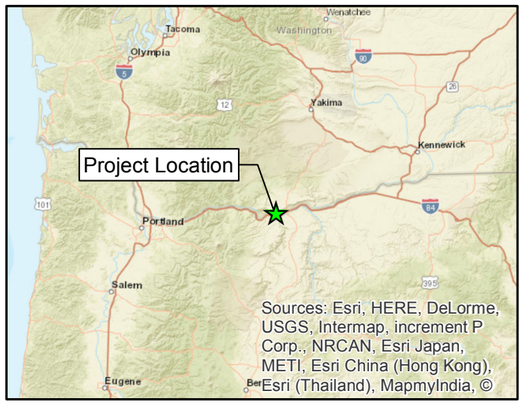
1.2 Investigation Objectives

The purpose of the nearshore sediment initial investigation was to investigate the potential for NAPL to be present in the initial study area, and evaluate sediment in the inundated lands against applicable sediment cleanup standards. The nearshore initial investigation data, in conjunction with data collected in the upland portion of the railyard, was used to develop an integrated conceptual site model (CSM) for the Wishram Railyard and shoreline area. This integrated CSM will be used to support evaluation of potential remedial alternatives for the site as part of a feasibility study.

1.3 Observational Investigation Approach

An observational approach was emphasized in the work plan for the Dart investigation and nearshore sediment data collection based on NAPL observations at the site. During the investigation, NAPL was observed in the inundated lands beyond the nearshore area, where additional investigation activities were conducted to address field observations, as described in this report.





N

0 375 750 1,500
Feet

1:9,000 1 inch = 750 feet

\\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE1-1_SITEMAP.MXD GGEE 2/15/2019 10:44:51

Figure 1-1. Site Location Map
BNSF Wishram Railyard
Wishram, Washington

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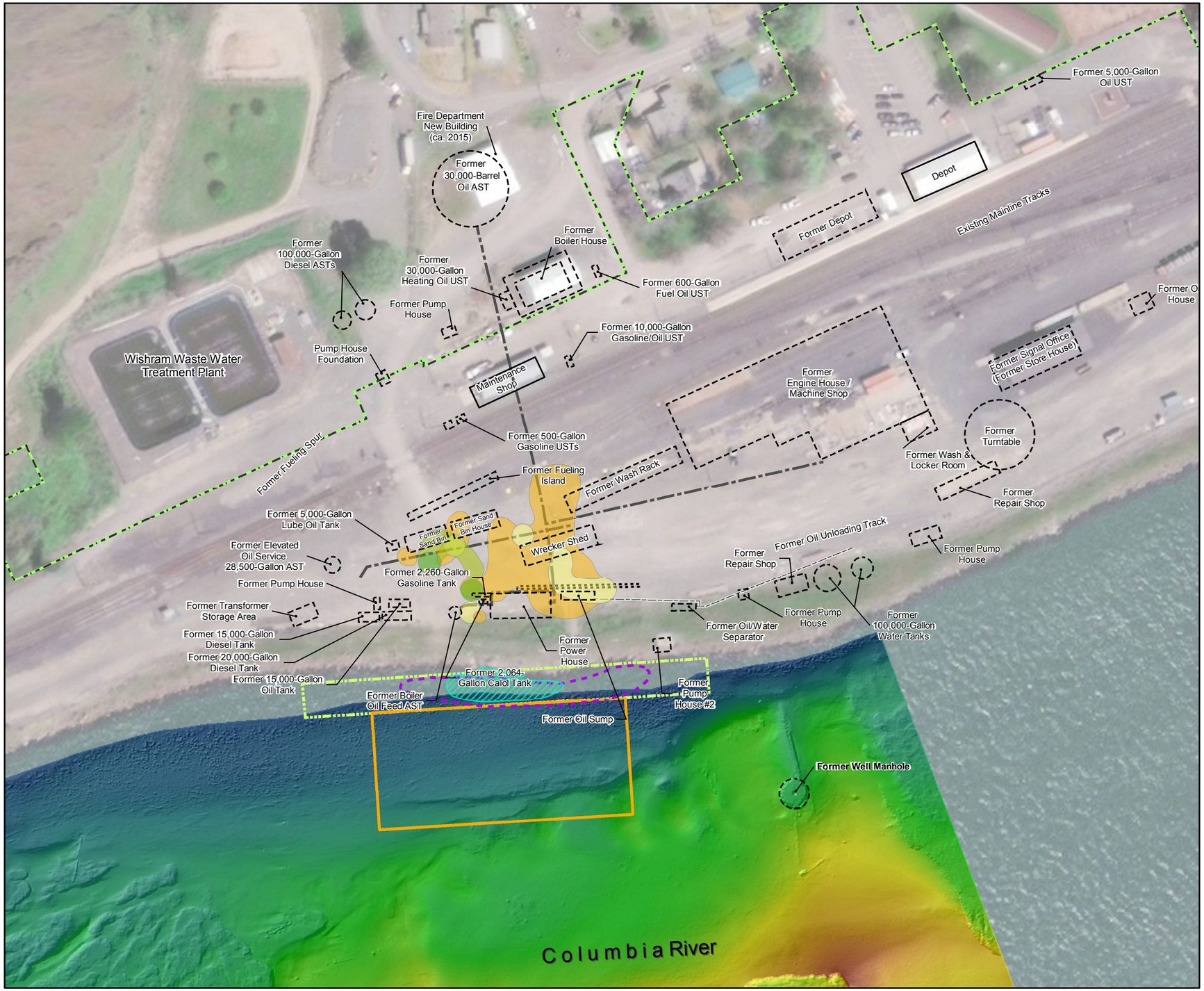

VICINITY MAP

LEGEND

- Existing Site Feature
- Former Site Feature
- Inferred Lateral Extent of Smear Zone Diesel Impacts
- Inferred Lateral Extent of Submerged Diesel Impacts
- Inferred Lateral Extent of Smear Zone Oil Impacts
- Inferred Lateral Extent of Submerged Oil Impacts
- Initial Study Area
- Expanded Study Area
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain
- Stormwater Underdrain
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Approximate BNSF Property Line

Bathymetry (ft NAVD88) (2017)

- High : 158
- Low : 93

Notes:
[1]Inferred lateral extent of Diesel- or Oil-Like LNAPL based on interpretation of LIF waveforms (July 2013) and soil boring logs (KJ, 2019).
ft = feet
NAPL = nonaqueous phase liquid
NAVD88 = North American Vertical Datum 1988
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act

N

0 62.5 125 250
Feet
1:1,500 1 inch = 125 feet

Figure 1-2. Wishram Railyard Inundated Lands Study Area
BNSF Track Switching Facility
Wishram, Washington

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\\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE1-2_RAILYARD_AND_STUDYAREA.MXD GGEE 2/19/2019 07:56:56

Current Features with Former Feature Footprints (Aerial Date: 2015)

Former Features (Aerial Date: 1951)

LEGEND

- Initial Study Area
- Expanded Study Area
- Current Shoreline
- Former Bunker Fuel / Oil Pipeline
- Former Oil Drain
- Former Oil Trough
- Former Sewer Line (Potential)
- Stormwater Underdrain (A portion removed from service circa 1960)
- Stormwater Underdrain (Rerouted portion circa 1960)
- Approximate BNSF Property Line
- Former Site Feature

N

0 75 150 300

Feet

1:1,800 1 inch = 150 feet

Figure 1-3. Current and Former Site Features
BNSF Wishram Railyard
Wishram, Washington

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SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE1-3_CURRENT_AND_FORMER_SITE_FEATURES.MXD GGEE 2/15/2019 15:33:53

2. Initial Investigation Activities

Initial investigation field activities were conducted in phases. The findings of each phase were used to refine the sampling design for each subsequent phase. The first phase was performed as part of the work planning process and included an historical data review and a bathymetric survey of the study area. The results of this work were presented in the work plan and are described and discussed in Sections 3 and 4 as appropriate. Follow-on nearshore investigation activities involved conducting a Dart survey in the Ecology area of interest to screen for the presence or absence of NAPL and the collection and analysis of surface and subsurface sediment samples to:

- Confirm Dart survey NAPL delineation
- Characterize sediment ebullition potential
- Characterize NAPL mobility and pore fluid saturation at any locations with confirmed NAPL
- Compare concentration of chemical constituents in surface sediments to SMS freshwater sediment criteria

Given the absence of any observed impacts within the nearshore area, and observed sheens outside the nearshore area during the field activities, the study area was expanded to offshore areas and additional activities were performed to identify the potential source of the observed sheens. In addition to the tasks described in the work plan, a surface sheen survey was performed by boat. The sheen survey and additional work elements in the expanded study area are presented in Section 2.3.

2.1 Historical Review and Bathymetric Survey Activities

Pre-investigation activities were completed before the submission of the work plan (CH2M, 2018) to assist in work plan development. These activities included reviewing available documentation about the site and surrounding areas including:

- Historical maps and aerial photographs
- Upland data regarding the NAPL nature and extent
- Bathymetric survey results

A summary of the historical review was provided in the work plan. A bathymetric survey of the Columbia River near Wishram was conducted in 2008 by the U.S. Army Corps of Engineers (USACE) and a bathymetric survey was conducted by Solmar Hydro for this project on June 2, 2017. The 2017 bathymetric results are shown on Figure 1-2.

2.2 Nearshore Investigation Activities

Nearshore investigation activities included a Dart survey and sediment grab sampling as described in the following subsections. In addition, one sediment core was advanced within the nearshore area at the location exhibiting the highest Dart fluorescence response. The bulk of the coring was performed outside the nearshore area, thus all core collection activities are described in Section 2.3.2.

2.2.1 Dart Survey

The objective of the Dart survey was to assist with determining the presence or absence of polycyclic aromatic hydrocarbons (PAHs) in the Ecology defined area of interest (Ecology, 2017a). The Dart sampler is a passive sampling device consisting of a continuous rod made from or coated with solid-phase extraction media. PAHs are attracted to and absorb into the solid-phase extraction media which, following removal from the sediment, can be analyzed in the laboratory using laser-induced fluorescence (LIF).

A total of 30 Darts and one duplicate ranging from 3- to 6-feet long were installed between June 19 and June 24, 2018, from a 24-foot-long, aluminum flat-bottom boat equipped with 2 spuds and operated by Gravity Marine of Fall City, Washington. A grid was established to facilitate the naming convention of investigation locations and confirm adequate spacing (Figure 2-1). Darts were deployed across the established nearshore study area at a spacing of approximately 20 to 30 feet (Figure 2-1). In addition, three control/reference Darts were also deployed; two within upland wells containing light nonaqueous phase liquid (LNAPL) (OHM-1) and nearshore dissolved impacts (WMW-16) and one at an upstream location with similar sub-bottom conditions to that of the study area (location identification US01).

Before the deployment of Darts within the sediment, pre-probing was conducted using a 1-inch-diameter, hollow-aluminum pole to estimate the lateral extent of the submerged riprap outboard of the exposed shoreline and to determine the maximum length of the Dart (3, 6, or 9 feet) that could be used at each location. In general, the toe of the riprap slope extended between 15 and 30 feet from the shoreline and the Darts deployed closest to the shoreline represent the approximate extent of the riprap (Figure 2-1). Pre-probing indicated the sediment thicknesses beyond the riprap ranged from several inches to approximately 6 feet and were generally between 1.5 and 6 feet. Refusal with the pre-probing rod was generally interpreted to be a hard rocky or sandy layer. Based on this information, Darts of lengths 3 and 6 feet were used.

Before the advancement of each Dart, a depth-to-top-of-sediment sounding was taken using a graduated leaded line. These measurements were used along with the published USACE Dalles Dam Forebay Levels (USACE, 2018), which represent the pool height above the dam to estimate the top of sediment elevation. Darts were advanced from the boat deck by attaching the top of each Dart to an expandable fiberglass pole using the vendor-supplied drive-head and pushing the tip of the Dart into the sediment until refusal was encountered. The final drive depths of the Darts ranged from 1.8 to 6 feet below sediment surface (bss). A labeled buoy was affixed to the top of the Dart to allow identification and retrieval. Immediately following insertion, the coordinates of each Dart were recorded using the on-board global positioning system (GPS). An approximate soak/equilibration time of 48 hours was targeted before each Dart was retrieved. However, because of weather conditions that limited the safe retrieval of some Darts around the 48-hour mark, final soak times ranged from 40 to 94 hours. Following the soak period, each Dart was retrieved by pulling on the rope that secured the buoy to the top of the Dart.

Darts were immediately placed on clean aluminum foil; any mud or debris was removed by wiping the Dart with a clean paper towel in a direction perpendicular to the length of the Dart. A zip tie was placed around the Dart to mark the depth to which it had been deployed. Each Dart was then wrapped in the foil and labeled. Darts were shipped overnight to Dakota Technologies, Inc. for bench-top fluorescence scanning using the Ultra-Violet Optical Screening Tool (UVOST) LIF reader, which generates a log of fluorescence response over depth. A summary of each Dart deployed, its length, penetration achieved, soak time, location coordinates, and estimated sediment surface elevation is provided in Table 2-1. A copy of the resulting UVOST logs generated by Dakota Technologies, Inc. are provided as Appendix A.

2.2.2 Surface Sediment Grab Sampling

The objective of the sediment grab samples was to characterize the sediments at Dart locations where higher levels of PAHs were likely present, based on the Dart responses. Following receipt of the Dart logs, surface sediment sampling was conducted on August 6 and 7, 2018, using a 26-foot long aluminum boat equipped with 3 spuds and a modified van Veen bottom grab sampler (operated by Gravity Marine). Grab samples were collected from five nearshore locations within the established study area as well as at the upstream background location (BG-US01). Within the initial study area, locations where Dart responses indicated the greatest potential for the presence of PAHs were targeted for surface sediment sampling. In addition, one sample was collected at one location (D420) within the initial study area where Dart responses were consistent with the background Dart response observed at BG-US01. Locations of each surface sediment grab sample are shown on Figure 2-2.

Before deployment of the van Veen grab sampler, a depth-to-top-of-sediment sounding was taken using a graduated weighted line and recorded within the field notes. If recovery was insufficient for sampling (either because of the presence of cobbles or aquatic vegetation), the sampler was reset and deployed

within several feet of the first attempt. The material collected during each successful attempt was processed immediately on the deck of the boat and placed on ice for shipment to the various laboratories. At one study area location and the background location, a bulk bioassay sample was collected and placed in a labeled, 5-gallon bucket for potential future analysis pending results of the chemical analyses.

The coordinates of each grab sample were recorded using the on-board GPS following sample collection. A summary of each surface sediment grab sample including its coordinates, analyses, and estimated sediment surface elevations is provided in Table 2-2.

2.3 Offshore Investigation Activities

During completion of the nearshore surface sediment grab sampling and advancement of the first sediment core on August 7, 2018, sheens were observed outboard of grid line E (approximately 60 feet south of the shoreline). Lake levels were lower than typical, the weather was hot with very little wind providing suitable conditions for observation of sheens. The sheens were observed to be migrating on the surface of the water from southwest to northeast toward the shoreline. This movement appeared to be driven by a combination of the river current and light winds coming from the west and northwest. These observations indicated that the sheens were originating from areas outside the work plan established study area (initial study area). In response to these observations, the study area was expanded (Figure 1-2) and investigation activities were modified to include an on-water sheen survey, relocation of planned sediment cores, and collection of additional samples to allow characterization of the offshore area.

2.3.1 Sheen Survey

Given the favorable low-wind conditions, before advancing any additional cores, a visual sheen survey was performed at approximately 1:00 p.m. on August 7, 2018, to determine the outboard extent of the sheens and allow for an estimate of those areas likely to be associated with the origin of these impacts. Gravity Marine navigated along several transects parallel to shore between the F and K grid lines. As the boat was maneuvered slowly along these lines, two Jacobs Engineering Group Inc. (Jacobs) staff (positioned on the port and starboard sides of the boat) scanned the water surface for the presence of sheens. While gas bubbles were consistently observed breaking the surface of the water throughout the survey area at this time, no direct observations of sheens originating with these bubbles were observed. During the survey, sheens were observed to extend to the south (offshore) between the J and I grid lines. The westernmost sheen was observed near grid location J120 and the easternmost sheen was observed in the vicinity of I120. Locations defining the observed outboard extent of the sheens were logged using a tablet equipped with GPS and are shown on Figure 2-3. Given the observed direction of sheen movement (north and east), these locations approximated the outboard extent of those areas where the sub-bottom conditions could be contributing to sheen generation.

2.3.2 Sediment Core Sampling

To assess the offshore area sub-bottom conditions for the presence of NAPL and to characterize the sediments, 8 sediment cores were advanced, from Gravity Marine's 26-foot-long aluminum boat equipped with 3 spuds, between August 7 and 8, 2018. As specified in the work plan, core locations were to be selected to confirm the Dart response results. However, based on the observed sheens and follow-on survey described in Section 2.3.1, the number of cores was increased from 6 to 8 and core locations were selected to cover those areas where sub-bottom conditions were most likely resulting in sheen generation. Location D200 was an exception; it was advanced before the completion of the sheen survey in the location where the highest Dart response (18 percent of the reference emitter [%RE]) was observed. Final core locations are shown on Figure 2-2.

Before advancing each core, a depth-to-top-of-sediment sounding was taken using a graduated weighted line and recorded within the field notes. Coring was performed using a vessel-mounted mobile AMS Power Probe 9100P direct-push unit and 3- or 4-inch plastic core barrels with clear polyethylene liners and dedicated core catchers. A depth of 10 feet bss was targeted for each core, with actual penetrations that ranged from 5.4 to 10.0 feet. Upon reaching the target depth or refusal, the cores were retrieved,

brought on the boat deck, capped and labeled, and transported to the land-based mobile core processing trailer. During core processing, the interior polyethylene sleeve containing the cored material was extruded from the outer core liner/barrel. The recovery was measured, and each core was logged and screened using visual, olfactory, and photoionization detector (PID) observations to evaluate NAPL presence. Core recoveries ranged from 61 to 74 percent. Recovered material was assumed to be representative of the upper portions of the core. Copies of the sediment core logs are provided in Appendix B. Per the work plan, samples were to be collected from each core at two depths for the analysis of chemical oxygen demand (COD) and total organic carbon (TOC) to assess the potential for ebullition. One sample was selected from the top foot of each core. At 6 select locations where NAPL or other evidence of petroleum impacts were observed in the cores, a surface sediment sample from the 0^{-} foot to 0.5-foot bss interval was also collected for petroleum-related constituent analysis. The addition of these analytes was made to allow an assessment of the surface sediment beyond where the grab samples were collected and within the footprint of where subsurface sediments showed NAPL impacts. The second sample from each core was collected from the most-impacted interval based on observations and PID readings, then analyzed for COD and TOC in accordance with the work plan. A summary of the cores including their coordinates, sampled intervals and analyses, and estimated sediment surface elevations is provided in Table 2-3.

2.3.3 NAPL Mobility Coring

Following completion of the sediment coring and processing activities, two locations, where visual, olfactory and PID screening indicated the greatest NAPL impacts, were selected for follow-on NAPL mobility core collection (G200 and G260; Figure 2-2). The purpose of these cores was to collect an undisturbed sample from the most impacted areas to allow laboratory testing of the potential mobility of NAPL. Coring was performed using the vessel-mounted mobile direct-push unit and 1.5-inch-diameter macrocore sampler with stainless steel core barrel liners.

Before advancement of the stainless steel lined macrocores, a series of test cores were advanced at each location using disposable clear acetate liners to determine the best means to achieve maximum recovery and at what depth intervals were likely to be associated with the recovered material. Based on this, it was determined that basket catchers would be used and that recovered material was coming from the base of the core. At each location, the core barrel equipped with the stainless steel liner was advanced to 5 feet bss within 5 to 10 feet of the original sediment core. Immediately upon retrieval, the liner was removed from the core barrel and capped at the bottom. Recovery was measured from the top of the liner and the liner was cut right above the height of the recovered material, packed with bubble wrap to fill any remaining void space at the end of the core, and capped and taped. The top and bottom of each core was labeled with its associated depths and was frozen immediately by placing it on its side in a cooler containing dry ice. Coolers containing the intact cores were shipped overnight to TestAmerica Corvallis in Corvallis, Oregon. A summary of NAPL mobility cores including their coordinates, associated intervals, and estimated sediment surface elevations is provided in Table 2-3.

Once at the laboratory, the cores were placed in liquid nitrogen until they froze over the entire diameter of the core, then were immediately cut into 2-inch pucks. These pucks were placed in plastic core caps, covered, and stored at -10 degrees Celsius in a manner that retained the pucks in situ orientation (most shallow end up). To initially screen the samples, photographs were taken of the top surface under white and ultraviolet (UV) (302 nanometers) light after the pucks were allowed to partially thaw. Pucks with surface NAPL fluoresced brownish-orange. This response was confirmed through laboratory TarGOST scans of the puck surfaces (both top and bottom), which were performed at the Dakota Technologies, Inc. laboratory in Fargo, North Dakota. Sample pucks were shipped to and from Dakota Technologies, Inc. on dry ice. Mobility testing, using water drive, was then performed on the two most highly impacted sample pucks from each core (four samples total). This method, as described in Niemet et al. (2015), clamps a thawed puck and its metal sleeve between two reservoirs and passes deaired water through the puck in an upward configuration at flux rates of 0.4 milliliters per minute (mL/min), 0.8 mL/min, and 4 mL/min. The inlet (bottom) pressure is continuously monitored using data acquisition software and a pressure transducer while the water level in the reservoir above the puck slowly increases with flow. Once 50 milliliters of fluid passed through the puck at the lowest flux rate, the water in the upper reservoir was evaluated for presence of NAPL release through visual inspection, odor, and under UV light. The water

was then removed from the reservoir, and the flux increased to the next rate. All puck materials were subjected to the Dean Stark extraction (Method API RP 40; API, 1998) at the end of mobility testing for determination of water and NAPL content, and the resulting dried, clean solids are used for grain density measurement. These parameters, along with the initial bulk volume and mass of the material within the puck, are used to calculate pore fluid saturations (PFS) within the puck following the water drive testing. Eight other pucks were also measured for PFS using the Dean Stark method without previous mobility testing. Grain size distribution testing using ASTM D422 was performed on the remaining soils from four intervals (including those with and without NAPL impacts) across each core (eight total samples). The results of the NAPL mobility testing are presented in Section 3.2.4.

Table 2-1. Dart Summary

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Station Location ID	Dart ID	Location Coordinates (NAD 83 WA South State Plane) (ft)		Time of Deployment		Measured Depth to Bottom (ft from water surface)	Length of Dart Deployed (ft)	Penetration (ft)	Dalles Dam Forebay Elevation at Time of Install (ft NAVD88)	Estimated Sed Surface Elevation (ft NAVD88)[a]	Time of Retrieval		Soak Time (hours)	Notes
		Easting (X)	Northing (Y)											
D440	D440-DART	1520786.50	118019.98	6/19/2018	9:30	8.0	3	3	162.6	154.6	6/21/2018	9:04	47.6	Drop cam verified; top 1 foot appears to be just weed mat
D460	D460-DART	1520813.98	118021.12	6/19/2018	10:21	7.2	3	3	162.5	155.3	6/21/2018	8:25	46.1	Drop cam verified
D420	D420-DART	1520771.65	118013.34	6/19/2018	13:21	6.7	6	3.3	162.4	155.7	6/21/2018	8:35	43.2	
D400	D400-DART	1520747.87	118014.08	6/19/2018	13:45	7.7	6	2.5	162.3	154.6	6/21/2018	8:44	43.0	
D400	D400-DART-D	1520748.19	118016.01	6/19/2018	14:07	6.7	3	3	162.3	155.6	6/21/2018	8:50	42.7	
D480	D480-DART	1520830.50	118021.39	6/19/2018	15:35	8.5	6	6	162.4	153.9	6/21/2018	8:12	40.6	
D500	D500-DART	1520860.15	118022.88	6/19/2018	16:12	9.3	3	1.8	162.4	153.1	6/21/2018	8:05	39.9	
D380	D380-DART	1520728.51	118012.91	6/19/2018	16:42	7.6	3	2.7	162.5	154.9	6/21/2018	8:58	40.3	
D360	D360-DART	1520712.79	118007.41	6/20/2018	8:34	7.9	3	3	162.5	154.6	6/24/2018	6:46	94.2	Drop cam verified
E350	E350-DART	1520702.79	117993.91	6/20/2018	9:15	8.6	3	3	162.5	153.9	6/24/2018	6:53	93.6	Drop cam verified
E330	E330-DART	1520675.15	117997.54	6/20/2018	10:35	9.6	6	5.3	162.5	152.9	6/24/2018	6:58	92.4	
E310	E310-DART	1520657.82	117992.86	6/20/2018	11:01	10.7	6	5.4	162.6	151.9	6/24/2018	7:05	92.1	
D280	D280-DART	1520628.62	118007.07	6/20/2018	11:58	7.6	6	4.2	162.6	155.0	6/24/2018	7:14	91.3	
D260	D260-DART	1520610.00	118006.32	6/20/2018	12:39	7.7	6	3.2	162.6	154.9	6/24/2018	7:22	90.7	
D240	D240-DART	1520589.44	118008.28	6/20/2018	14:41	7.4	3	3	162.6	155.2	6/24/2018	7:32	88.8	
D220	D220-DART	1520563.09	118008.51	6/20/2018	14:52	6.6	3	2.8	162.6	156.0	6/24/2018	7:40	88.8	Drop cam verified
D170	D170-DART	1520518.66	118007.08	6/20/2018	15:18	7.2	3	3	162.6	155.4	6/24/2018	7:47	88.5	
D200	D200-DART	1520545.19	118008.96	6/20/2018	15:31	6.7	6	5.8	162.6	155.9	6/24/2018	7:52	88.4	
D150	D150-DART	1520498.34	118008.10	6/20/2018	15:55	7.0	3	2.3	162.6	155.6	6/24/2018	7:58	88.0	Originally called D160; changed to D150 based on grid layout
D120	D120-DART	1520471.57	118009.67	6/20/2018	16:08	6.6	3	2.7	162.7	156.1	6/24/2018	8:01	87.9	
D100	D100-DART	1520446.03	117998.21	6/20/2018	16:36	7.9	3	2.2	162.6	154.7	6/24/2018	8:06	87.5	
D060	D060-DART	1520405.05	118000.05	6/20/2018	16:45	7.1	3	2.5	162.6	155.5	6/24/2018	8:09	87.4	
F320	F320-DART	1520670.37	117974.08	6/24/2018	9:35	9.9	6	5.3	161.7	151.8	6/26/2018	9:24	47.8	
F340	F340-DART	1520693.07	117975.91	6/24/2018	9:51	9.0	3	3	161.7	152.7	6/26/2018	9:31	47.7	
F360	F360-DART	1520715.16	117978.00	6/24/2018	10:15	8.9	3	3	161.7	152.8	6/26/2018	9:37	47.4	
E380	E380-DART	1520726.04	117995.72	6/24/2018	10:36	7.5	3	2.2	161.7	154.2	6/26/2018	9:42	47.1	
E400	E400-DART	1520751.55	117997.37	6/24/2018	10:46	7.4	3	2.3	161.7	154.3	6/26/2018	9:40	46.9	
E290	E290-DART	1520637.78	117993.71	6/24/2018	11:05	9.9	6	5.8	161.8	151.9	6/26/2018	9:54	46.8	
F300	F300-DART	1520651.13	117973.09	6/24/2018	11:14	10.6	3	3	161.8	151.2	6/26/2018	10:00	46.8	
E270	E270-DART	1520621.13	117992.77	6/24/2018	12:00	10.7	3	2.4	161.9	151.2	6/26/2018	10:04	46.1	
E250	E250-DART	1520600.94	117992.40	6/24/2018	12:09	10.8	3	3	161.9	151.1	6/26/2018	10:08	46.0	
BG-US01	BG-US01-DART	1529656.02	119071.33	6/24/2018	13:12	6.5	3	3	162.0	155.5	6/26/2018	10:15	45.0	Background blank (hung in water column)
OHM-1	OHM-1-DART			6/24/2018			3	1.5			6/26/2018		48.0	Existing monitoring well on Wishram yard - sent to lab; partially submerged in LNAPL
WMW-16	WMW-16-DART			6/26/2018	13:00	NA	3	1.5			6/28/2018	13:00	48.0	Existing monitoring well on Wishram yard; partially submerged within water column

[a] Estimated surface water elevation estimated using Dalles Dam Forebay Elevation at Time of Install; data source:
http://www.nwd-wc.usace.army.mil/dd/common/projects/www/tda.html

ft = foot (feet)
LNAPL = light nonaqueous phase liquid
NAD = North American Datum
NAVD88 = North American Vertical Datum of 1988

Table 2-2. Surface Sediment Grab Sample Summary

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Station Location ID	Location Coordinates (NAD 83 WA South State Plane [ft])		Measured Depth to Bottom (ft from water surface)	Estimated Surface Water Elevation at Time of Collection (ft NAVD88)[a]	Estimated Sediment Surface Elevation (ft NAVD88)	Field Sample ID	Representative Sample Depth (ft bss)	Sample Date and Time		Laboratory Analytical						Notes
	Easting (X)	Northing (Y)								TPH-DRO & -RRO (SGC)	TPH-DRO & -RRO (No SGC)	PAHs	EPH	VPH	COD	
BG-US01	1529652.49	119071.54	3.8	160	156.2	BG-US01-080718	0 - 0.5	8/7/2018	8:55	X	X	X	X	X	X	Upstream (approximately 1.9 miles) background location; bulk bioassay sample collected and placed on hold
D150	1520502.10	117996.33	5.9	160.4	154.5	D150-GS-080718	0 - 0.5	8/7/2018	7:30	X	X	X			X	Collocated Dart had varying waveform with very low-level response at approximately 0.1-2.1 ft bss (bottom); waveform very blue-dominant; maximum response in 0-0.5 ft = 4.7 %RE
D220	1520563.61	117997.21	7.4	160.2	152.8	D220-GS-080718	0 - 0.5	8/7/2018	7:55	X	X	X	X	X	X	Collocated Dart varying waveform with very low-level response at approximately 0.1-2.6 ft bss (bottom); waveform blue-green dominant; maximum response in 0-0.5 ft = 6.9 %RE
D240	1520594.91	117998.50	9.3	161.4	152.1	D240-GS-080618	0 - 0.5	8/6/2018	14:50	X	X	X	X	X	X	Collocated Dart had varying waveform with low-level response at approximately 0-2.7 ft bss (bottom); waveform green-dominant, transitioning to blue-dominant at approximately 1.4 ft bss; maximum response in 0-0.5 ft = 10.5 %RE
D260	1520611.39	117996.78	9.5	161.4	151.9	D260-GS-080618	0 - 0.5	8/6/2018	15:30	X	X	X	X	X	X	Collocated Dart had varying waveform with very low-level response at approximately 0-3.0 ft bss (bottom); waveform blue-green dominant; maximum response in 0-0.5 ft = 5.6 %RE
D420	1520770.20	118013.17	6.3	161.3	155.0	D420-GS-080618	0 - 0.5	8/6/2018	16:55	X	X	X	X	X	X	Collocated Dart had waveform consistent with background response along entire length (0-3.7 ft bss); bulk bioassay sample collected and placed on hold; maximum response in 0-0.5 ft = 2.1 %RE
						D420-GS-080618-1		8/6/2018	17:00	X	X	X	X	X		

[a] Estimated surface water elevation at the time of collection assumed to be represented by the Dalles Dam Forbay Elevation as obtained from:
http://www.nwd-wc.usace.army.mil/dd/common/projects/www/tda.html

Notes:
%RE = percent of the reference emitter
bss = below sediment surface
COD = chemical oxygen demand; analyzed by Stat Lab using method E410.4
EPH = extractable petroleum hydrocarbons; analyzed by Test America using Method NWTPH/EPH
ft = foot (feet)
ID = identification
NAD = North American Datum
NAVD88 = North American Vertical Datum of 1988
PAH = polycyclic aromatic hydrocarbon; analyzed by Pace Analytical using Method 8270 SIM
SGC = silica gel treatment/cleanup
TPH-DRO = total petroleum hydrocarbons as diesel-range organics; analyzed by Pace Analytical using Method NWTPH-Dx
TPH-RRO = total petroleum hydrocarbons as residual-range organics; analyzed by Pace Analytical using Method NWTPH-Dx
VPH = volatile petroleum hydrocarbons; analyzed by Test America using Method NWTPH/VPH

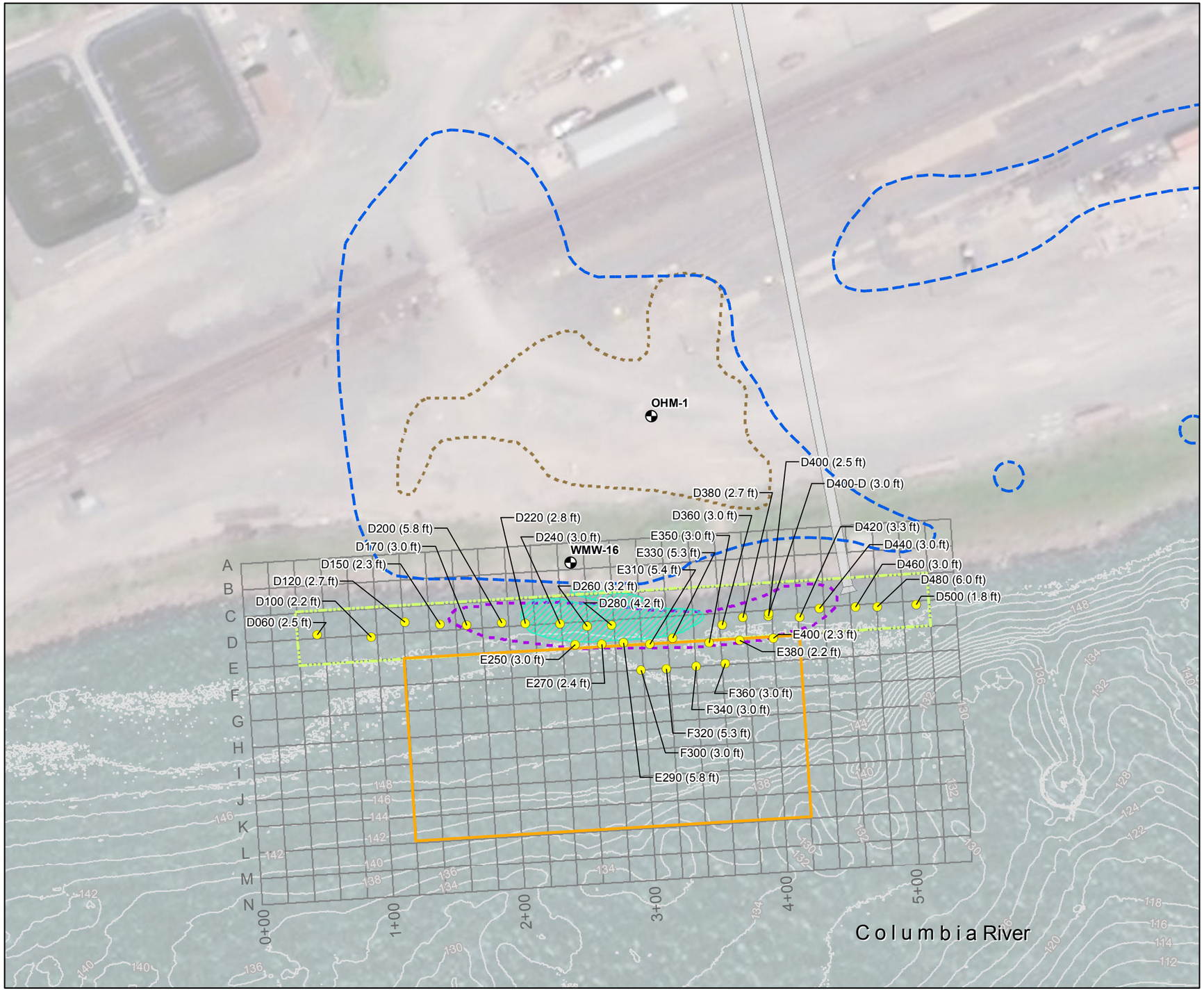
Table 2-3. Core Sample Summary

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

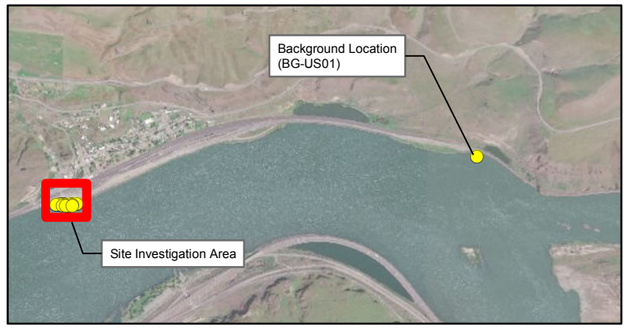
Station Location ID	Actual Location Coordinates (NAD 83 WA South State Plane) (ft)		Measured Depth to Bottom (ft from water surface)	Estimated Surface Water Elevation at Time of Collection (ft NAVD88)[a]	Estimated Sed Surface Elevation (ft NAVD88)	Target Coring Depth (ft bss)	Penetration (ft)	Recovery (ft)	Field Sample ID	Representative Sample Depth (ft bss)	Sample Date and Time		Laboratory Analytical							Notes
	Easting (X)	Northing (Y)											TPH-DRO & -RRO (SGC)	TPH-DRO & -RRO (No SGC)	PAHs	EPH	VPH	COD	TOC	NAPL Mobility	
Lithology Cores																					
D200	1520546.37	118008.00	4.0	160.1	156.1	10	7.0	4.3	D200-GS-080718	0-0.5	8/7/2018	12:30	X	X	X	X	X	X			No NAPL observed; collocated Dart had varying waveform with low-level response at approximately 0.5 ft (highest observed; 18 %RE) and
									D200-SC-080718-A	3.5	8/7/2018	16:40							X		
F360	1520713.94	117981.30	8.8	162.3	153.5	10	6.4	3.9	F360-SC-080818-A	1	8/8/2018	13:10						X	X		NAPL observed from 2.0 to bottom of core at 3.9 ft; collocated Dart showed had waveform consistent with background response along
									F360-SC-080818-A	4	8/8/2018	13:15						X	X		
F400	1520753.13	117980.18	9.1	162.2	153.1	10	10.0	6.5	F400B-SC-080818-A	1	8/8/2018	11:55						X	X		No NAPL observed; no prior Dart
									F400B-SC-080818-B	5	8/8/2018	12:00						X	X		
G200	1520554.09	117949.19	10.2	160.1	149.9	10	6.9	4.3	G200-GS-080718	0-0.5	8/7/2018	18:50	X	X	X	X	X	X			NAPL observed from 2.5 to bottom of core at 4.3 ft; no prior Dart
									G200-SC-080718-A	3.5	8/7/2018	18:40						X	X		
G260	1520611.41	117951.16	10.2	160.1	149.9	10	7.0	4.3	G260-GS-080718	0-0.5	8/7/2018	18:00	X	X	X	X	X	X			NAPL observed from 2.0 to bottom of core at 4.3 ft; no prior dart
									G260-SC-080718-A	3.5	8/7/2018	17:25						X	X		
									G260-SC-080718-A-1	3.5	8/7/2018	17:30						X	X		
									G260-SC-080718-B	4	8/7/2018	17:10						X	X		
I400	1520760.93	117914.32	18.0	162.3	144.3	10	7.8	5.8	I400-GS-080918	0-0.5	8/9/2018	10:00	X	X	X	X	X	X			No NAPL observed; no prior Dart
									I400-SC-080918-A	2.5	8/9/2018	10:15						X	X		
									I400-SC-080918-B	5.5	8/9/2018	11:00						X	X		
J260	1520614.66	117891.71	14.7	161.9	147.2	10	7.4	5.4	J260-GS-080818	0-0.5	8/8/2018	17:40	X	X	X	X	X	X			NAPL observed from 0.5 to 4.0 ft; no prior Dart
									J260-SC-080818-A	2.5	8/8/2018	17:45						X	X		
K120	1520484.45	117855.27	18.9	161.7	142.8	10	5.4	3.7	K120-GS-080818	0-0.5	8/8/2018	16:40	X	X	X	X	X	X			No NAPL observed; no prior Dart
									K120-SC-080818-A	3.4	8/8/2018	16:55						X	X		
Mobility Cores																					
G200	1520556.13	117943.05	12.4	162.9	150.5	5	5.0	2.5	G200-MC-080918	1.5-4.0	8/9/2018	13:30								X	NAPL mobility core based on NAPL observations prior collocated core; assigned representative interval based on trial cores using clear liners and prior lithology core at this location
G260	1520615.35	117942.06	12.1	162.6	150.5	5	5.0	1.8	G200-MC-080918	1.5-3.3	8/9/2018	15:50								X	NAPL mobility core based on NAPL observations prior collocated core; assigned representative interval based on trial cores using clear liners and prior lithology core at this location

[a] Estimated surface water elevation at the time of collection assumed to be represented by the Dalles Dam Forbay Elevation as obtained from:
http://www.nwd-wc.usace.army.mil/dd/common/projects/www/tda.html

Notes:
NAPL Mobility testing first included white and black light core photography and laser-induced fluorescence scanning by Dakota Technologies using the TarGOST tool. Based on the core photography and LIF scanning results those intervals that were likely to represent the highest NAPL saturations were then subjected to water-drive and pore fluid saturation testing (Dean Stark) by TestAmerica, Corvallis, Oregon
%RE = percent of the reference emitter
bss = below sediment surface
COD = chemical oxygen demand; analyzed by Stat Lab using method E410.4
EPH = extractable petroleum hydrocarbons; analyzed by TestAmerica using Method NWTPH/EPH
ft = foot (feet)
ID = identification
LIF = laser-induced fluorescence
NAD = North American Datum
NAPL = nonaqueous phase liquid
NAVD88 = North American Vertical Datum 1988
PAH = polycyclic aromatic hydrocarbon; analyzed by Pace Analytical using Method 8270 SIM
SGC = silica gel treatment/cleanup
TOC = total organic carbon; analyzed by Method U.S. Department of Agriculture LOI
TPH-DRO = total petroleum hydrocarbons as diesel-range organics; analyzed by Pace Analytical using Method NWTPH-Dx
TPH-RRO = total petroleum hydrocarbons as residual-range organics; analyzed by Pace Analytical using Method NWTPH-Dx
VPH = volatile petroleum hydrocarbons; analyzed by TestAmerica using Method NWTPH/VPH



VICINITY MAP



LEGEND

- Dart Sample Location
- Existing Monitoring Well
- Sampling Grid (20 ft x 20 ft)
- Initial Study Area
- Expanded Study Area
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)

Notes:
NAPL = nonaqueous phase liquid
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act
ft = feet
NAVD88 = North American Vertical Datum 1988

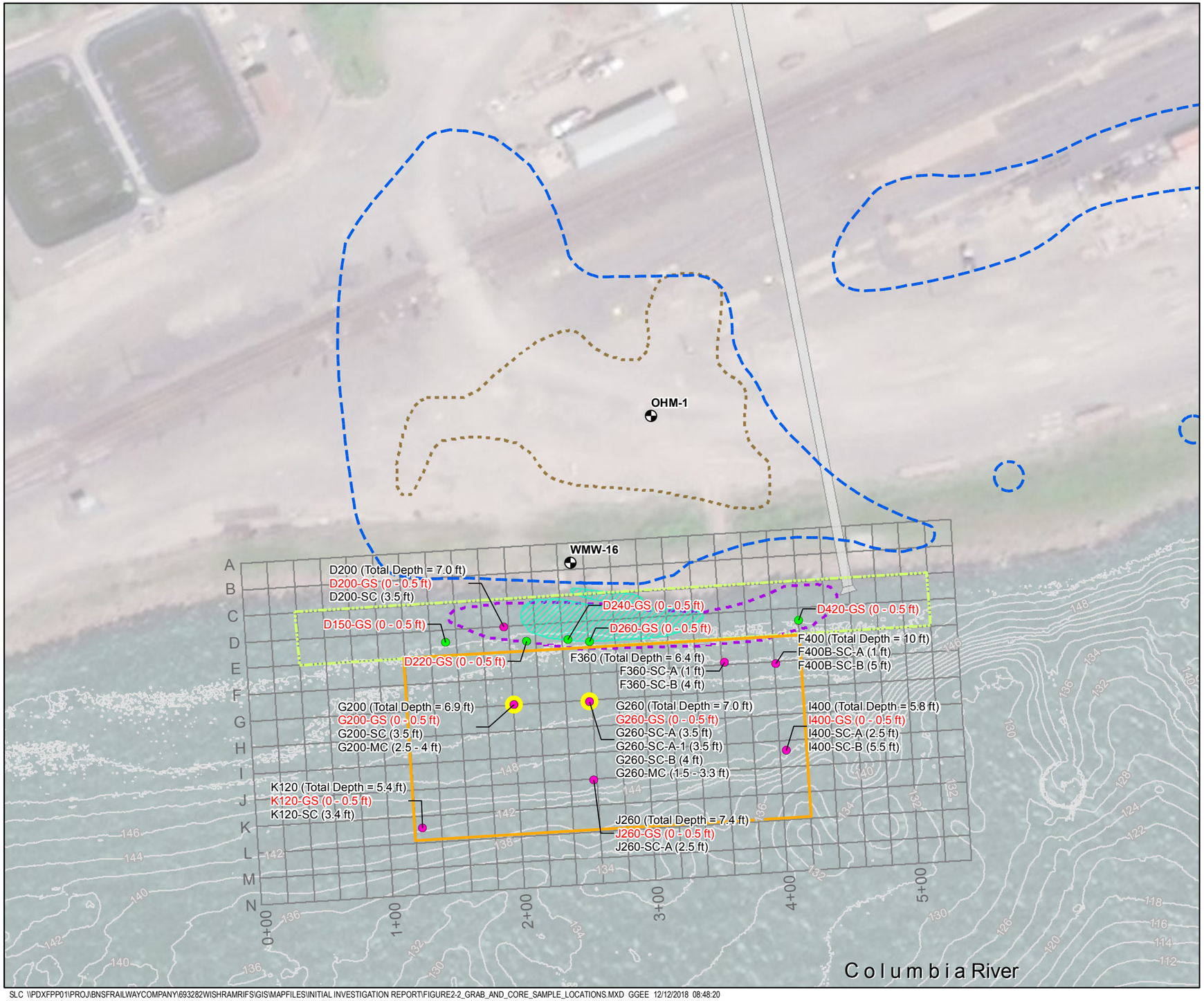
N

0 40 80 160
Feet
1:960 1 inch = 80 feet

Figure 2-1. June 2018 Dart Sample Locations
BNSF Wishram Railyard
Wishram, Washington

JACOBS

SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE2-1_DART_LOCATIONS.MXD GGEE 12/12/2018 08:50:03



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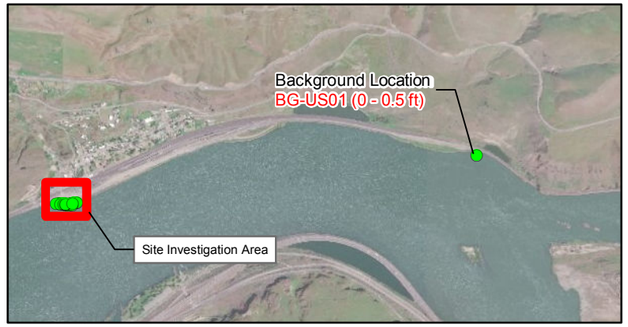

LEGEND

- Surface Sediment Grab Sample Location
- Lithology Core Sample Location
- Mobility Core Sample Location
- Existing Monitoring Well
- Sampling Grid (20 ft x 20 ft)
- Initial Study
- Expanded Study
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)

Sample ID Notes:

G260 (Total Depth = 7.0 ft)	Total penetration depth of core.
G260-GS (0 - 0.5 ft)	Red Text = Sample selected for petroleum-related contaminants of concern
G260-SC-A (3.5 ft)	
G260-SC-A-1 (3.5 ft)	"-1" = Duplicate sample
G260-SC-B (4 ft)	
G260-MC (1.5 - 3.3 ft)	"-MC" = Mobility sample

Notes:

NAPL = nonaqueous phase liquid	ft = feet
µg/L = microgram(s) per liter	NAVD88 = North American
MTCA = Model Toxics Control Act	Vertical Datum 1988

N

0 40 80 160
Feet

1:956 1 inch = 79.65 feet

Figure 2-2. August 2018 Surface Sediment Grab Sample and Core Sample Locations
BNSF Wishram Railyard
Wishram, Washington

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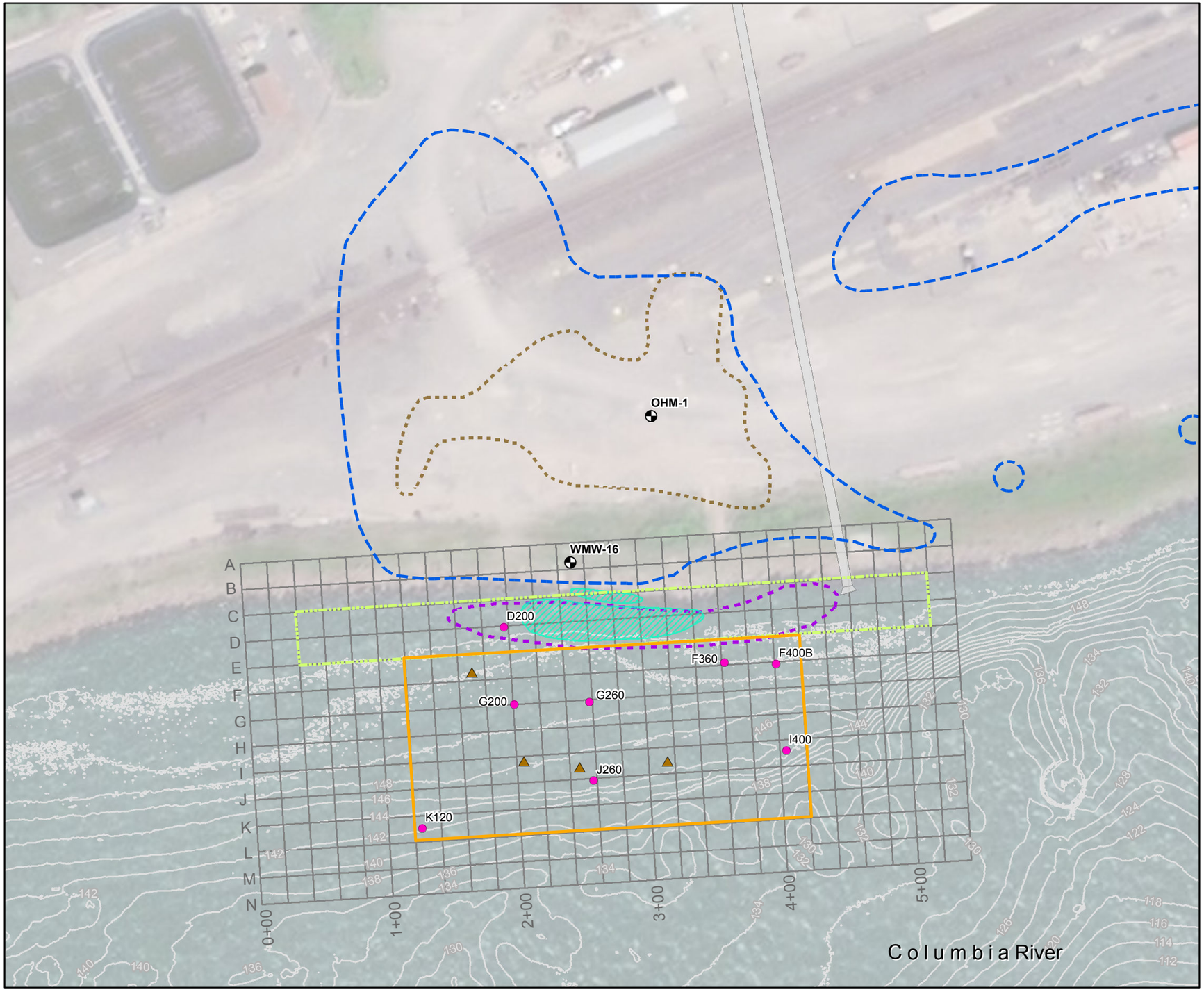
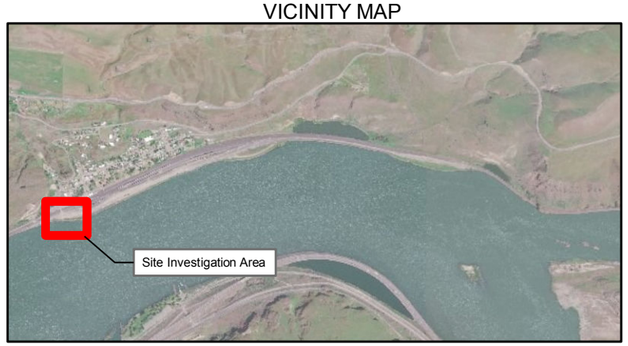
SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE2-2_GRAB_AND_CORE_SAMPLE_LOCATIONS.MXD GGEE 12/12/2018 08:48:20



VICINITY MAP



LEGEND

- Southernmost Sheens Observed August 7, 2018
- Lithology Core Sample Location
- Existing Monitoring Well
- Sampling Grid (20 ft x 20 ft)
- Initial Study Area
- Expanded Study Area
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)

Notes:
NAPL = nonaqueous phase liquid
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act
ft = feet
NAVD88 = North American Vertical Datum 1988

N

0 40 80 160
Feet
1:960 1 inch = 80 feet

Figure 2-3. August 2018 Sheen Observations and Core Locations
BNSF Wishram Railyard
Wishram, Washington

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SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE2-3_SHEEN_LOCATIONS.MXD GGEE 12/20/2018 11:28:02

3. Results

3.1 Nearshore Area

3.1.1 Dart Survey

Each Dart log, presented in Appendix, A plots the overall (total) fluorescence with depth in the Signal column. The fill color shown in the Signal column is referred to as the waveform and is based on the relative contribution of the instrument's four channels that are each associated with different wavelengths and have been assigned a unique color (blue, green, orange, and red). The leftmost column on each log provides callouts at various depths that illustrate the relative contribution of each of the four colors/ channels to the overall waveform coloration.

The fluorescence responses associated with Dakota Technologies, Inc.'s scan of the Darts deployed within the study area were notably low and not indicative of the presence of NAPL; the maximum responses at individual locations across the study area ranged from 2.0 to 18.1 %RE. Maximum responses associated with the upstream background location (BG-US01) and upland monitoring well WMW-16 were 3.9 and 3.1 %RE, respectively. Conversely the Dart deployed within the upland LNAPL-containing well, OHM-1, had a maximum fluorescence response of 979 %RE. A summary of the data for each Dart is provided in Table 3-1. Table 3-1 includes the maximum response and its associated depth, the average response across the length of the Dart, and the general waveform coloration that ranged from orange and red dominant to blue and green dominant.

Thirteen of the 31 study area locations showed Dart responses consistent with the background reference location and exhibited very low-level responses with maximums less than 10 %RE and average responses that were less than 1.5 %RE. Consistent with the background Dart, the waveforms associated with the fluorescence responses at these locations were orange and red dominant. These responses were generally observed at the eastern and western peripheries of the study area and at locations advanced farther from the shore along the survey grid F-line, as shown on Figure 3-1. While low-level Dart fluorescence responses were also observed at the remaining 18 locations (average responses across each were between 1 and 4.4 %RE), at least a portion of these logs exhibited a waveform with greater relative contributions from the blue and green fluorescence channels than those seen at the background location. The maximum fluorescence response at the majority of these locations was less than 10 %RE. Exceptions to this include the three locations (D200-DART, D240-DART, and D380-DART) highlighted on Figure 3-1, where maximums were observed to range between 10.5 and 18.1 %RE. These marginally higher maximums coincided with intervals with relatively higher contributions from the blue and green fluorescence channels.

Despite the absence of elevated Dart responses indicating the presence of NAPL, the spatial distribution of the variations in the waveform colors and relative intensity of responses across depth at select locations provided a means with which to select the follow-on sediment sampling locations. As described in Sections 2.2.2 and 2.3.2, sediment grab sample locations, and to a lesser extent sediment core locations, were selected to include the range of the observed fluorescence waveforms and intensities. Sediment analytical results and comparisons to the Dart data are presented in Section 3.2.2.

3.1.2 Stratigraphy and Visual Observations

Beyond the toe of the riprap embankment that extends approximately 15 feet from the water line, the sediment samples obtained through grab sampling indicated the presence of a micaceous fine sand to silty fine sand at the surface. Within the top 6 inches, varying amounts of gravel and cobbles and milfoil and other organic debris were also observed. The core advanced at D200 indicated that the fine sand to silty fine sand extended to a depth of at least 4.3 feet in the nearshore area. No visual, olfactory, or PID evidence of NAPL was encountered within the nearshore area.

3.1.3 Petroleum-Related Constituents in Surface Sediment

In accordance with the work plan, petroleum-related analyses were performed on the five surface sediment grab samples collected within the initial study area. In addition, the shallow 0-foot to 0.5-foot interval from core location D200 was also sampled for petroleum constituents. Petroleum-related laboratory analyses for the six surface sediment samples collected across the initial study area and the background sample (BG-US01) included the following:

- Total petroleum hydrocarbons (TPH), diesel-range organics (TPH-DRO) and oil-range or residual-range organics (TPH-ORO) with and without silica gel treatment/cleanup (SGC) using Method NWTPH-Dx
- Volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH) using Methods NWTPH/VPH and NWTPH/EPH, respectively
- PAHs using U.S. Environmental Protection Agency (EPA) Method 8270 SIM

Analytical results from the six nearshore surface sediment samples from within the initial study area and from the upstream background location are summarized in Table 3-2, and laboratory analytical reports are included as Appendix C. A comparison of the results to Washington Freshwater Sediment Cleanup Objectives (SCOs), as listed in Table VI, WAC 173-204-563, indicates 1 of the 6 surface samples collected across the initial study area exceeded the SCO for TPH-DRO (340 milligrams per kilogram [mg/kg]). Specifically, at core location D200, where the highest observed Dart fluorescence response was observed but where NAPL was not observed, a DRO concentration of 459 mg/kg was measured in the non-SGC sample. While this result was in excess of the SCO of 340 mg/kg, the same sample run with SGC was below the SCO at an estimated concentration (J-flagged) of 57.6 mg/kg. TPH-ORO concentrations in both the SGC and non-SGC samples from D200 were below the SCO of 3,600 mg/kg. TPH-DRO and -ORO were below the laboratory method detection limits in the surface sediment grab sample collected from the upstream background location (BG-US01).[1] No other constituents as tested for in each surface sediment sample were in excess of the SCO.

Given the exceedance of the SCO for TPH-DRO in the non-SGC surface sediment sample from D200 and in accordance with cleanup provisions of the SMS under WAC 173-204, as described in the SCUM II (Ecology, 2017b), the three highest concentrations from the available nearshore surface sediment data set were averaged for comparison against the Washington Freshwater Sediment Cleanup Screening Levels (CSLs). A summary of the TPH-DRO and TPH-ORO results from across the nearshore areas and the averages of the three highest results from SGC and non-SGC samples are provided in Table 3-3. The averages of the three highest TPH-DRO and TPH-ORO results for the nearshore area were below the CSL for both SGC and non-SGC samples. Based on this information, the nearshore area does not qualify as a sediment site under applicable standards.

3.1.4 Comparison of Sediment Sampling and Dart Results

Sediment grab sample locations and, to a lesser extent, sediment core locations were selected to include the range of fluorescence waveforms and intensities observed in the nearshore Dart data (Section 2.2 and Table 3-2). To confirm the suitability of using the Dart data to identify those areas where surface sediments were most likely to be impacted with petroleum-related constituents, TPH results were compared against the Dart response data collected from the same approximate location and depth interval.

In total, there were six locations where both Dart response and TPH analytical results were available. These included the 0- to 0.5-foot interval locations at D150, D200, D220, D240, D260, and D420. Plots of both the maximum and average Dart responses across the 0- to 0.5-foot intervals (Appendix A) against the sum of their collocated TPH-DRO and TPH-ORO (DRO+ORO) results are provided on Figure 3-2. A

[1] Bulk bioassay samples collected were not analyzed due to initial concentrations below the SCUM II observed at each of the surface sediment grab samples, indicating the site doesn't meet the SCUM II standards for a sediment site

summary of the Dart and TPH results for each sample are shown on Figure 3-2. The one non-detect TPH (DRO at D420) was assigned a proxy value that was equal to the laboratory method detection limit.

Figure 3-2 shows good fits to linear trend lines (r-squared values of 0.96 and 0.97), indicating strong correlations between DRO+ORO results and both the average and maximum Dart responses. These data indicate that Dart response data is an effective indicator of total TPH concentrations in site sediments and that the Dart survey was an effective means with which to screen for petroleum impacts in sediment across the initial study area.

Insert

Tables

3-1 Dart Results Data Summary

(2-page 11x17 Front and back – Pages 3-3 and 3-4)

3-2 Nearshore Sediment Analytical Results

(2-page 11x17 Front and back – Pages 3-5 and 3-6)

3-3 Evaluation of Nearshore Sediment Results against Cleanup Screening Levels

(2-page 8.5x11 front and back, pages 3-7 and 3-8

Insert Figure

3-1 Dart Results

(2-page 11x17 – Pages 3-9 and 3-10)

Table 3-1. Dart Results Data Summary

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Station Location ID	Dart ID	Penetration (ft)	Average Dart Fluorescence Response (%RE)	Maximum Dart Fluorescence Response		Average Dart Fluorescence Response Across Top 0.5 ft bss Interval (%RE)	Waveform Coloration	Notes
				%RE	(ft bss)			
D060	D060-DART	2.5	0.7	2.0	0.6	0.8	orange-red-green	Consistent waveform across depth
D100	D100-DART	2.2	0.7	2.9	1.9	0.8	orange-red-green	Consistent waveform across depth
D120	D120-DART	2.7	0.6	2.1	1.1	0.7	orange-red-green	Consistent waveform across depth
D150	D150-DART	2.3	3.0	4.9	1.3	2.5	blue-green	Consistent waveform across depths below 0.1 ft bss
D170	D170-DART	3	1.8	5.2	2.6	1.6	blue-green	Consistent waveform across depths below 0.1 ft bss
D200	D200-DART	5.8	3.6	18.1	0.4	9.2	orange-green-blue	Consistent waveform across depths below 0.1 ft bss; marginally higher response between 0.1 and 1 ft bss
D220	D220-DART	2.8	3.2	6.9	0.2	2.8	orange-green-blue	Consistent waveform across depths below 0.1 ft bss
D240	D240-DART	3	4.4	10.5	0.2	4.9	orange-green-blue	Consistent waveform across depth
D260	D260-DART	3.2	1.9	5.6	0.1	1.9	orange-green-blue	Consistent waveform across depth
D280	D280-DART	4.2	2.6	12.6	1.8	1.5	blue-green	Waveform becomes more blue dominant below 2 ft bss; highest response of 12.6 %RE is anomalous spike across a <0.01 ft interval
D360	D360-DART	3	2.1	9.1	2.7	1.1	blue-green	Waveform becomes more blue dominant below with depth
D380	D380-DART	2.7	1.7	8.2	0.0	1.1	orange-green-blue	Consistent waveform across depth; marginally higher response at depth (approximately 5 %RE)
D400	D400-DART	2.5	1.6	3.9	1.9	1.2	orange-green-blue	Consistent waveform across depths below 0.3 ft bss
D400	D400-DART-D	3	0.9	4.1	2.7	0.9	orange-red-green	Consistent waveform across depth
D420	D420-DART	3.3	1.1	7.6	3.5	0.8	orange-red-green	Consistent waveform across depth
D440	D440-DART	3	1.2	6.3	0.0	1.9	orange-red-green	Consistent waveform across depth
D460	D460-DART	3	1.2	6.2	1.3	1.0	orange-red-green	Consistent waveform across depth
D480	D480-DART	6	1.0	5.2	4.8	1.7	orange-red-green	Consistent waveform across depth
D500	D500-DART	1.8	0.9	4.1	1.5	0.9	orange-red-green	Consistent waveform across depth
E250	E250-DART	3	1.9	4.6	2.3	1.6	blue-green	Waveform becomes less blue dominant below depth of 2 ft bss
E270	E270-DART	2.4	1.7	6	2.0	1.1	blue-green	Consistent waveform across depths below 0.4 ft bss
E290	E290-DART	5.8	2.2	5.4	2.9	1.5	blue-green	Consistent waveform across depth with exception of less blue dominance between 2.5 to 3 ft bss
E310	E310-DART	5.4	1.9	6.5	4.7	1.4	blue-green	Waveform becomes more blue dominant below 3.5 ft bss
E330	E330-DART	5.3	2.2	5.8	2.1	1.3	orange-green-blue	Waveform becomes less orange dominant below depth of 3 ft bss
E350	E350-DART	3	1.4	9.7	2.8	0.8	blue-green	Waveform becomes more blue dominant below depth of 2 ft bss
E380	E380-DART	2.2	1.5	11.9	2.0	1.1	orange-green-blue	Waveform becomes less orange dominant below depth of 1.6 ft bss
E400	E400-DART	2.3	1.1	3.9	2.1	0.7	blue-green	Waveform becomes more blue dominant below depth of 2 ft bss
F300	F300-DART	3	1.3	10.3	2.1	1.8	orange-red-green	Consistent waveform across depth; highest response of 10.3 %RE is anomalous spike across a less than 0.01 ft interval with adjacent responses 1 to 2 orders of magnitude lower
F320	F320-DART	5.3	1.1	2.6	3.8	0.9	orange-red-green	Consistent waveform across depth
F340	F340-DART	3	0.8	6.5	1.4	0.4	orange-red-green	Consistent waveform across depth
F360	F360-DART	3	1.1	3.4	1.4	1.0	orange-red-green	Consistent waveform across depth
Reference Locations								
BG-US01	BG-US01-DART	3	1.0	3.9	--	--	orange-red-green	Reference Dart; represents upstream (approximately 1.9 miles) background location surface water soak
WMW-16	WMW-16-DART	1.5	1.7	3.1	--	--	orange-green-red	Reference Dart; represents upland in well (WMW-16) groundwater (dissolved constituents) soak
OHM-1	OHM-1-DART	1.5	835	979	--	--	green-orange-blue	Reference Dart; represents upland in well (OHM-1) NAPL soak

Notes:
Estimated surface water elevation estimated using Dalles Dam Forebay Elevation at Time of Install; data source:
http://www.nwd-wc.usace.army.mil/dd/common/projects/www/tda.html
%RE = percent of the reference emitter
bss = below sediment surface
ft = foot (feet)
NAPL = nonaqueous phase liquid

Table 3-2. Nearshore Sediment Analytical Results

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

		Location ID:		BG-US01		D200			D150		D220		D240		D260		D420			
		Field Sample ID:		BG-USO1-GS-080718		D200-GS-080718		D200-SC-080718A	D150-GS-080718		D220-GS-080718		D240-GS-080618		D260-GS-080618		D420-GS-080618		D420-GS-080618-1	
		Sample Date:		08/07/2018		08/07/2018		08/07/2018	08/07/2018		08/07/2018		08/06/2018		08/06/2018		08/06/2018		08/06/2018	
		Sample Depth (ft):		0-0.5		0-0.5		3.5	0-0.5		0-0.5		0-0.5		0-0.5		0-0.5		0-0.5	
General Chemistry		*SCO* [a]	*CSL* [b]																	
Total Organic Carbon	mg/kg	--	--					4,580												
Total Solids	%	--	--	75.8		78.1		78.6	70.9		68		71.6		70.7		72.8		73.9	
Chemical Oxygen Demand	mg/kg	--	--	220		220		350	220		250		200	U	220		220			
PAHs (SW8270DSIM)																				
1-Methylnaphthalene	µg/kg	--	--	26.4	U	25.6	U		28.2	U	29.4	U	28.0	U	28.3	U	27.5	U	27.0	U
2-Chloronaphthalene	µg/kg	--	--	26.4		25.6			28.2		29.4		28.0		28.3		27.5		27.0	
2-Methylnaphthalene	µg/kg	--	--	26.4	U	25.6	U		28.2	U	29.4	U	3.00	J	28.3	U	27.5	U	27.0	U
Acenaphthene	µg/kg	--	--	7.91	U	7.69	U		8.47	U	8.82	U	8.39	U	8.49	U	8.24	U	8.11	U
Acenaphthylene	µg/kg	--	--	7.91	U	8.27			8.47	U	8.82	U	6.30	J	8.49	U	8.24	U	8.11	U
Anthracene	µg/kg	--	--	7.91	U	7.69	U		8.47	U	8.82	U	6.55	J	8.49	U	8.24	U	8.11	U
Benz[a]anthracene	µg/kg	--	--	7.91	U	17.3			1.85	J	2.82	J	23.3		3.91	J	8.24	U	0.966	J
Benzo(a)pyrene	µg/kg	--	--	7.91	U	134			2.48	J	1.88	J	27.5		4.24	J	8.24	U	8.11	U
Benzo(b)fluoranthene	µg/kg	--	--	7.91	U	24.3			2.86	J	1.07	J	20.8		5.21	J	8.24	U	8.11	U
Benzo(ghi)perylene	µg/kg	--	--	7.91	U	7.69	U		5.29	J	3.25	J	8.39	U	6.00	J	8.24	U	8.11	U
Benzo(k)fluoranthene	µg/kg	--	--	7.91	U	17.7			1.79	J	2.29	J	14.3		1.66	J	8.24	U	8.11	U
Chrysene	µg/kg	--	--	7.91	U	113			1.72	J	8.82	U	18.9		3.24	J	8.24	U	8.11	U
Dibenzo(a,h)anthracene	µg/kg	--	--	7.91	U	7.69	U		8.47	U	8.82	U	8.64		0.931	J	8.24	U	8.11	U
Fluoranthene	µg/kg	--	--	7.91	U	7.26	J		2.68	J	1.35	J	8.39	U	3.98	J	8.24	U	8.11	U
Fluorene	µg/kg	--	--	7.91	U	1.61	J		8.47	U	8.82	U	2.10	J	8.49	U	8.24	U	8.11	U
Indeno(1,2,3-cd)pyrene	µg/kg	--	--	7.91	U	7.69	U		1.83	J	1.06	J	14.8		2.72	J	8.24	U	8.11	U
Naphthalene	µg/kg	--	--	26.4	U	5.79	J		28.2	U	29.4	U	4.28	J	28.3	U	27.5	U	27.0	U
Phenanthrene	µg/kg	--	--	7.91	U	7.69	U		1.03	J	8.82	U	12.9		1.49	J	8.24	U	8.11	U
Pyrene	µg/kg	--	--	7.91	U	23.1			4.37	J	2.57	J	48.9		5.31	J	8.24	U	0.937	J
Total PAHs (17)[c]	µg/kg	17,000	30,000	26.4	U	378	J		25.9	J	16.3	J	212	J	38.7	J	27.5	U	1.90	J
TPH (NWTPH-DX)																				
Diesel-range Organics	mg/kg	340	510	5.28	U	**459**			50.4	J	40	J	180		81.5		5.49	U	5.41	U
Residual-range Organics	mg/kg	3,600	4,400	13.2	U	1,380			223		188		781		313		13.7	U	5.95	J
TPH (NWTPH-DXSG)																				
Diesel Range Organics	mg/kg	340	510	5.28	U	57.6	J		113	U	20.6	J	219	J	7.88	J	5.49	U	2.39	J
Residual Range Organics	mg/kg	3,600	4,400	13.2	U	179	J		174	J	88.8	J	907	J	32.3	J6	13.7	U	7.6	J
NWTPH-VPH																				
C10-C12 Aliphatics	mg/kg	--	--	3.8	U	2.9	U				5.8	U	7.9	U	4.7	U	5.8	J	4.8	U
C10-C12 Aliphatic (adjusted)	mg/kg	--	--	2.7	U	3	U				3	U	3.1	U	3.2	U	2.8	U	2.8	U
C10-C12 Aromatics	mg/kg	--	--	7	J	5.1	J				11	J	13	J	8.1	J	8.9	J	9.4	J
C12-C13 Aromatics	mg/kg	--	--	3.8	U	2.9	U				7.5	J	8	J	4.7	U	5.2	U	4.8	U
C5-C6 Aliphatics	mg/kg	--	--	3.8	J	2.9	U				5.8	U	7.9	U	4.7	U	5.2	U	5.3	J
C5-C6 Aliphatics (adjusted)	mg/kg	--	--	3.8	J	3	U				3	U	3.1	U	3.2	U	2.8	U	5.3	J
C6-C8 Aliphatics	mg/kg	--	--	3.8	U	2.9	U				5.8	U	7.9	U	4.7	U	5.2	U	4.8	U
C6-C8 Aliphatic (adjusted)	mg/kg	--	--	2.7	U	3	U				3	U	3.1	U	3.2	U	2.8	U	2.8	U
C8-C10 Aliphatics	mg/kg	--	--	3.8	U	2.9	U				5.8	U	7.9	U	4.7	U	5.2	U	4.8	U
C8-C10 Aliphatic (adjusted)	mg/kg	--	--	2.7	U	3	U				3	U	3.1	U	3.2	U	2.8	U	2.8	U
C8-C10 Aromatics	mg/kg	--	--	3.8	U	2.9	U				5.8	U	7.9	U	4.7	U	5.2	U	4.8	U
NWTPH-EPH																				
C10-C12 Aliphatics	mg/kg	--	--	0.65	U	0.85	J				2.8	U	2.9	U	3	U	3	J	1.3	U
C10-C12 Aromatics	mg/kg	--	--	1.1	U	1.2	U				6.2	U	6.1	U	1.3	U	1.2	U	1.1	U
C12-C16 Aliphatics	mg/kg	--	--	0.58	U	4.3	J				16	J	19	J	2.1	J	0.6	U	0.59	U
C12-C16 Aromatics	mg/kg	--	--	0.58	U	1.5	J				3.3	U	3.2	U	0.7	U	0.6	U	0.59	U
C16-C21 Aliphatics	mg/kg	--	--	0.81	U	11					55		78		11		1.1	J	0.82	U
C16-C21 Aromatics	mg/kg	--	--	0.85	U	9.4					33	J	37		5.6	J	1.2	J	0.92	J
C21-C34 Aliphatics	mg/kg	--	--	1.6	U	30					180		270		50		3.2	J	2.9	J
C21-C34 Aromatics	mg/kg	--	--	1.3	U	31					190		230		47		4.6	J	3.2	J

[a] Washington Freshwater SCOs

[b] Washington Freshwater Sediment CSLs

[c] Sum of the 17 PAH listed in Table 8-1 of Washington State Department of Ecology SCUM II, updated December 2017

Notes:
µg/kg = microgram(s) per kilogram
CSL = Cleanup Screening Level
EPH = extractable petroleum hydrocarbons
ft = foot (feet)
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbon
SCO = Sediment Cleanup Objective
SCUM II = Sediment Cleanup User's Manual II
TPH = total petroleum hydrocarbons
VPH = volatile petroleum hydrocarbons
U = Not detected at the reporting limit (or method detection limit or estimated detection limit if shown).

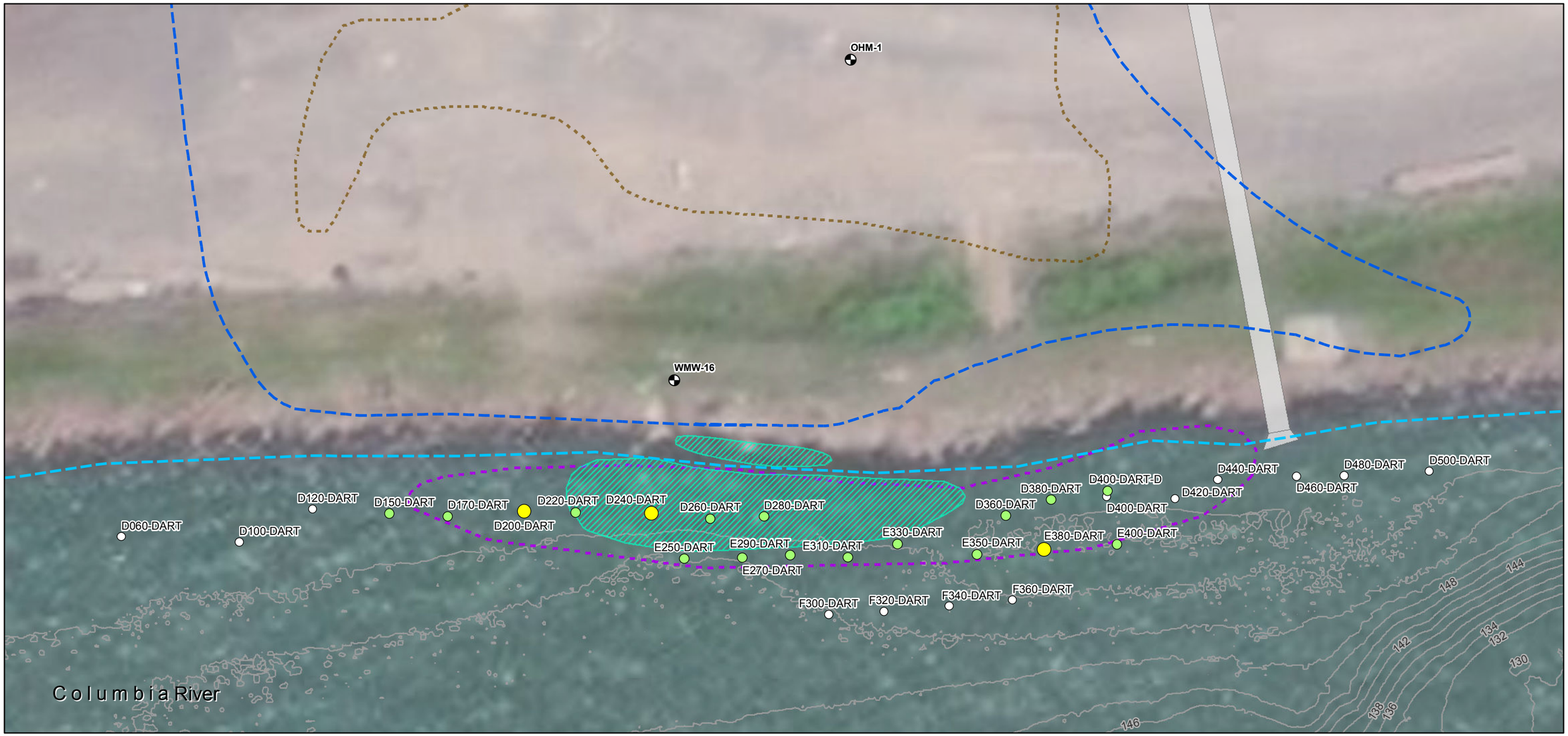
Table 3-3. Evaluation of Nearshore Sediment Results against Cleanup Screening Levels

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Sample ID	NS/OS/BG	Diesel Range Organics		Residual Range Organics		
			No SGC	with SGC	No SGC	with SGC
		CSL[a]:	**510**		**4,400**	
BG-USO1-GS-080718	BG		5.28	5.28	13.2	13.2
D150-GS-080718	NS		50.4	***113***	223	174
D200-GS-080718	NS		***459***	57.6	***1,380***	***179***
D220-GS-080718	NS		40	20.6	188	88.8
D240-GS-080618	NS		***180***	***219***	***781***	***907***
D260-GS-080618	NS		81.5	7.88	313	32.3
D420-GS-080618	NS		5.49	5.49	13.7	13.7
D420-GS-080618-1	NS		5.41	2.39	6.0	7.6
Average of 3 Highest Concentrations (shaded if in excess of CSL)						
Nearshore			240	130	825	420

[a] Washington Freshwater Sediment CSLs

Notes:
All concentrations reported in mg/kg.
The three highest concentrations site wide shown in bold and italics.
BG = background
CSL Cleanup Screening Level
ID = identification
mg/kg = milligram(s) per kilogram
NS = nearshore
OS = offshore
SGC= silica gel treatment/cleanup



LEGEND

- Very Low Level Response Consistent with Background
- Very Low Level Response (Generally <10% RE Maximum) with Blue-green Waveform that is Inconsistent with Background
- Low Level Response (Maximum Response Between 10 and 18%RE) with Blue-green Waveform that is Inconsistent with Background
- Existing Monitoring Well
- Current Shoreline
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)

Notes:
NAPL = nonaqueous phase liquid
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act
UST = underground storage tank

N

0 17.5 35 70
Feet

1:420 1 inch = 35 feet

Figure 3-1. Dart Results
BNSF Track Switching Facility
Wishram, Washington

JACOBS

SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGURE3-1_DART_RESULTS.MXD GGEE 1/21/2019 12:14:23

3.2 Offshore Area

3.2.1 Stratigraphy and Visual Observations

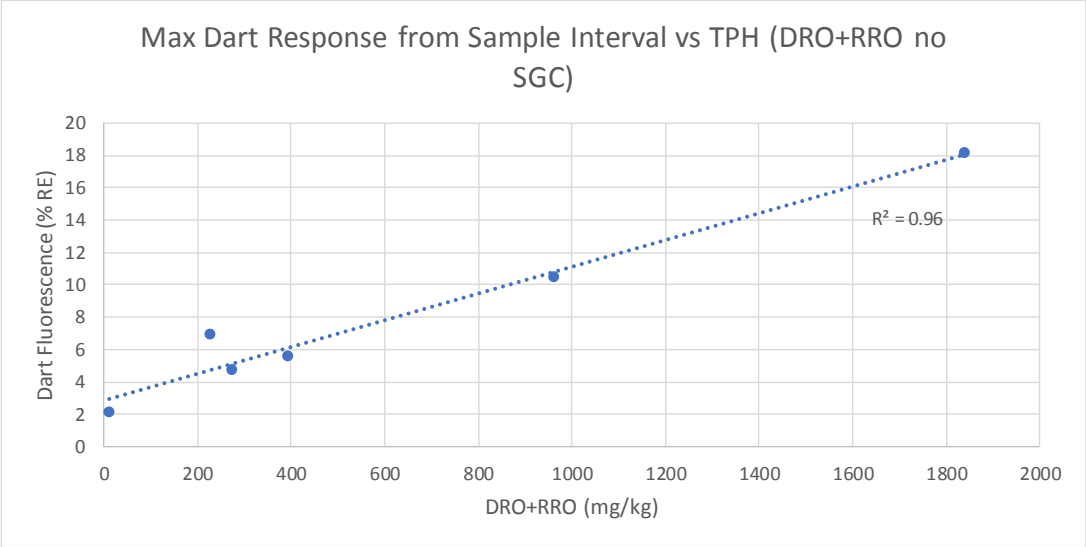
The sediment samples obtained through core sampling indicated the presence of a micaceous fine sand that extended to depths of between 0.5 foot (J260) and 5.5 feet bss (I400). No visual, olfactory, or PID evidence of NAPL or petroleum-related impacts were encountered within these materials. These fine sands were observed to comprise the majority of the material in three of the seven offshore cores. At the remaining 4 locations (G200, G260, J260, and F360), a 2- to 3.5-foot interval of highly plastic disturbed silty sand with no apparent bedding structure and an abundance of organic debris, consisting of wood and roots, was observed approximately 0.5 foot to 2.5 feet bss. In each instance where this interval was present, a black, tacky NAPL was also observed and PID screening results were elevated. At the location where the bottom of the NAPL-impacted interval was encountered (J260), a micaceous fine sand with laminar structure, no odor, no staining, and no elevated PID screening results was noted. These four core locations, highlighted on Figure 3-3, represented the only locations where NAPL was observed during the investigation. The presence of anthropogenic debris at one location, consisting of the remnants of a glass jar and its metal lid (G200 at 4.2 feet bss), and the absence of bedding structure within the NAPL-impacted intervals encountered suggest that these materials represent a layer of fill that was emplaced, likely before the inundation of these lands that resulted from the construction of The Dalles Dam. Bedrock was not encountered within the study area during the initial investigation. Figure 3-4 presents two cross-sections (A-A' and B-B') that illustrate the observed sediment conditions across both the nearshore and offshore areas.

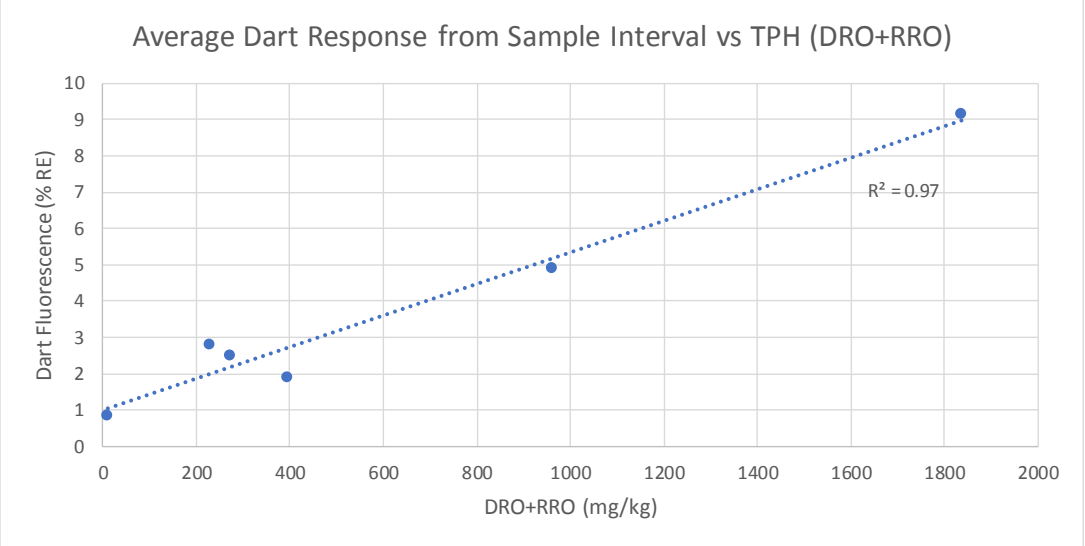
3.2.2 Petroleum-Related Constituents in Surface Sediment

The shallow 0-foot to 0.5-foot interval from offshore core locations G200, G260, I400, J260, and K120 were sampled for petroleum constituents as listed in Section 3.1.3. Analytical results from the offshore surface sediment samples taken from cores within the expanded study area are summarized in Table 3-4, and laboratory analytical reports are included as Appendix C.

Shallow samples collected from within the offshore area exceeded the SCO for TPH-DRO (340 mg/kg) and TPH-ORO (3,600 mg/kg) (with and without SGC). Specifically, at core location J260 where NAPL was closest to the sediment surface at a depth of 0.5 to 4 feet bss, TPH-DRO concentrations with and without SGC were 4,830 and 12,700 mg/kg, respectively. Concentrations of TPH-ORO with and without SGC were 12,100 and 31,000 mg/kg, respectively. At the remaining 3 core locations where NAPL was observed it was greater than 2 feet bss and results from the overlying sediment were all below applicable SCOs. No other constituents as tested for in each surface sediment sample were in excess of the SCO.

Given the exceedance of the SCO in the surface sediment sample collected from J260 for TPH-DRO and TPH-ORO, the three highest concentrations from the offshore area (consistent with expanded study area where some locations showed buried NAPL) were calculated for comparison against the Washington Freshwater Sediment CSLs. A summary of the TPH-DRO and TPH-ORO results from across the offshore area and the averages of the three highest results from SGC and non-SGC samples are provided in Table 3-5. TPH-DRO results from both SGC and non-SGC analyses exceed the CSL of 510 mg/kg. For TPH-ORO, the average of the 3 highest results exceeded the CSL of 4,400 mg/kg for the non-SGC results only.





Data for 0-0.5 ft interval

	TPH	Dart Response (%RE)	
	DRO+RRO	Max	Average
D150	273.4	4.7	2.5
D220	228	6.9	2.8
D240	961	10.5	4.9
D260	394.5	5.6	1.9
D420	11.44	2.1	0.84
D200	1839	18.1	9.15

Notes:

TPH - total petroleuem hydrocarbons

DRO+RRO - sum of diesel range and residual range organics

mg/kg - milligrams per kilogram

%RE - percent of the reference emitter

Figure 3-2. Plots of Dart Response vs. Total Petroleum Hydrocarbon Results
BNSF Wishram Railyard
Wishram, Washington

JACOBS

D200-GS-080718 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	**459**
Residual Range Organics	1,380
TPH (SGT) (mg/kg)	
Diesel Range Organics	57.6 J
Residual Range Organics	179 J
Total PAHs (mg/kg)	0.378 J

D220-GS-080718 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	40 J
Residual Range Organics	188
TPH (SGT) (mg/kg)	
Diesel Range Organics	20.6 J
Residual Range Organics	88.8 J
Total PAHs (mg/kg)	0.016 J

D240-GS-080618 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	180
Residual Range Organics	781
TPH (SGT) (mg/kg)	
Diesel Range Organics	219 J
Residual Range Organics	907 J
Total PAHs (mg/kg)	0.212 J

D260-GS-080618 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	81.5
Residual Range Organics	313
TPH (SGT) (mg/kg)	
Diesel Range Organics	7.88 J
Residual Range Organics	32.3 J6
Total PAHs (mg/kg)	0.039 J

D420-GS-080618 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	5.49 U
Residual Range Organics	13.7 U
TPH (SGT) (mg/kg)	
Diesel Range Organics	5.49 U
Residual Range Organics	13.7 U
Total PAHs (mg/kg)	0.028 U

D150-GS-080718 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	50.4 J
Residual Range Organics	223
TPH (SGT) (mg/kg)	
Diesel Range Organics	113 U
Residual Range Organics	174 J
Total PAHs (mg/kg)	0.026 J

G200-GS-080718 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	2.7 J
	14
TPH (SGT) (mg/kg)	
Diesel Range Organics	5.55 U
Residual Range Organics	5.57 J
Total PAHs (mg/kg)	0.018 J

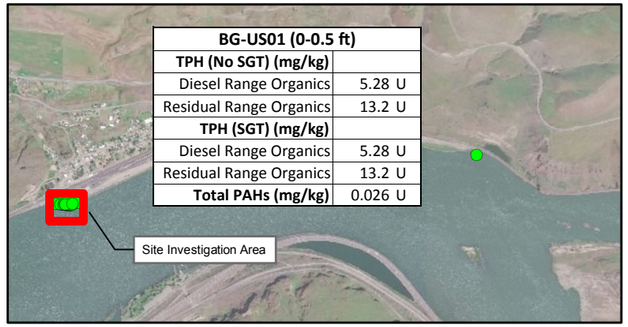
K120-GS-080818 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	25.7 U
Residual Range Organics	35.2 J
TPH (SGT) (mg/kg)	
Diesel Range Organics	3.95 J
Residual Range Organics	19.6
Total PAHs (mg/kg)	0.010 J

J260-GS-080818 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	**12,700**
Residual Range Organics	**31,000**
TPH (SGT) (mg/kg)	
Diesel Range Organics	**4,830**
Residual Range Organics	**12,100**
Total PAHs (mg/kg)	6.06 J

G260-GS-080718 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	4.53 J
Residual Range Organics	12.3 J
PH (SGT) (mg/kg)	
Diesel Range Organics	5.68 U
Residual Range Organics	14.2 U
Total PAHs (mg/kg)	0.028 U

I400-GS-080918 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	54.3
Residual Range Organics	290
TPH (SGT) (mg/kg)	
Diesel Range Organics	14.1 J
Residual Range Organics	74.7
Total PAHs (mg/kg)	0.003 J

VICINITY MAP



BG-US01 (0-0.5 ft)	
TPH (No SGT) (mg/kg)	
Diesel Range Organics	5.28 U
Residual Range Organics	13.2 U
TPH (SGT) (mg/kg)	
Diesel Range Organics	5.28 U
Residual Range Organics	13.2 U
Total PAHs (mg/kg)	0.026 U

LEGEND

- Core Location with NAPL Observed
- Core Location with no NAPL Observed
- Surface Sediment Grab Sample Location
- Very Low Level Response Consistent with Background
- Very Low Level Response (Generally <10% RE Maximum) with Blue-green Waveform that is Inconsistent with Background
- Low Level Response (Maximum Response Between 10 and 18% RE) with Blue-green Waveform that is Inconsistent with Background
- Section Line (See Figure 3-3)
- Sampling Grid (20 ft x 20 ft)
- Initial Study
- Expanded Study
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)

Notes:
NAPL = nonaqueous phase liquid
µg/L = microgram(s) per liter
MTCA = Model Toxics Control Act
ft = feet
NAVD88 = North American Vertical Datum 1988

N

0 25 50 100
1:780 Feet 1 inch = 65 feet

	SCO[1]	CSL[2]
Diesel Range Organics	340	510
Residual Range Organics	3600	4400
Total PAHs	17	30

1 - Washington Freshwater Sediment Cleanup Objectives (SCO)
2 - Washington Freshwater Sediment Cleanup Screening Levels (CSL)
Values in **bold** are in excess of the SCO
Shaded values are in excess of the CSL
U = Not Detected at the reporting limit (or MDL or EDL if shown)
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.

Figure 3-3. August 2018 Surface Sediment Sampling Results
BNSF Wishram Railyard
Wishram, Washington

JACOBS

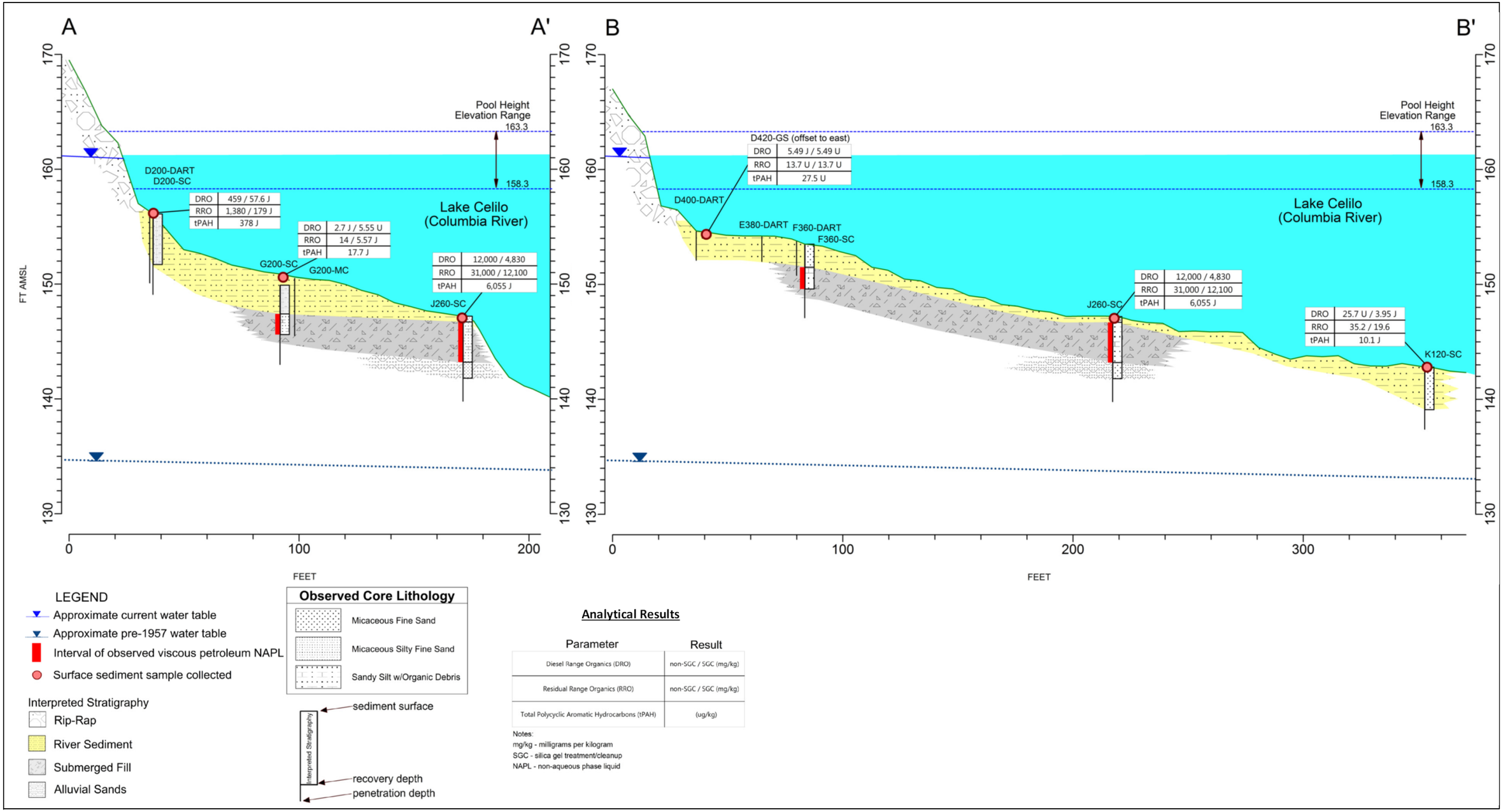


Figure 3-4. Cross-Sections
BNSF Wishram Railyard
Wishram, Washington

JACOBS

Table 3-4. Offshore Sediment Analytical Results

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

		Location ID:		F360		F360		F400		F400		G200		G200		G260		G260		G260		G260		I400		I400		I400		J260		J260		K120		K120	
		Field Sample ID:		F360-SC-080818-A		F360-SC-080818-B		F400B-SC-080818-A		F400B-SC-080818-B		G200-GS-080718		G200-SC-080718-A		G260-GS-080718		G260-SC-080718-A		G260-SC-080718-A-1		G260-SC-080718-B		I400-GS-080918		I400-SC-080918-A		I400-SC-080918-B		J260-GS-080818		J260-SC-080818-A		K120-GS-080818		K120-SC-080818-A	
		Sample Date:		08/08/2018		08/08/2018		08/08/2018		08/08/2018		08/07/2018		08/07/2018		08/07/2018		08/07/2018		08/07/2018		08/07/2018		08/09/2018		08/09/2018		08/09/2018		08/08/2018		08/08/2018		08/08/2018		08/08/2018	
		Sample Depth (ft):		1		4		1		5		0-0.5		3.5		0-0.5		3.5		3.5		4		0-0.5		2.5		5.5		0-0.5		2.5		0-0.5		3.4	
General Chemistry		*SCO*[a]	*CSL*[b]																																		
Total Organic Carbon	mg/kg	--	--	5,710		57,700		3,380		7,510				91,000				86,400		107,000		66,700				18,600		6,700				37,100				9,320	
Total Solids	%	--	--	75.5		61.9		79.9		71		72.1		66		70.4		67.4		73.8		84.6		78.2		71.5		73.9		72.9		68.1		77.9		79.6	
Chemical Oxygen Demand	mg/kg	--	--	480		2,200		220		250		220		2200		220		2,200		2,200		2,200		200	U	220		250		220		2,200		220		220	
PAHs (SW8270DSIM)																																					
1-Methylnaphthalene	µg/kg	--	--									27.7	U			28.4	U							25.6	U					335				25.7	U		
2-Chloronaphthalene	µg/kg	--	--									27.7				28.4								25.6						137				25.7			
2-Methylnaphthalene	µg/kg	--	--									27.7	U			28.4	U							25.6	U					332				25.7	U		
Acenaphthene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					139				7.70	U		
Acenaphthylene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					41.2	U			7.70	U		
Anthracene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					195				7.70	U		
Benz[a]anthracene	µg/kg	--	--									1.57	J			8.52	U							2.11	J					169				7.70	U		
Benzo(a)pyrene	µg/kg	--	--									2.02	J			8.52	U							0.869	J					1,230				7.70	U		
Benzo(b)fluoranthene	µg/kg	--	--									2.27	J			8.52	U							7.68	U					52.7				1.16	J		
Benzo(ghi)perylene	µg/kg	--	--									2.51	J			8.52	U							7.68	U					305				5.60	J		
Benzo(k)fluoranthene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					403				7.70	U		
Chrysene	µg/kg	--	--									1.47	J			8.52	U							7.68	U					741				7.70	U		
Dibenzo(a,h)anthracene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					41.2	U			0.823	J		
Fluoranthene	µg/kg	--	--									2.72	J			8.52	U							7.68	U					41.2	U			7.70	U		
Fluorene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					109				7.70	U		
Indeno(1,2,3-cd)pyrene	µg/kg	--	--									1.44	J			8.52	U							7.68	U					99.9				1.44	J		
Naphthalene	µg/kg	--	--									27.7	U			28.4	U							25.6	U					60.5	J			25.7	U		
Phenanthrene	µg/kg	--	--									8.32	U			8.52	U							7.68	U					399				7.70	U		
Pyrene	µg/kg	--	--									3.69	J			8.52	U							7.68	U					1820				1.04	J		
Total PAHs (17) [c]	µg/kg	17,000	30,000									17.7	J			28.4	U							2.98	J					6,055	J			10.1	J		
TPH (NWTPH-DX)																																					
Diesel Range Organics	mg/kg	340	510									2.7	J			4.53	J							54.3						**12,700**				25.7	U		
Residual Range Organics	mg/kg	3600	4400									14				12.3	J							290						**31,000**				35.2	J		
TPH (NWTPH-DXSG)																																					
Diesel-range Organics	mg/kg	340	510									5.55	U			5.68	U							14.1	J					**4,830**				3.95	J		
Residual-range Organics	mg/kg	3600	4400									5.57	J			14.2	U							74.7						**12,100**				19.6			
NWTPH-VPH																																					
C10-C12 Aliphatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					4	J			4.2	U		
C10-C12 Aliphatic (adjusted)	mg/kg	--	--									2.9	U			2.8	U							2.7	U					3	U			2.6	U		
C10-C12 Aromatics	mg/kg	--	--									5.2	J			5.3	J							4.5	J					5	J			6.4	J		
C12-C13 Aromatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					11				4.2	U		
C5-C6 Aliphatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					4	U			4.2	U		
C5-C6 Aliphatics (adjusted)	mg/kg	--	--									2.9	U			2.8	U							2.7	U					3	U			2.6	U		
C6-C8 Aliphatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					4	U			4.2	U		
C6-C8 Aliphatic (adjusted)	mg/kg	--	--									2.9	U			2.8	U							2.7	U					3	U			2.6	U		
C8-C10 Aliphatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					4	U			4.2	U		
C8-C10 Aliphatic (adjusted)	mg/kg	--	--									2.9	U			2.8	U							2.7	U					3	U			2.6	U		
C8-C10 Aromatics	mg/kg	--	--									3.1	U			3.2	U							2.8	U					4	U			4.2	U		
NWTPH-EPH																																					
C10-C12 Aliphatics	mg/kg	--	--									1.3	U			0.67	U							2.6	U					21	J			1.2	U		
C10-C12 Aromatics	mg/kg	--	--									1.2	U			1.2	U							2.3	U					4	U			1.1	U		
C12-C16 Aliphatics	mg/kg	--	--									1.3	J			0.61	U							2.6	J					32				0.84	J		
C12-C16 Aromatics	mg/kg	--	--									0.62	U			0.61	U							1.2	U					7	J			0.56	U		
C16-C21 Aliphatics	mg/kg	--	--									3.8	J			1.1	J							15						87				3.9	J		
C16-C21 Aromatics	mg/kg	--	--									4.3	J			1.4	J							8	J					180				2.5	J		
C21-C34 Aliphatics	mg/kg	--	--									14				4.4	J							64						310				17			
C21-C34 Aromatics	mg/kg	--	--									19				4.1	J							60						890				20			

[a] Washington Freshwater SCOs

[b] Washington Freshwater Sediment CSLs

[c] Sum of the 17 PAHs listed in Table 8-1 of Washington State Department of Ecology SCUM II, updated December 2017

Notes:

µg/kg = microgram(s) per kilogram

CSL = Cleanup Screening Levels

EPH = extractable petroleum hydrocarbons

ft = foot (feet)

ID = identification

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

mg/kg = milligram(s) per kilogram

PAH = polycyclic aromatic hydrocarbon

SCO = Sediment Cleanup Objective

SCUM II = Sediment Cleanup User's Manual II

TPH = total petroleum hydrocarbons

VPH = volatile petroleum hydrocarbons

U = Not detected at the reporting limit (or method detection limit or estimated detection limit if shown)

Values in **bold** are in excess of the SCO.

Shaded values are in excess of the CSL.

Table 3-5. Evaluation of Offshore Sediment Results against Cleanup Screening Levels

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Sample ID	Nearshore/Offshore/ Background		Diesel Range Organics		Residual Range Organics	
			No SGC	with SGC	No SGC	with SGC
		CSL[a]:	**510**		**4,400**	
G200-GS-080718	OS		2.7 J	5.55 U	14	5.57 J
G260-GS-080718	OS		4.53 J	*5.68 U*	12.3 J	14.2 U
I400-GS-080918	OS		*54.3*	*14.1 J*	*290*	*74.7*
J260-GS-080818	OS		*12,700*	*4,830*	*31,000*	*12,100*
K120-GS-080818	OS		*25.7 U*	3.95 J	*35.2 J*	*19.6*
Average of Three Highest Concentrations (shaded if in excess of CSL)						
Offshore			**4,260**	**1,617**	**10,442**	4,065

[a] Washington Freshwater Sediment CSL

Notes:
All concentrations reported in mg/kg.
The three highest concentrations sitewide are shown in bold and italics.

CSL Cleanup Screening Level
ID = identification
J (flag) = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
OS = offshore
SGC = silica gel treatment/cleanup
U (flag) = Not detected at the reporting limit (or method detection limit or estimated detection limit if shown).

Within the offshore area, PAHs were mostly non-detect or had low-level detections where total PAH results (sum of detected concentration across the 17 PAHs) (Ecology, 2017b; Table 8-1) ranged from 2.9 to 6,055 micrograms per kilogram (µg/kg) (J260), and were all below the SCO of 17,000 µg/kg.

Consistent with the nearshore area surface sediment, samples from offshore indicated only limited low-level detections of the VPH fractions (often estimated). Where EPH fractions were detected, between 70 and 80 percent of the detections consisted of both aliphatics and aromatics in the carbon range C21-C34. Again, this is consistent with the TPH results, as higher concentrations of TPH-ORO were observed relative to the TPH-DRO.

3.2.3 Total Organic Carbon and Chemical Oxygen Demand in Surface and Subsurface Sediment

Sediment COD and TOC data were collected from the eight lithology core sample locations shown on Figure 2-2 at depths ranging from 1.0 to 5.5 feet bss. The sample depths were chosen to represent the primary gas production zone, which is generally considered as the top 5 feet of soft sediment. Ponar grab samples for COD also were collected from five surface sediment grab sample locations shown on Figure 2-2 (D150, D220, D240, D260, and D420).

TOC concentrations ranged between 3,380 and 107,000 mg/kg with a median value of 4,563 mg/kg. The higher TOC concentrations (ranging from 37,100 mg/kg to 107,000 mg/kg) were observed farther from shore at F360, G200, G260, and J260 at depths ranging from 2.5 to 4 feet bss (Figure 3-3). These high TOC samples were collocated with occurrences of organic debris, roots, and free-phase NAPL identified in the sediment core logs (Appendix B). The high TOC samples were also collocated with the maximum observed COD concentration of 2,200 mg/kg (Table 3-4), suggesting that these samples were potentially influenced by NAPL present in the sample. In contrast, the COD/TOC ratio, which is an indicator of the ease of biodegradability of the organic carbon, was observed to decrease with depth and was higher in

samples from 0.5 foot to 2.5 feet bss with values ranging from 0.05 to 0.08. This is consistent with observations at other sites as fresh organic matter is more labile than the more recalcitrant organic matter found at depth. These results were used to estimate gas ebullition potential in site sediments as discussed in Section 4.4.1.

3.2.4 Nonaqueous Phase Liquid Mobility

Soils from the mobility cores advanced within offshore NAPL-affected areas at G200 and G260 were characterized in detail as part of this study through core photography, TarGOST screening, and PFS and grain-size distribution testing of samples collected from across each core. NAPL mobility testing using water drive was also performed on the two most highly-impacted intervals. A copy of the NAPL mobility laboratory testing report that includes all these data is included as Appendix D.

Results of the grain-size analysis are presented in Appendix D. Grain-size results and the core photography (Appendix D) indicate that the NAPL affected intervals in each core (samples WISH-3, WISH-6, and WISH-7) consisted of silt with trace fine and coarse sand, and trace clay. Above these intervals (WISH-1 and WISH-5), sediments consisted predominantly of fine sand with some silt. Grain-size distribution results for those samples containing minimal fines that included the fine sands overlying locations where NAPL was observed were used to estimate a range of hydraulic conductivities for these materials using the Kozeny-Carmen method as modified by others and shown in Carrier (2003). Results of this calculation estimate a range of hydraulic conductivities of approximately 4.3×10^{-3} centimeters per second (cm/sec) (G200, 1.7 to 2.0 feet [bss]) to 8.4×10^{-3} cm/sec (G260, 1.7 to 2.5 feet bss)

PFS LNAPL and water saturations) were calculated from the Dean Stark Extraction data at 6 discrete 0.1- to 0.2-foot intervals across each of the 2 soil cores where TarGOST screening and photography indicated NAPL presence. First, the masses provided by the laboratory had to be converted to a volume basis using the matrix density. The bulk sample volume and bulk solids volume were calculated using the wet bulk density and grain density values, respectively, using measurements from the laboratory for the materials in each core segment. A water density of 1 gram per cubic centimeter (g/cm^3) was assumed for water. NAPL density was assumed to be 0.96 g/cm^3 based on measurements of NAPL collected from upland wells in 2016 (KJ, 2019). For calculation purposes, it was assumed that the pore volume of these saturated samples was filled completely with water and NAPL, and no air was present. Therefore, the pore volume represents the sum of the water and NAPL volumes. Porosity is based on the bulk sample volume, and PFS are based on the pore volume.

PFS results are included at the end of Appendix D and are shown as profiles across depth on Figure 3-5 adjacent to the TarGOST screening profiles and observed lithology. LNAPL saturations ranged from less than 1 to 42 percent of the pore volume (%PV). Water drive testing performed on the 2 sub-samples from each core with the highest TarGOST responses (peak responses ranging from 168 to 229 %RE) and with measured NAPL saturations of (ranging from 16 to 38 %PV) indicated no mobile fractions of NAPL. This is consistent with the tacky and viscous nature of the NAPL that was observed in the field and indicates that the submerged NAPL at the site is not hydraulically mobile.

Since the samples tested did not produce any NAPL during the water drive testing, the actual residual NAPL saturation could not be quantified to anything other than something greater than was tested for mobility, which was as high as 38 %PV.

3.3 Data Quality Evaluation

Analytical parameters that went through the data validation process include: PAHs by SW8270-SIM, DRO and ORO with and without SGC by NWTPH-Dx, EPH by NWTPH-EPH, VPH by NWTPH-VPH, TOC by USDA LOI, Total Solids and Percent Moisture.

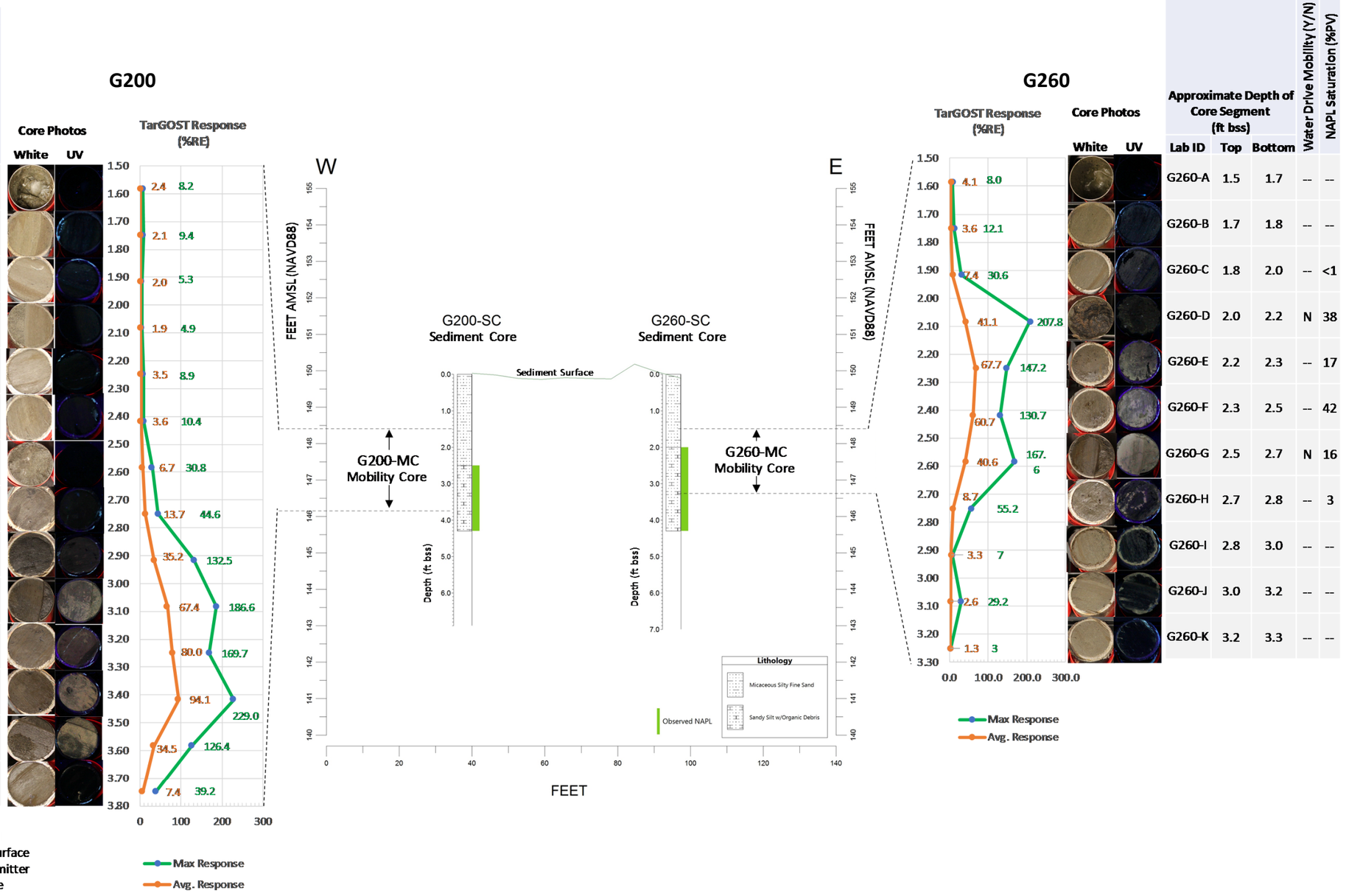
From the data validation process qualifications applied include:

- **U-MBL/EBL/TBL** – Results are qualified as non-detected and are not discernably different from the concentrations associated with the contaminated method, equipment, or trip blank.
- **UJ-BSL** – Analytes qualified are not detected with estimated quantitation limits and potential low bias due to the associated blank spike/blank spike duplicate sample not meeting recovery acceptance criteria.
- **UJ/J-SSL** – Results or quantitation limits are estimated and potentially biased low due to the associated spiked surrogate not meeting recovery acceptance criteria.
- **UJ/J-OT** – The laboratory noted that there was an elevated baseline in the NWTPH-VPH samples. The narrative suggests that the results are potentially biased high or reported with reporting limits biased high. Data are available for use at an estimated level.

Additional information concerning the data quality issues identified and the basis for applied data qualifiers are presented in the data validation reports included in Appendix D.

Based on the types of qualifiers added and the general level of data validation, the data for this investigation are considered acceptable for use, meeting the data quality objectives established in the sampling and analysis plan (CH2M, 2018; Appendix C). Quality assurance checks were conducted by the project team and analytical laboratories in accordance with the sampling and analysis plan requirements. Quality assurance data presented in the analytical data packages (Appendix C) and data validation reports (Appendix E) indicate that the analytical data, are of acceptable precision, accuracy, representativeness, completeness, comparability, and sensitivity.

Approximate Depth of Core Segment (ft bss)			Water Drive Mobility (Y/N)	NAPL Saturation (%PV)
Lab ID	Top	Bottom		
G200-B	1.5	1.7	--	--
G200-C	1.7	1.8	--	--
G200-D	1.8	2.0	--	--
G200-E	2.0	2.2	--	--
G200-F	2.2	2.3	--	--
G200-G	2.3	2.5	--	--
G200-H	2.5	2.7	--	--
G200-I	2.7	2.8	--	--
G200-J	2.8	3.0	--	27
G200-K	3.0	3.2	N	33
G200-L	3.2	3.3	--	37
G200-M	3.3	3.5	N	27
G200-N	3.5	3.7	--	12
G200-O	3.7	3.8	--	<1



Approximate Depth of Core Segment (ft bss)			Water Drive Mobility (Y/N)	NAPL Saturation (%PV)
Lab ID	Top	Bottom		
G260-A	1.5	1.7	--	--
G260-B	1.7	1.8	--	--
G260-C	1.8	2.0	--	<1
G260-D	2.0	2.2	N	38
G260-E	2.2	2.3	--	17
G260-F	2.3	2.5	--	42
G260-G	2.5	2.7	N	16
G260-H	2.7	2.8	--	3
G260-I	2.8	3.0	--	--
G260-J	3.0	3.2	--	--
G260-K	3.2	3.3	--	--

– analysis not performed
ft bss feet below sediment surface
%RE percent of reference emitter
%PV percent of pore volume

Figure 3-5. NAPL Mobility Core Results
BNSF Wishram Railyard
Wishram, Washington

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4. Updated Conceptual Site Model

This section describes the updated CSM for the site with a focus on the offshore area of interest (Figure 4-1). The updated CSM builds off the baseline CSM presented in the approved work plan (CH2M, 2018) using the data generated as part of the work described above in Section 2 as well as newly available relevant data associated with upland RI efforts. Consistent with the EPA's *Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model* (EPA, 2011), the CSM presented represents a Characterization Stage CSM that will be updated in the future as appropriate, based on future key data collection efforts.

4.1 Sources and Chemicals of Interest

Primary sources of NAPL and petroleum-related constituents related to the historical upland railyard operations are detailed in the site investigation and forthcoming RI report (KJ, 2019). These included various aboveground storage tanks, underground storage tanks, and product and steam lines associated with fueling and maintenance operations and onsite utilities (including power generation). In most cases, contaminated soil and NAPL in the immediate vicinity of the sources were removed and disposed of offsite.

The primary release mechanisms from the historical sources are unknown, but may include surface spills, overfilling, surface leaks, or subsurface leaks, resulting in NAPL-impacted surface and subsurface soil within the upland area. In some instances, sufficient NAPL was released to cause saturation of pore spaces in the soil allowing vertical migration of NAPL as a separate phase to the top of the present-day water table approximately 10 feet bss or to the top of the historical water table approximately 40 to 50 feet bss. Based on the presence of measurable NAPL in monitoring wells downgradient of the petroleum storage and operations area, NAPL appears to have migrated laterally on top of whichever water table was present at the time of the release. NAPL that remains within the upland area at the site today consists of a submerged highly viscous (7,390 centistokes at 50 degrees Fahrenheit) oil-based Bunker C with limited ongoing mobility. The extent of this NAPL does not extend to the current shoreline, and investigations within the inundated lands have not shown the presence of NAPL within nearshore areas. Fractions of dissolved lighter-range (that is, TPH-DRO) are also present in the upland groundwater, the downgradient extent of which is currently being investigated.

Within the inundated lands, which are the subject of this report, a separate occurrence of viscous NAPL consistent with Bunker C has been identified in the offshore area within a submerged layer approximately 40 feet to 60 feet from the shoreline. Contaminants associated with these impacts include TPH-DRO, TPH-ORO, and bunker C related PAHs. The absence of bedding structure and disturbed nature of these materials suggests they were emplaced within the former lands that were subsequently inundated by the construction of The Dalles Dam in 1957, and that they are a separate release than those previously identified within the upland portions of the site. This is also supported by the lack of NAPL mobility that has been observed in cores taken from the most impacted intervals/areas. While the primary sources associated with the submerged NAPL present beneath Lake Celilo are unknown, the RI Work Plan Addendum (KJ, 2016) included a summary of 1950 and 1951 correspondences between Spokane, Portland & Seattle Railway (SP&S) personnel and the State of Washington Pollution Control Commission (PCC), as well as internal SP&S communications related to potential releases of petroleum hydrocarbons at the railyard that may have affected the inundated lands (BNSF, 2017). These include:

- A release described in a November 20, 1950 letter from SP&S to the PCC and in an internal December 1, 1950 SP&S document as an accidental spill due to a broken valve on the service tank while fueling a locomotive that had occurred some years prior to 1950. The oil was trenched across the track to accumulate in a swamp and allowed to dry to the consistency of asphalt. The December 1, 1950 letter also notes evidence of a new oil spill just upstream from the Power House since the November 20, 1950 letter (KJ, 2016)
- A PCC Field Engineer, Mr. Alfred Neale, visited the railyard and in a letter dated February 26, 1951, noted three sewer outfalls that discharged wastes to the Columbia River. The documents record that Mr. Neale inspected the facility and observed waste oils on the banks of the Columbia River in the

vicinity of the outfall (potentially Former Pump House #2 location) nearest to the oil/water separator. He also observed an open ditch a short distance downstream which had an outfall for conveyance of sewage wastes to the river that terminated over 100 feet from the river.

The relationship between these observed releases (either from the elevated oil service tank or waste oils on the river bank) and the NAPL observed in the offshore portion of the inundated lands is unknown.

4.2 Geologic and Hydrogeologic Conditions

The local geology at the site, as determined by soil borings completed to date, consists of varying thickness of surface fill (sand and gravel reportedly sourced from nearby sand dunes and river deposits), followed by 10- to 95-foot-thick sequences of glacio-fluvial sediment (and silt) deposited on eroded Columbia River Basalt Group bedrock during ice-age floods. Up to 100 feet of the shoreline, water depths extend up to 15 feet as the riverbed dips to the south at a slope of approximately 8 percent. Beyond this distance, steeper slopes of approximately 20 percent are present and water depths increase to over 30 feet within approximately 160 feet of the shoreline. Overlying the glacio-fluvial deposits within the river and beyond the toe of the riprap embankment are surface sediments consisting of micaceous fine sand to silty fine sand with varying amounts of organics that have been observed at thicknesses of up to approximately 5 feet. In select locations farther from the shoreline, a 2- to 3.5-foot interval of highly plastic silty sand fill containing wood, roots, and limited amounts of inorganic debris is present at depths of 0.5 to 2.5 feet bss. It is estimated, using the date of inundation (1957) and the range of measured thicknesses of sediment observed in 2018, that the rate of sediment accumulation in the area of the site ranges from approximately 0.1 to 1 inch per year

The uppermost hydrogeologic unit at the site is the glaciofluvial aquifer, consisting of unconsolidated sand and silt deposited during the Missoula Floods. The aquifer is unconfined. Numerous monitoring wells have been installed at the railyard. The wells are screened in the sand/silt deposits, which can be up to 95-feet thick in the western section of the railyard. The deposits are generally homogeneous, and, in some areas, the sand and silt overlie a thin layer of gravel just above bedrock (KJ, 2016). Given the presence of exposed bedrock surfaces east and west of the initial sediment study area of interest, as shown on historical aerial photographs and local bathymetry, the glaciofluvial aquifer likely pinches out to the south just beyond the former shoreline of the Columbia River (Figure 1-3), approximately 350 feet from the current shoreline (CH2M, 2018). Groundwater occurs in the unconfined sand/silt alluvial aquifer at 10 to 12 feet bss beneath the railyard. Before construction of the dam and creation of Lake Celilo, the unconfined water table was likely at least 30 to 50 feet deeper. While groundwater flow across the railyard is generally south toward the lake at a very shallow gradient, it has been estimated that during 10 months of the year, the nearshore portions of Lake Celilo in the vicinity of the railyard is a losing water body where flow directions and periods of groundwater discharge are controlled by the lake level. Daily oscillations in the Columbia River stage (typically 1 to 2 feet) occur because of variable discharge rates from The Dalles Dam (KJ, 2019).

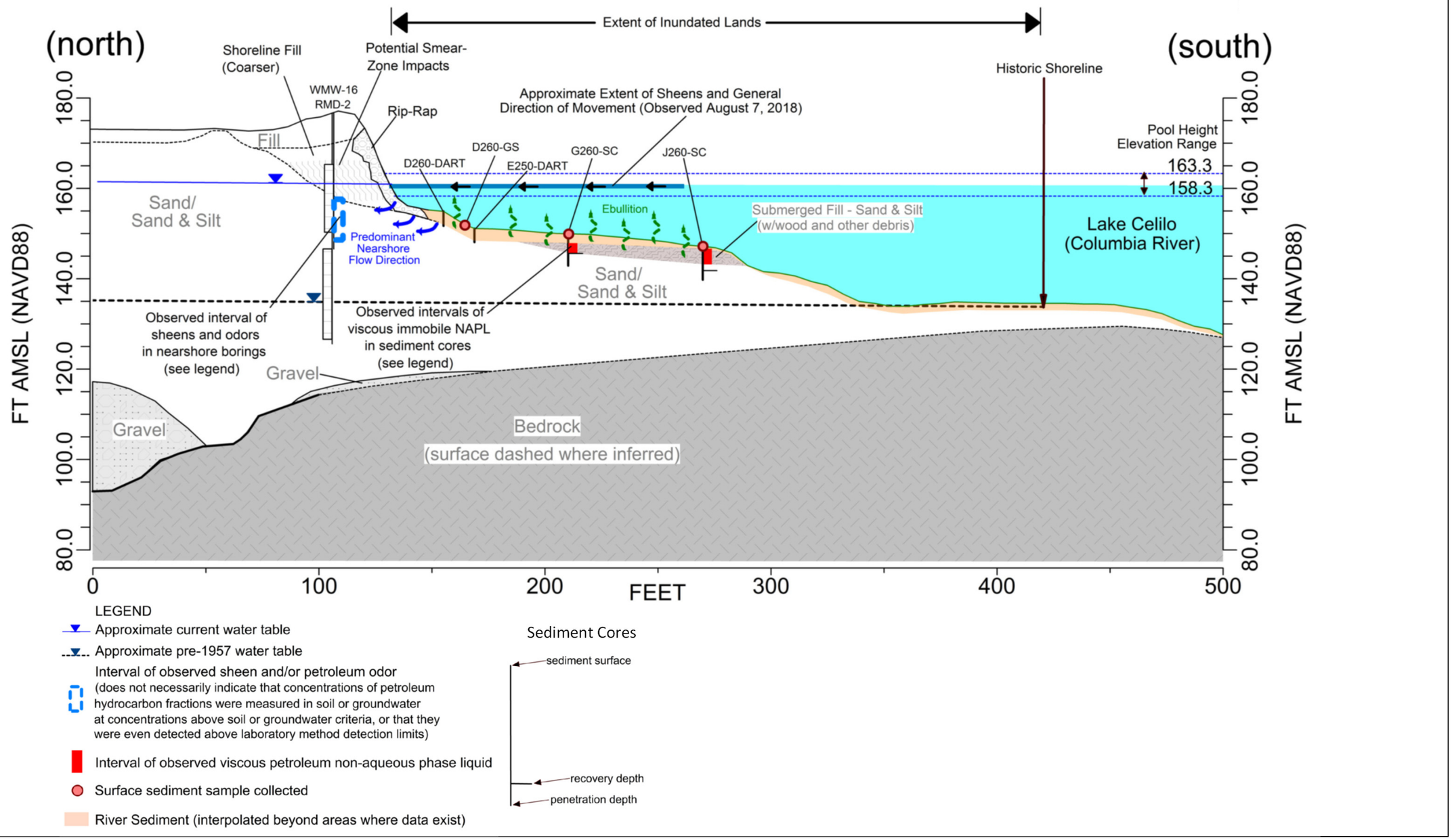

Figure 4-1. Nearshore/Offshore Conceptual Site Model1
BNSF Wishram Railyard
Wishram, Washington

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4.3 Nature and Extent

4.3.1 Nonaqueous Phase Liquid

A black, tacky, viscous NAPL has been observed approximately 0.5 foot to 2.5 feet bss within a fill layer containing organic and, to a lesser extent, inorganic debris. The fractions of TPH measured in surface sediments immediately adjacent to NAPL-affected fill (core location J260), as well as the appearance and odor of the fill suggest NAPL consists of a heavy fuel oil (for example, Bunker C oil). The coring and Dart response data collected to date indicate NAPL is not present within the nearshore areas but is located within former upland areas (now inundated) between approximately 40 and 130 feet south of the current shoreline (Figure 3-2).

While the general extents of NAPL have been identified as part of the initial investigation, there are areas where further refinement and delineation are required. Specifically, the southern extent beyond location J260, and the areas west of G200, and southwest of G260 remain areas of uncertainty. Additionally, given the capability of the coring equipment and the depths to the top of the sediment surface, the vertical extent of the observed NAPL impacts could only be established at core J260. At the remaining three locations where NAPL was observed, the vertical extents require confirmation.

4.3.2 Chemicals of Interest

Analytical results from 9 of the 11 surface sediment samples, collected across the initial and expanded study areas, indicate concentrations of TPH-DRO and TPH-ORO hydrocarbon ranges are below Washington Freshwater SCO and CSLs. Of the seven samples collected within the nearshore area and analyzed for TPH-DRO and -TPH-ORO and PAHs, only one location had a detection above the SCO. This was for TPH-DRO in the non-SGC sample at location D200. However, the average of the three highest TPH-DRO results across the nearshore area are below the CSL. TPH-ORO and total PAHs were below their respective SCOs and CSLs in all surface sediment samples from the nearshore area.

Within the offshore area, concentrations of TPH-DRO and TPH-ORO were found at core location J260 in excess of the SCO for both TPH-DRO (340 mg/kg) and TPH-ORO (3,600 mg/kg). This surface sediment sample collected from 0 to 0.5 foot bss was immediately adjacent to an occurrence of the NAPL-impacted fill layer that was observed to extend from 0.5 foot to 4 feet. The average of the three highest concentrations in soft sediment from the offshore area is above the CSL for TPH-DRO and TPH-ORO. Concentrations of TPH-DRO and TPH-ORO exceeding the SCO observed in surface sediment at J260 require further lateral delineation, particularly south and east of this location.

Total PAH concentrations in surface sediment across the offshore area were all below the SCO of 17,000 µg/kg and the CSL of 30,000 µg/kg. The maximum total PAH concentration of 6,055 µg/kg was detected in the surface sediment sample from core location J260.

4.4 Nonaqueous Phase Liquid Release and Transport Mechanisms

4.4.1 Gas Ebullition

As related to environmental transport, gas ebullition is a natural process whereby methane and other gases generated from biodegradation of organic matter are released from water bodies via gas bubbles. Gas ebullition occurs when the buoyant force of the gas bubble exceeds the combined cohesive forces in the sediment and the hydrostatic pressure exerted by the water column. As these bubbles are generated, hydrophobic NAPL droplets can coat or be entrained within the gas bubbles and then get carried to the sediment surface. Once within the water column or at the water surface, the bubbles either burst, creating a sheen, or remain on the surface until enough gas escapes to make the droplet less dense than water and appear as a LNAPL bleb.

In freshwater ecosystems, gas bubble formation is limited to the near surface sediment and is influenced by several factors that include sediment physicochemical properties, biogeochemical processes, and the height of the water column. In most cases, ebullition is caused by labile organic matter in the sediment. At Wishram, there are no records of vegetation being removed from the shoreline before it was inundated in 1957 after the construction of The Dalles Dam. During 2018 initial investigation activities performed in June and August, an abundance of vegetation (primarily milfoil) was observed to be growing throughout the study area. Gas bubbles were also observed to be rising through the water column and breaking at the surface. However, during field efforts, the generation of NAPL blebs and sheens were not observed in conjunction with these bubbles. During the August 2018 field efforts, the rate of ebullition and abundance of sheens both appeared to increase during periods of lower water, which, according to the published USACE Dalles Dam Forbay Levels (USACE, 2018) fluctuated between a maximum of 162.93-feet NAVD88 on August 9, 2018, and a minimum 160.02-feet NAVD88 on August 7, 2018, (period of greatest abundance of observed sheens; Section 2.3.1. Wind conditions were favorable for sheen observation (3 to 8 miles per hour) during the days preceding and following August 7, 2018.

Gas ebullition potential in sediment samples collected from across the study area was evaluated using the gas ebullition model presented in *Field Measurements and Modeling of Ebullition Facilitated Flux of Heavy Metals and Polycyclic Aromatic Hydrocarbons from Sediments to the Water Column* (Viana et al., 2012), and the TOC and COD concentrations measured in surface and subsurface sediment at the site as input parameters. Details on these calculations are presented in Appendix F. The estimated gas ebullition rates for the site ranged between 6.5 to 6.8 liters per square meter per day with little spatial variability. The estimated rates are consistent with field measurements reported in the literature (Appendix F). These rates are indicative of high gas production in the sediments associated with the site, resulting from the high TOC content observed in deeper sediment (4 to 10 percent at depths of 2.5 to 4.0 feet bss) and more labile carbon substrate observed at shallow depths. This is further validated by field observations of ebullition during the recent sampling event. The NAPL occurrence depth coincides with the ebullition active zone of 0 to 5 feet bss (Viana et al., 2012; Costello, 2003), suggesting that gas ebullition could be responsible for the mobilization of free phase NAPL and contribute to NAPL transport to the water column.

4.4.2 Seep Migration

Seep migration was described by Ecology as *NAPL seepage because of NAPL drainage and mobility at low water* (Ecology, 2017a). A NAPL seep is defined as a NAPL release where:

- NAPL is moving under a sustained NAPL gradient
- A NAPL source is located at some distance from the seep and provides the driving force
- A recent or ongoing NAPL release is typically in association with the discharge
- NAPL saturations are above residual

The absence of NAPL in the nearshore areas adjacent to the riprap embankment and physical separation of the defined extent of upland NAPL (KJ, 2019) and the shoreline to the south (Figure 1-2) suggest that seep migration from the upland portions of the site is not contributing to the observed sheens. Furthermore, the maximum distance of the sheens from the shoreline observed on August 7, 2018, and the direction of their movement to the northeast do not support the notion that the sheens originate from the riprap embankment or from sediments within the nearshore areas just beyond this embankment, but are instead coming from areas farther from the offshore area where submerged NAPL was observed within the fill layer bss.

The absence of mobility in the intact cores, taken from the submerged NAPL found within the fill layer during the initial investigation, indicates that seepage of NAPL from these areas is unlikely even if there were sufficient head present across this interval.

Discharge of dissolved-phase constituents detected in groundwater at the shoreline would only occur during periods when the river is a gaining water body. This pathway is currently being evaluated as part of the upland investigation activities. Dissolved phase discharges associated with the submerged NAPL farther from the shoreline would require the presence of upward hydraulic gradients in these areas. The

solubility of the NAPL constituents of concern and whether there is a potential for dissolved phase discharges associated with the offshore NAPL impacts has not been evaluated to date.

4.4.3 Sheen Migration

Sheen migration was described by Ecology as *NAPL wicking along the capillary fringe* (Ecology, 2017a). This is analogous to a NAPL sheen discharge (Sale and Lyverse, 2014) where:

- Very limited amount of oil is discharged as a sheen on the water surface
- Ephemeral sheen behavior may be observed
- Former seeps have occurred
- Discharge occurs along the groundwater-air interface
- NAPL saturations are close to or below residual

For the reasons highlighted in Section 4.4.2, NAPL sheens at the site are believed to be sourcing from the submerged NAPL impacts associated with the layer of fill present in the inundated lands. Therefore, there is no capillary fringe or groundwater-air interface along which sheen migration could occur based on available data. No evidence has been collected to date that suggests sheens are present within the nearshore upland soils, nor have sheens been observed to be originating from the riprap embankment. The presence of the sheens in proximity to the shoreline can be explained by the transport at the water surface from areas farther offshore (where they have originated) through a combination of winds and current. This phenomenon was consistently observed during the field work performed during August 2018.

4.4.4 Bank Erosion

Bank erosion was identified by Ecology as a potential NAPL-transport mechanism. As stated in the work plan (CH2M, 2018), this is not considered a viable pathway for NAPL transport at the site since the bank in the area of interest is heavily armored. The presence of sediment thicknesses of up to 5 feet in the nearshore area and the depositional material within the interstitial voids in the riprap indicate that there are insufficient currents in the impounded Lake Celilo to erode the shoreline here.

4.5 Potential Exposure Pathways and Receptors

Potentially affected media are limited to surface water across the study area and sediment in areas where the submerged NAPL is present. Exposure pathways and potential receptors associated with the offshore area have not been evaluated to date, but could include those related to Washington state designated uses (WAC 173-201A) as shown in Table 4-1.

Table 4-1. Columbia River Designated Uses

Inundated Lands Initial Investigation, BNSF Wishram Track Switching Facility, Wishram, Washington

Aquatic Life Use	Recreation Use	Water Supply Use	Miscellaneous Use
Spawning/Rearing	Primary Contact	Domestic	Wildlife Habitat
Salmonid Migration		Industrial	Harvesting
		Agricultural	Commerce/Navigation
		Stock	Boating
			Aesthetics

4.6 Inundated Lands Characterization Stage Conceptual Site Model

Figure 4-1 presents a current inundated lands characterization stage CSM developed by updating the preliminary stage CSM presented in the Ecology-approved Work Plan (CH2M, 2018) with the information collected during the Initial Sediment Investigation as well as any relevant findings associated with recent upland investigations (KJ, 2019). The key components of the CSM are as follows:

- A black, tacky, viscous NAPL consistent with heavy fuel oil (Bunker C) is present within a distinct 2- to 4-foot-thick fill layer beneath 0.5 to 2.5 feet of generally clean river sediments. This fill layer exhibits little soil structure and significant organic debris and was likely emplaced during grading and filling in upland areas subsequently inundated as a result of the creation of Lake Celilo.
- Occurrences of NAPL within the inundated lands have been observed between 40 and 130 feet south of the current riprap shoreline and appear isolated from upland impacts. Observations for the shoreline upland boreholes and cores and Darts immediately south of the riprap show no evidence of NAPL-impregnated soil or sediment in these areas.
- Sheen and odor are observed in upland soil cores, but these are considered less significant indicators of a NAPL discharge. Furthermore, hydraulic studies performed as part of recent upland work have shown that the river is predominantly a losing water body in which groundwater flows away from the river approximately 10 out of 12 months of the year.
- Observations of sheens at distances of up to 130 feet south of the shoreline and the direction of their movement at the surface toward the shoreline indicates they are originating not from the shoreline, but from the submerged NAPL present farther from shore. This is consistent with the absence of any direct observations of sheens originating along the riprap shoreline.
- Testing of these NAPL-impacted soils indicates there is no direct hydraulic mobility of NAPL, which is consistent with its viscous and tacky nature. Observations of gas bubbles within the water column, their proximity to the submerged NAPL and outboard extent of observed sheens, as well as the estimates of elevated gas generation potential associated with the sediments and soils collocated with NAPL indicate ebullition is the primary mechanism responsible for the sheens.
- Consistent with the ebullition process, the rate of gas bubble generation and the abundance of sheens appear to increase during periods of lower water observed during the August 2018 field efforts.

Based on these observations, the source of the sheens observed in offshore inundated lands historically associated with the railroad is likely the isolated NAPL found 0.5 to 2.5 feet beneath the river sediment within the submerged fill layer. The intermittent sheening observed is the result of ebullition, with the gases developed by the decaying organic matter associated with the submerged fill. A greater abundance of gas-bubbles and sheening occurs during periods of low water when the overlying water column is reduced and during hot periods when the temperature of the sediments rises. A combination of the winds and current carry the sheens toward the shoreline where they are seen most often from the shoreline and where globules have been observed to accumulate during relatively warm and calm weather conditions.

5. Next Steps

To address the identified impacts within the offshore area and satisfy the requirements for initial and RIs in accordance with WAC 173-204-510 and 520 and SCUM II guidance, additional data collection is needed. An addendum to the existing work plan is being prepared and will be submitted separately. The work plan addendum will identify the specific data needed to further characterize the horizontal and vertical extent of the NAPL-affected interval and related chemicals. These data will be used to refine the CSM and site boundaries associated with the offshore NAPL and observed sheens.

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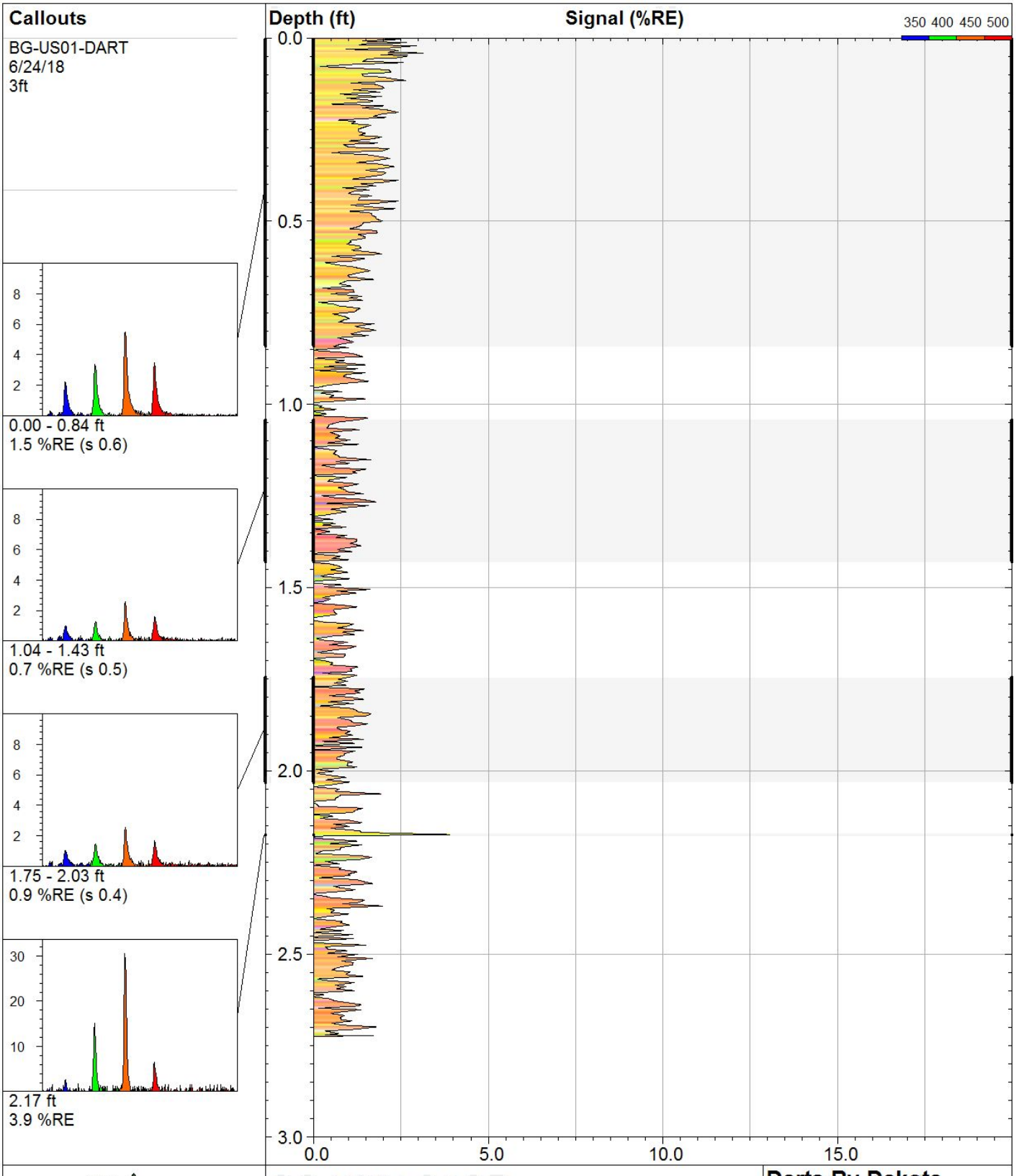
Appendix A
Dart Response Logs



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BG-US01-DART

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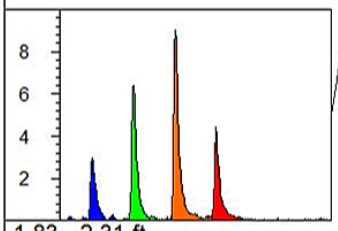
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.72 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.9 %RE @ 2.17 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 12:05 CDT**

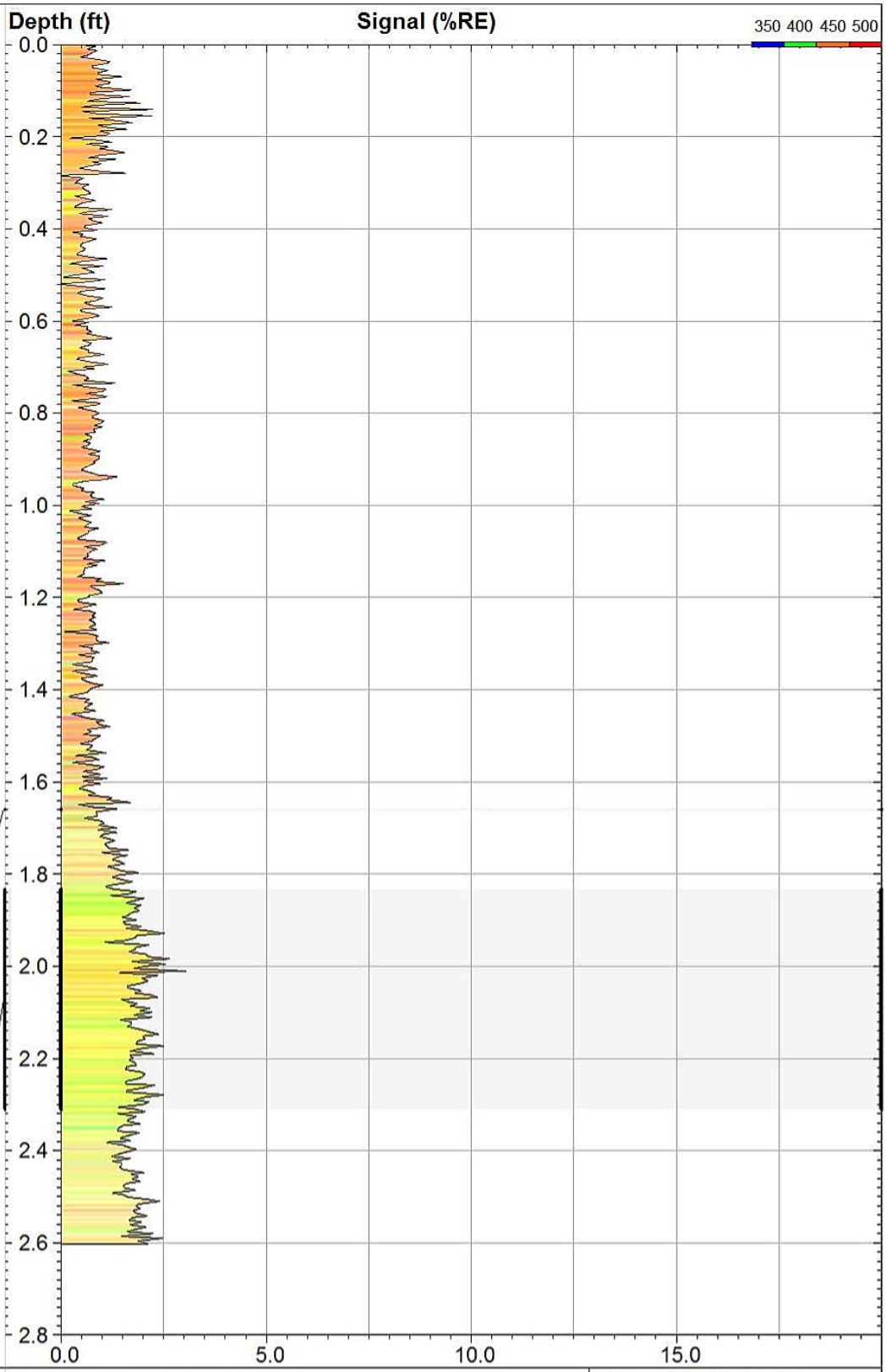
Callouts

MW-16-DART
7/4/18
3ft

Note 1.66:
Pink flagging tape tied here.



1.83 - 2.31 ft
1.9 %RE (s 0.3)



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MW-16-DART

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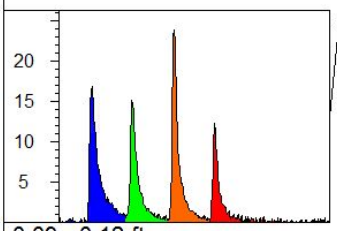
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.60 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.1 %RE @ 2.01 ft**
Operator / Unit: **RWS / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-07-04 10:23 CDT**

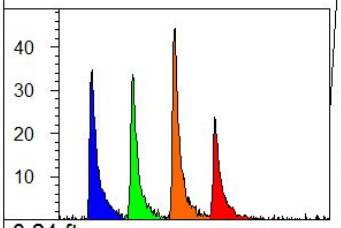
Callouts

OMH-1-DART
6/24/18
3ft

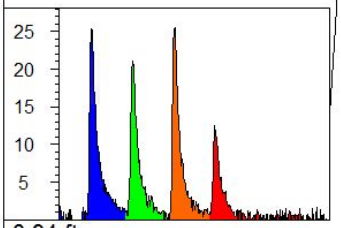
1.5ft hung in well



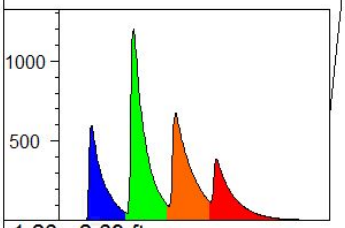
0.09 - 0.12 ft
9.9 %RE (s 5.7)



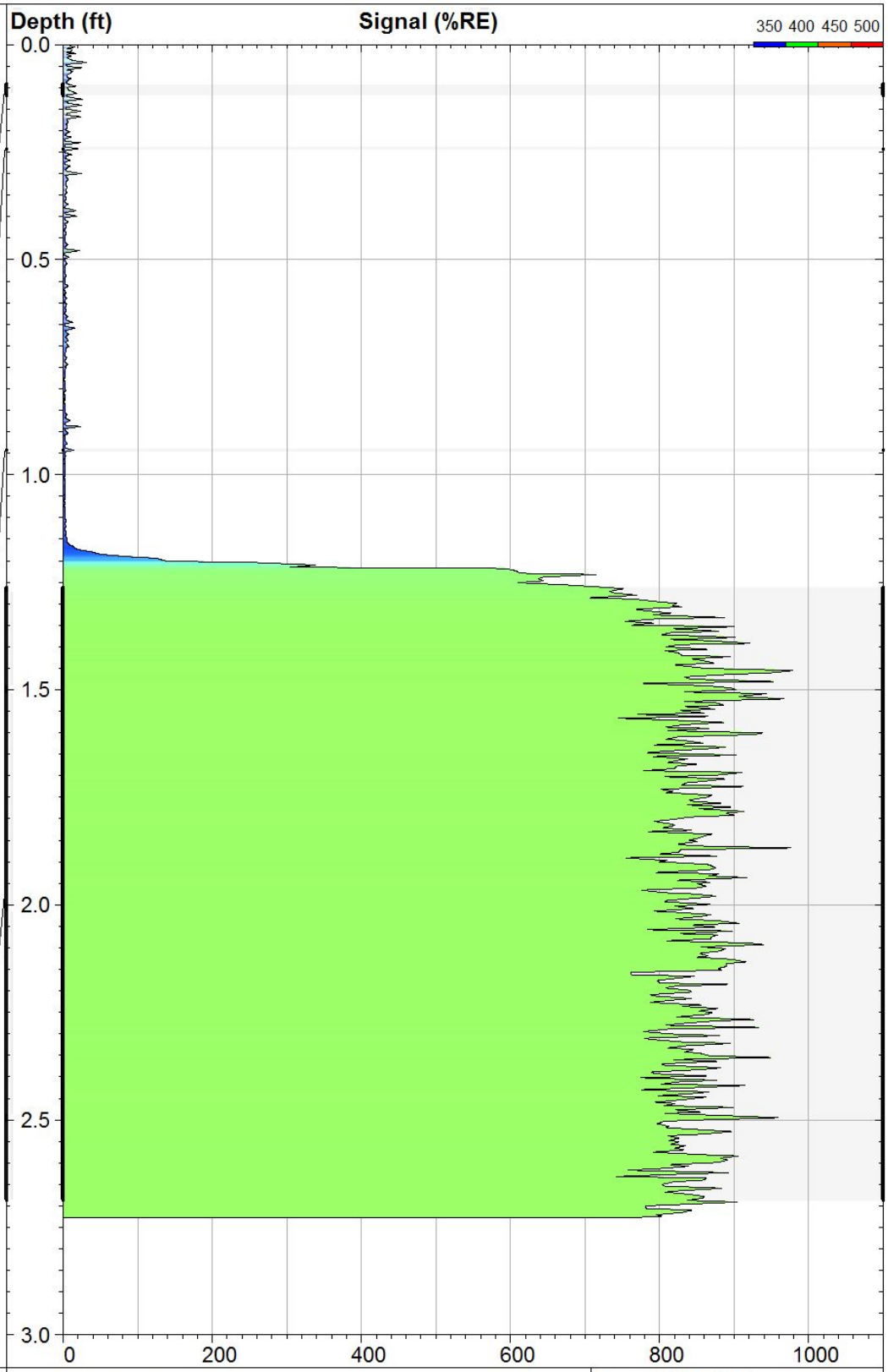
0.24 ft
20.1 %RE



0.94 ft
14.0 %RE



1.26 - 2.69 ft
841.9 %RE (s 46.6)



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OHM-1-DART

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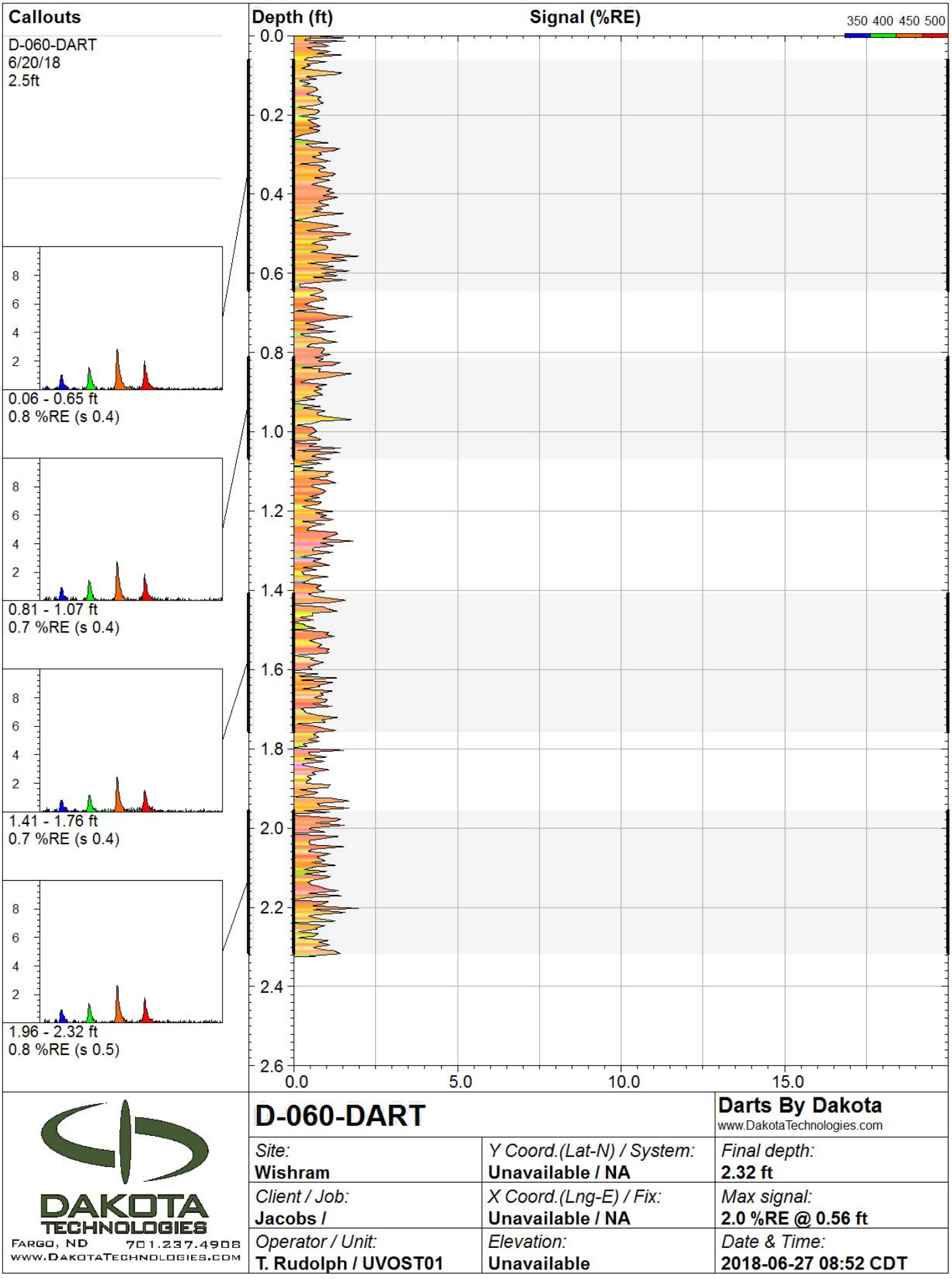
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.73 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **978.7 %RE @ 1.46 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 11:37 CDT**



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D-060-DART

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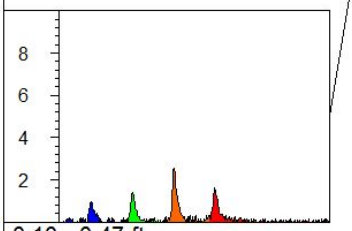
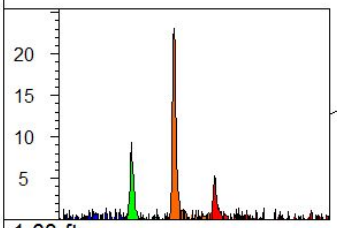
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.32 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **2.0 %RE @ 0.56 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-27 08:52 CDT**

Callouts

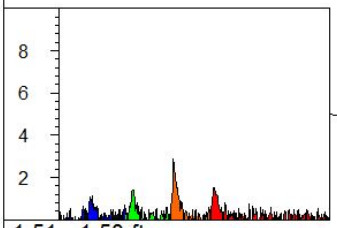
D-100-DART
6/20/18
2.2ft



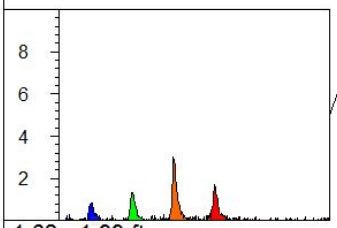
0.10 - 0.47 ft
0.8 %RE (s 0.4)



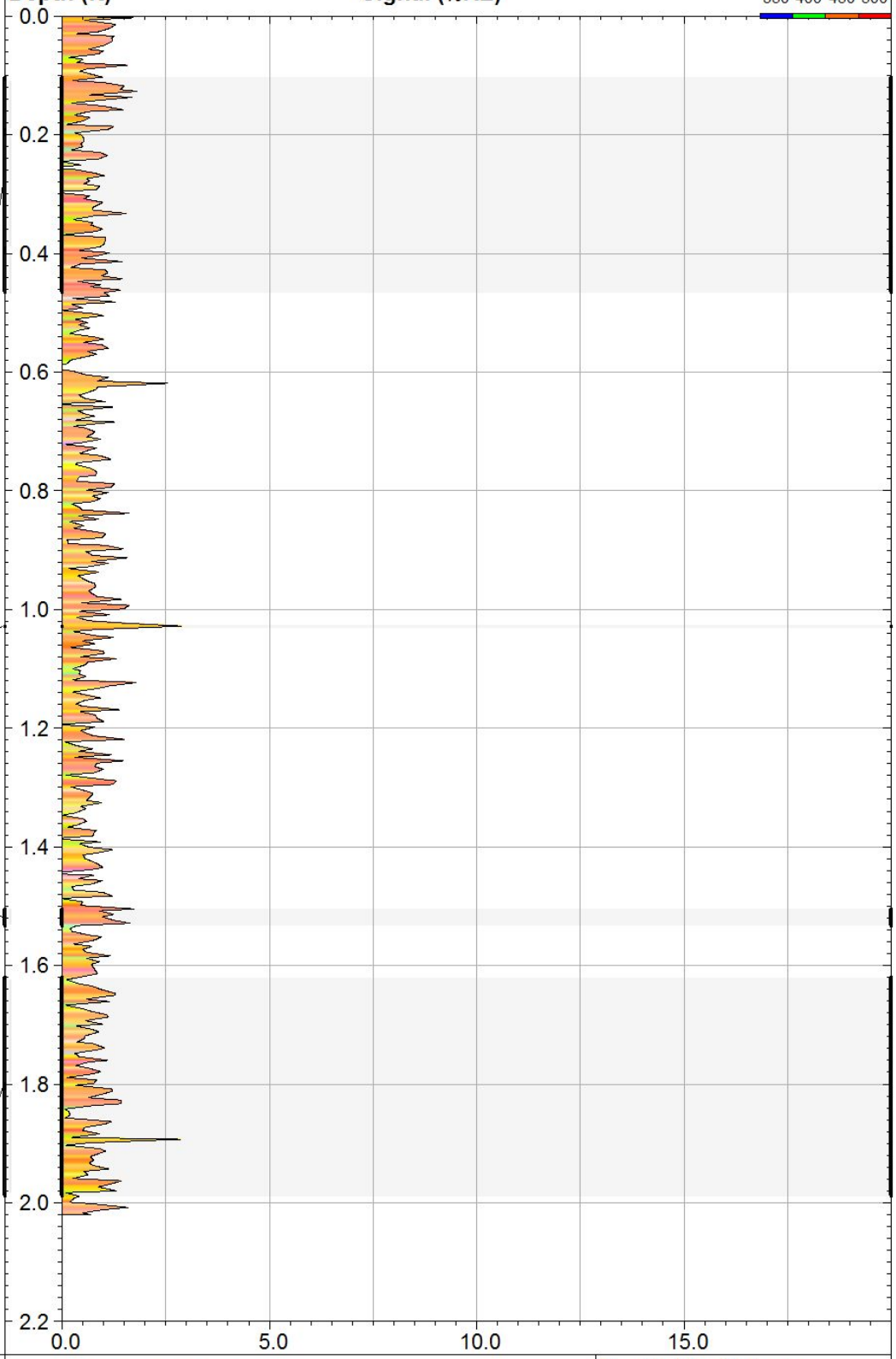
1.03 ft
2.9 %RE



1.51 - 1.53 ft
1.2 %RE (s 0.5)



1.62 - 1.99 ft
0.7 %RE (s 0.5)



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D-100-DART

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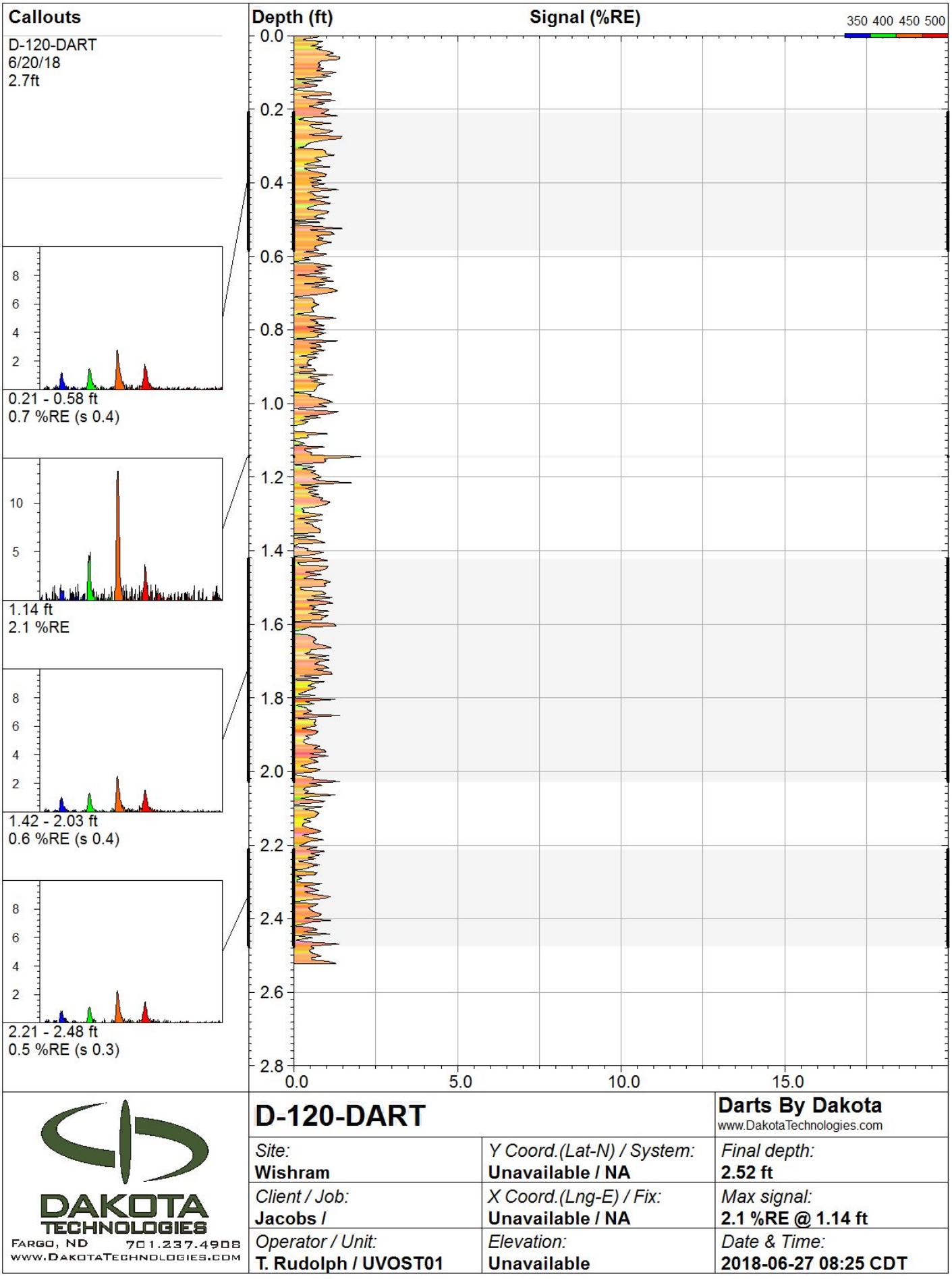
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.02 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **2.9 %RE @ 1.89 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-27 08:39 CDT**



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D-120-DART

Darts By Dakota
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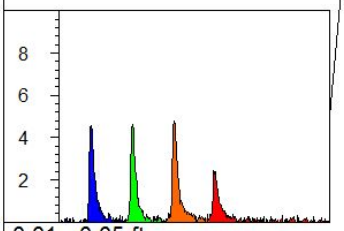
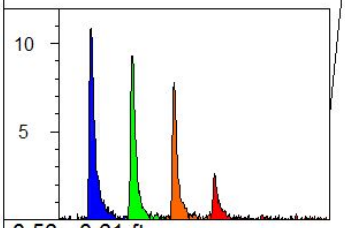
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.52 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **2.1 %RE @ 1.14 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-27 08:25 CDT**

Callouts

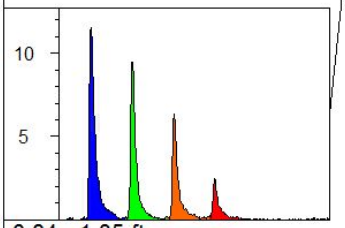
D-150-DART
6/20/18
2.3ft



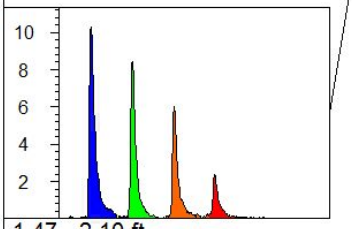
0.01 - 0.05 ft
2.0 %RE (s 0.5)



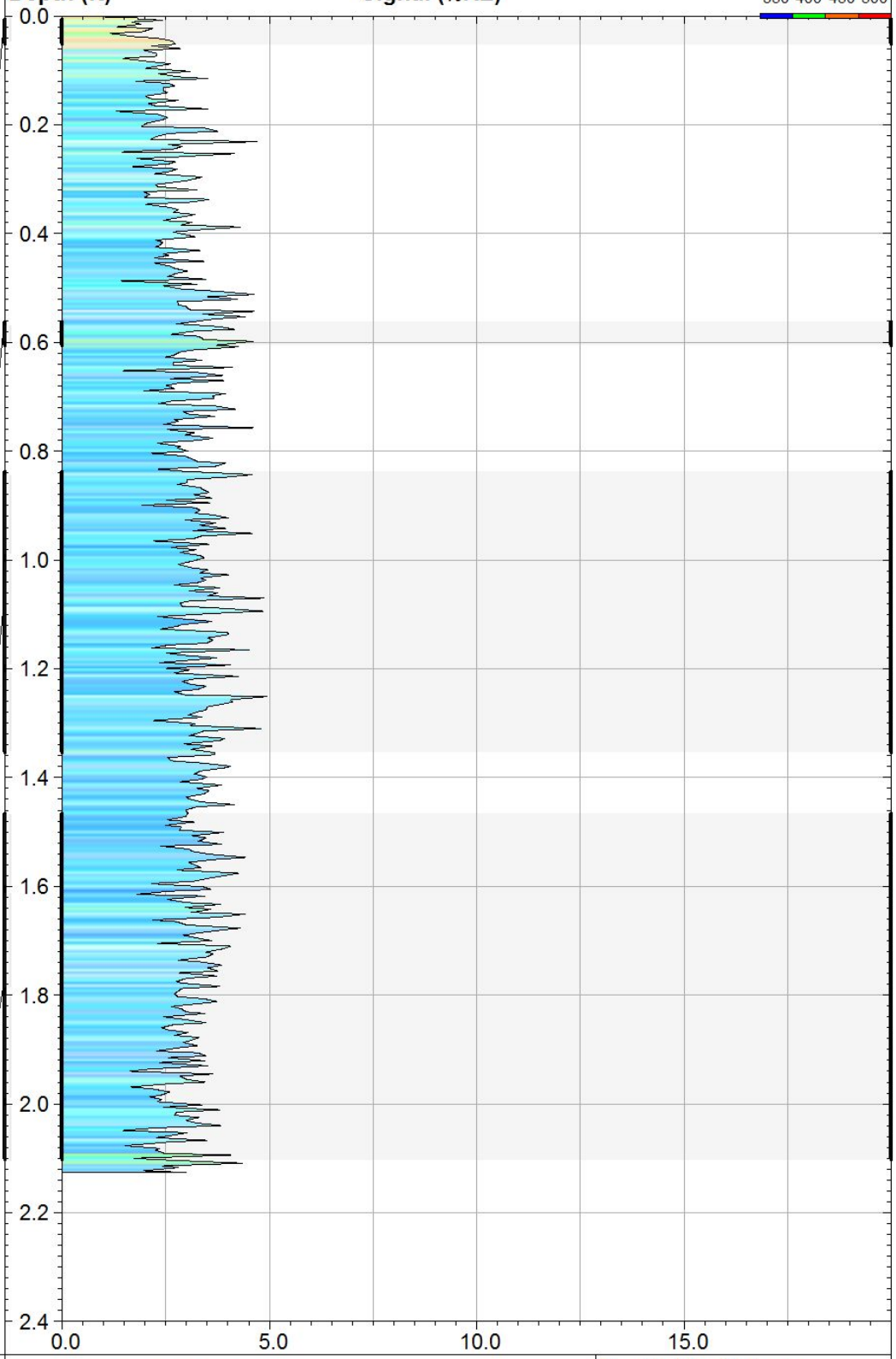
0.56 - 0.61 ft
3.5 %RE (s 0.6)



0.84 - 1.35 ft
3.3 %RE (s 0.6)



1.47 - 2.10 ft
3.0 %RE (s 0.6)



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D-150-DART

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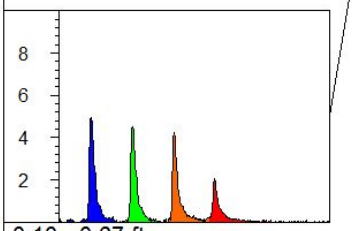
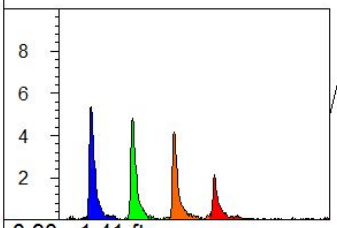
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.13 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.9 %RE @ 1.25 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 16:28 CDT**

Callouts

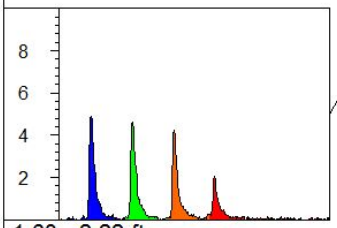
D-170-DART
6/20/18
3ft



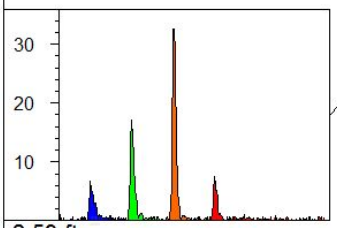
0.10 - 0.67 ft
1.7 %RE (s 0.5)



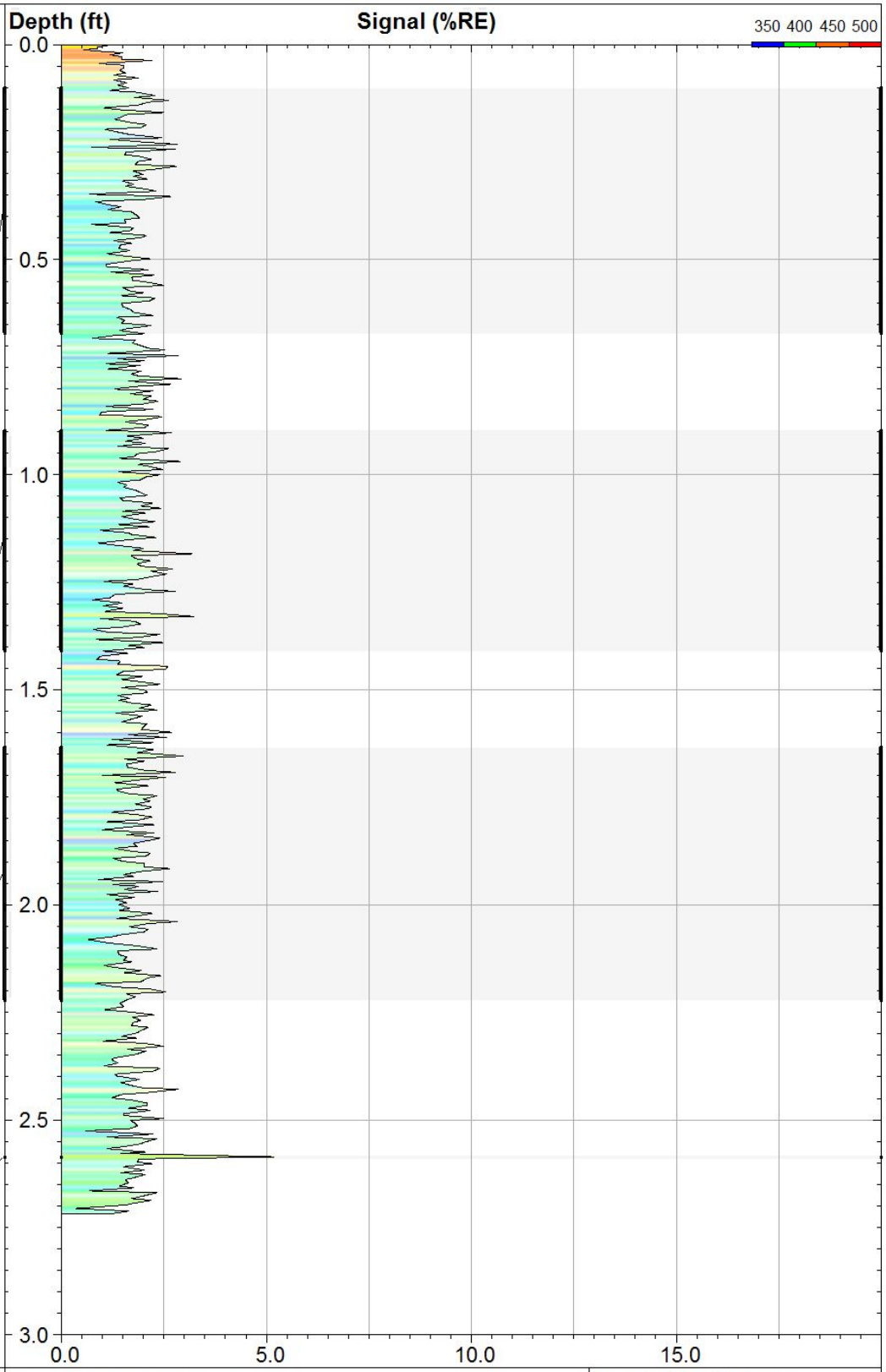
0.90 - 1.41 ft
1.8 %RE (s 0.6)



1.63 - 2.22 ft
1.8 %RE (s 0.5)



2.59 ft
5.2 %RE



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D-170-DART

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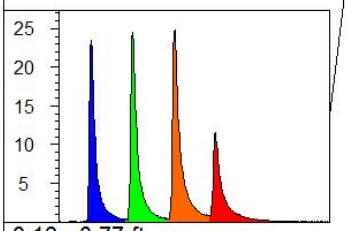
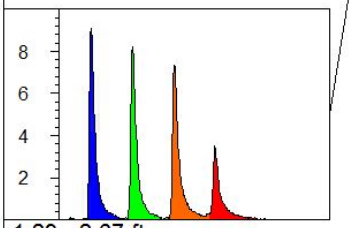
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.72 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.2 %RE @ 2.59 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 16:16 CDT**

Callouts

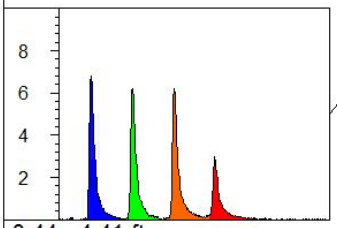
D-200- DART
6/20/18
5.8ft



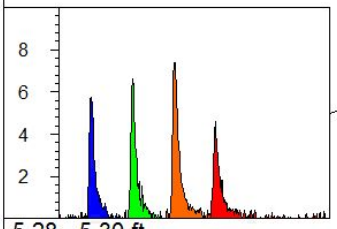
0.16 - 0.77 ft
10.8 %RE (s 2.7)



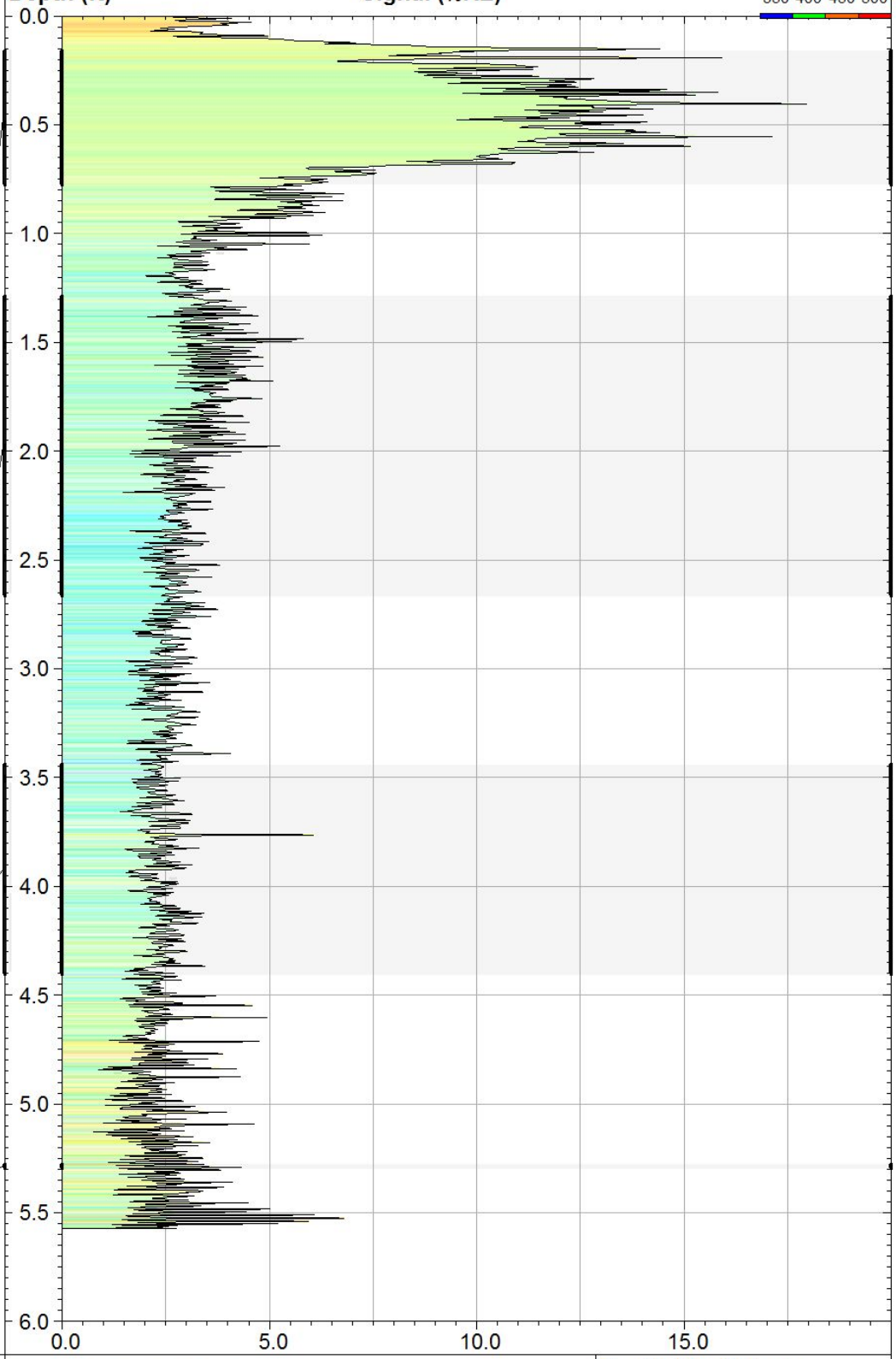
1.29 - 2.67 ft
3.1 %RE (s 0.8)



3.44 - 4.41 ft
2.4 %RE (s 0.5)



5.28 - 5.30 ft
2.8 %RE (s 1.4)



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D-200-DART

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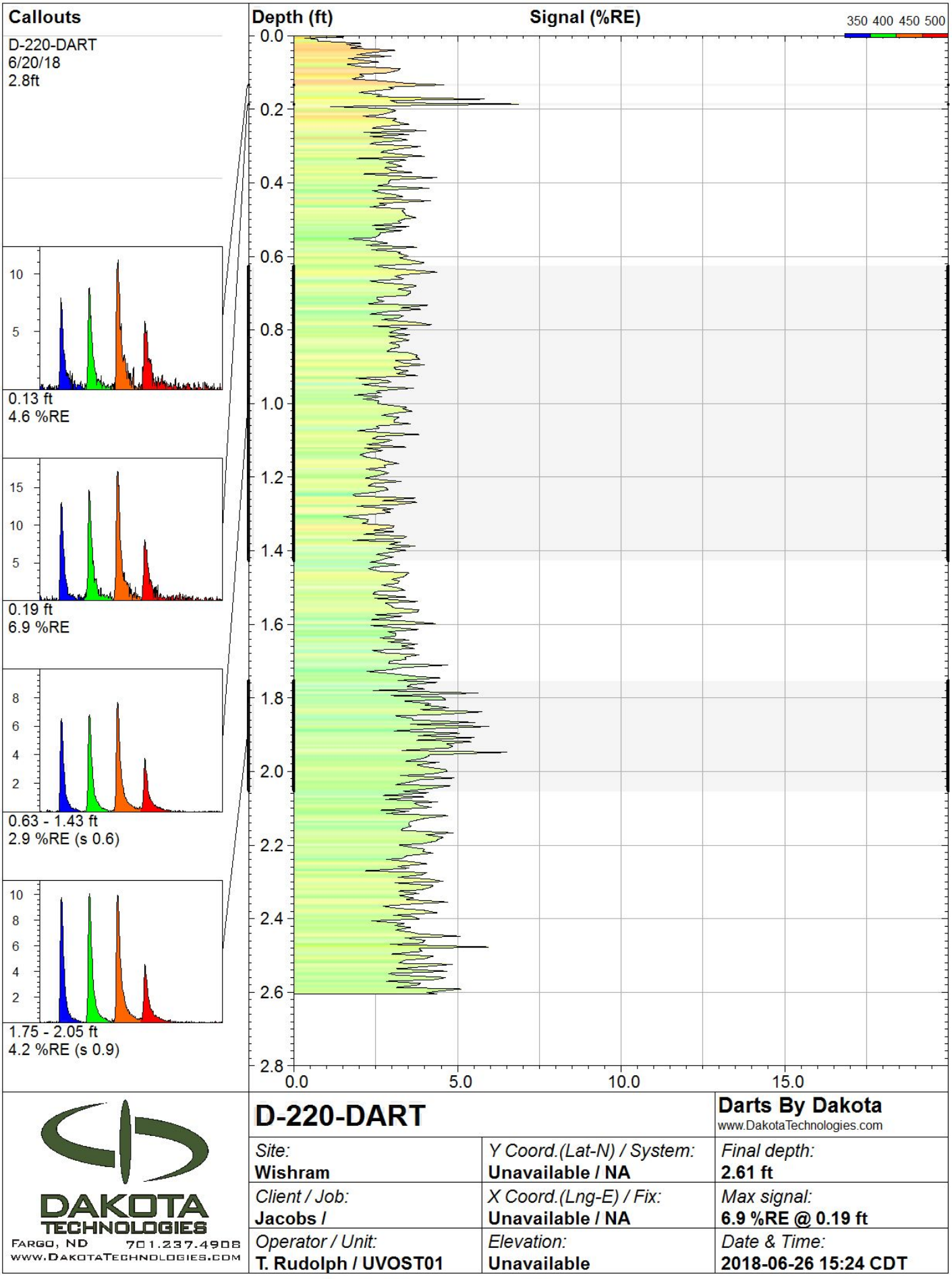
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.57 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **18.1 %RE @ 0.40 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 13:46 CDT**



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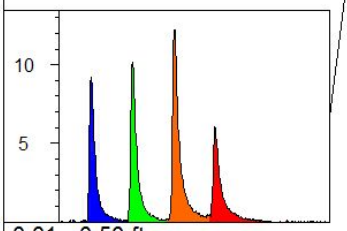
D-220-DART

Darts By Dakota
www.DakotaTechnologies.com

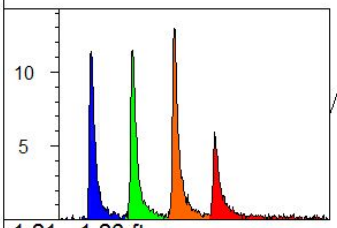
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.61 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.9 %RE @ 0.19 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 15:24 CDT**

Callouts

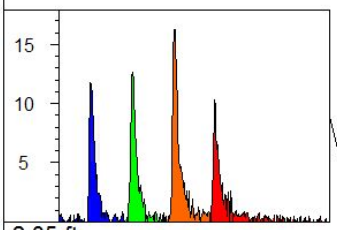
D-240- DART
6/20/18
3ft



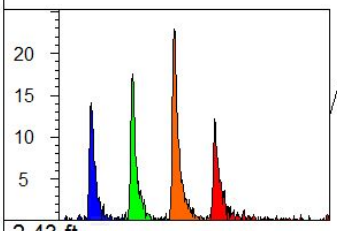
0.01 - 0.50 ft
4.9 %RE (s 1.4)



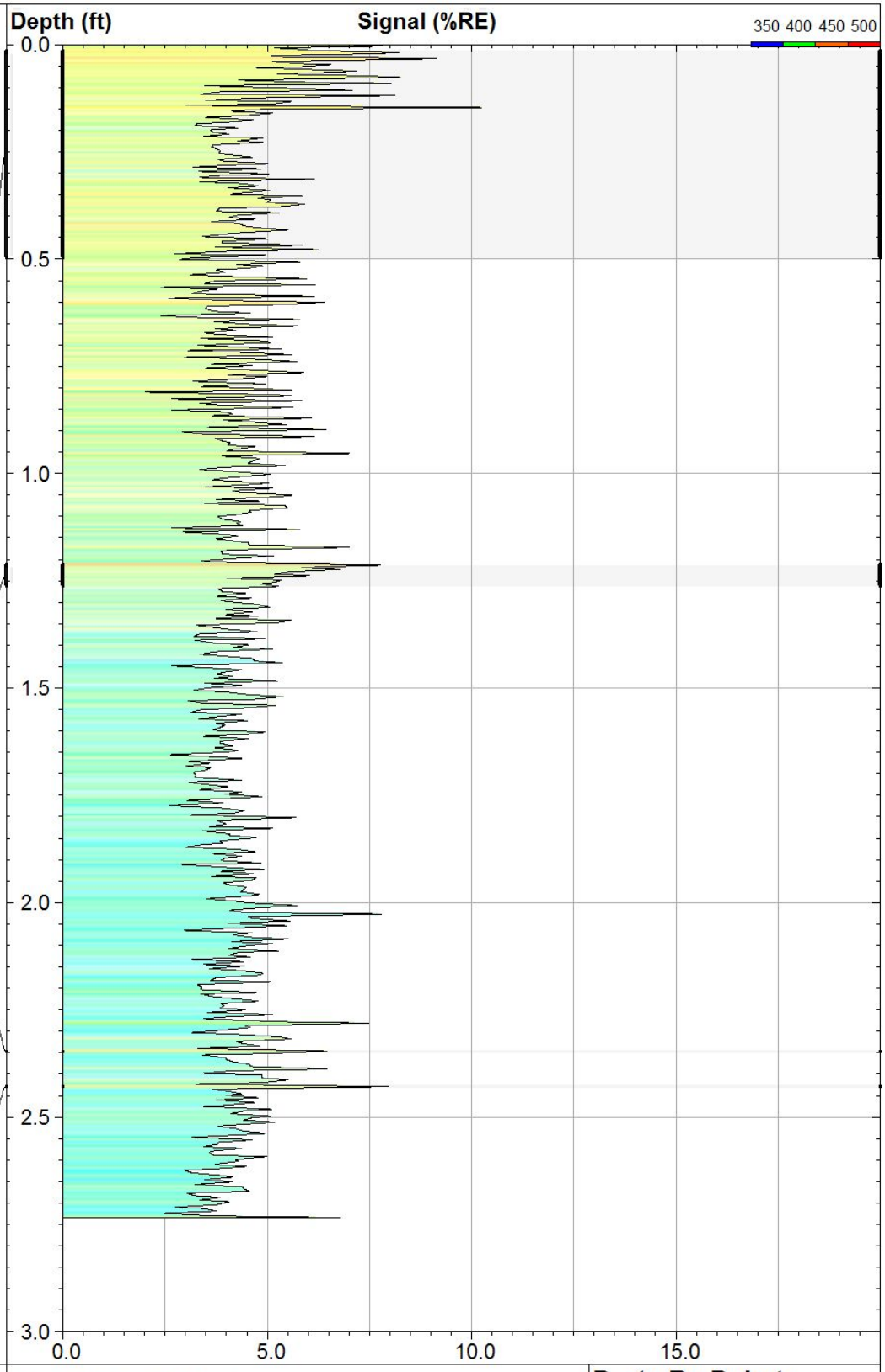
1.21 - 1.26 ft
5.6 %RE (s 1.0)



2.35 ft
6.5 %RE



2.43 ft
8.0 %RE



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D-240-DART

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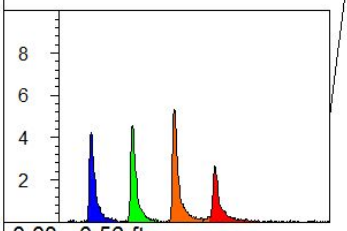
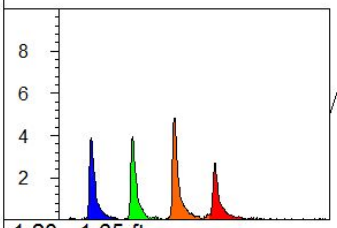
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.73 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **10.5 %RE @ 0.15 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 14:49 CDT**

Callouts

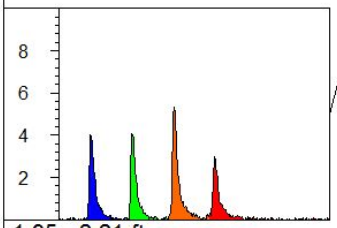
D-260- DART
6/20/18
3.2ft



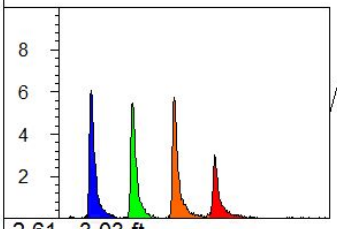
0.03 - 0.56 ft
1.9 %RE (s 0.7)



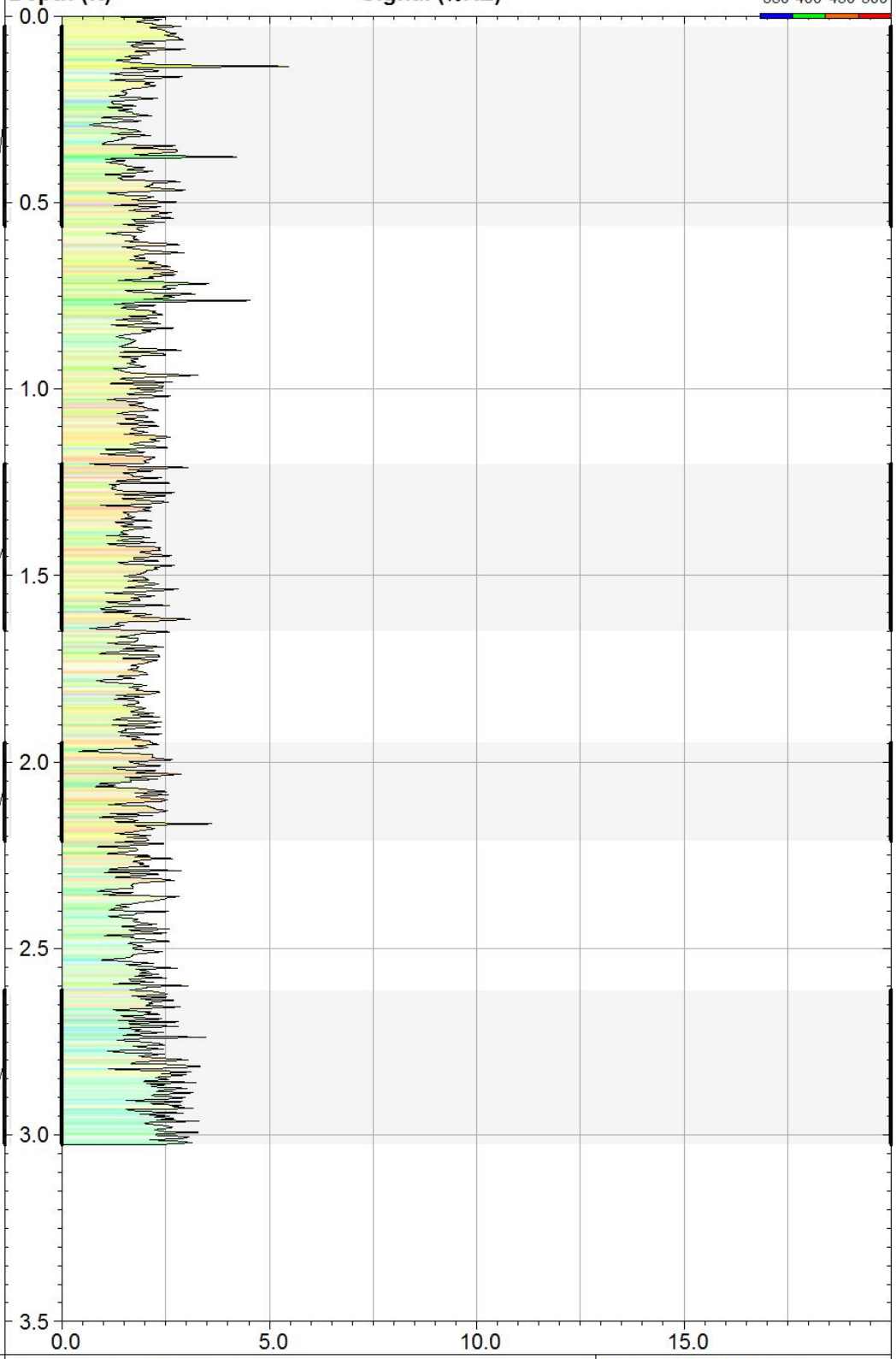
1.20 - 1.65 ft
1.8 %RE (s 0.5)



1.95 - 2.21 ft
1.9 %RE (s 0.6)



2.61 - 3.03 ft
2.3 %RE (s 0.6)



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D-260-DART

Darts By Dakota
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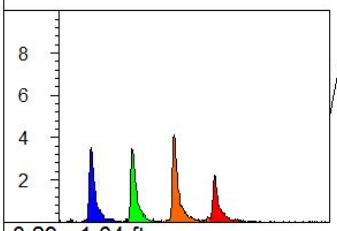
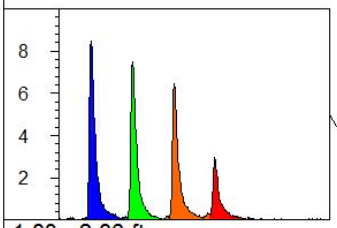
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **3.03 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.6 %RE @ 0.14 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 14:17 CDT**

Callouts

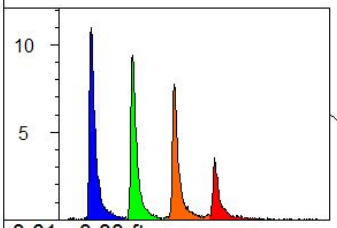
D-280- DART
6/20/18
4.2ft



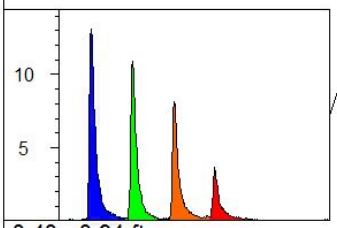
0.29 - 1.04 ft
1.4 %RE (s 0.4)



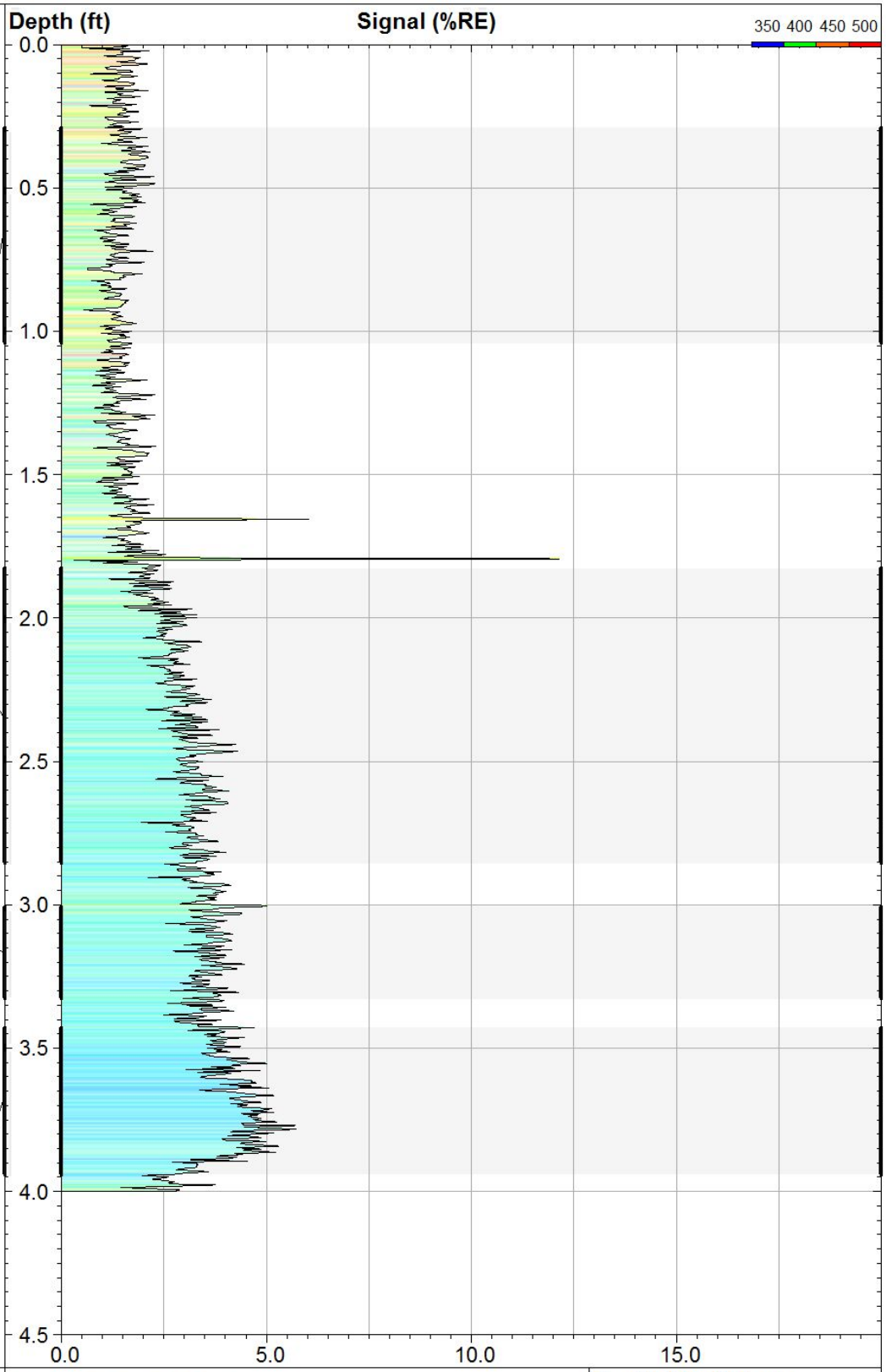
1.83 - 2.86 ft
2.9 %RE (s 0.6)



3.01 - 3.33 ft
3.6 %RE (s 0.5)



3.43 - 3.94 ft
4.2 %RE (s 0.7)



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D-280-DART

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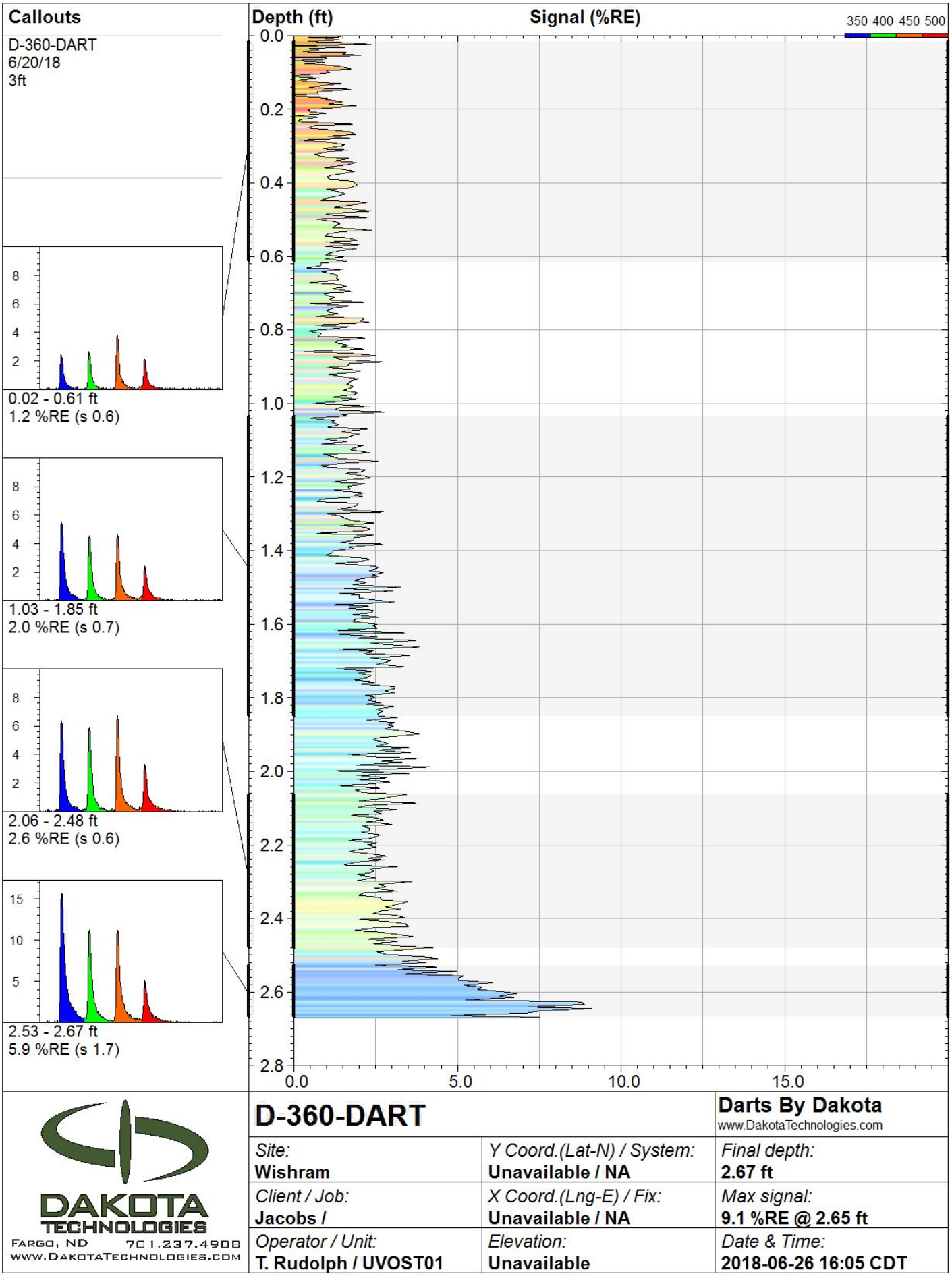
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **4.00 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **12.6 %RE @ 1.79 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 11:37 CDT**



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D-360-DART

Darts By Dakota
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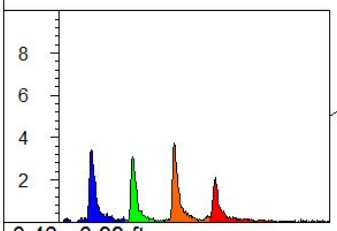
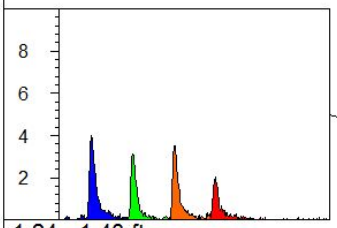
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.67 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **9.1 %RE @ 2.65 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 16:05 CDT**

Callouts

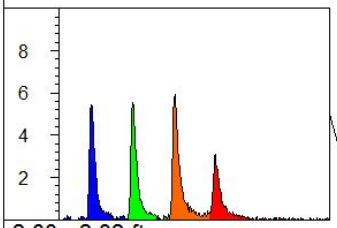
D-380- DART
6/19/18
2.7ft



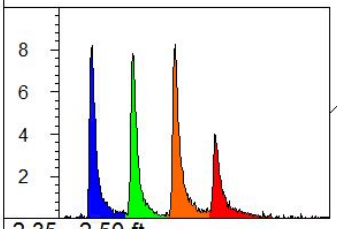
0.46 - 0.99 ft
1.4 %RE (s 0.4)



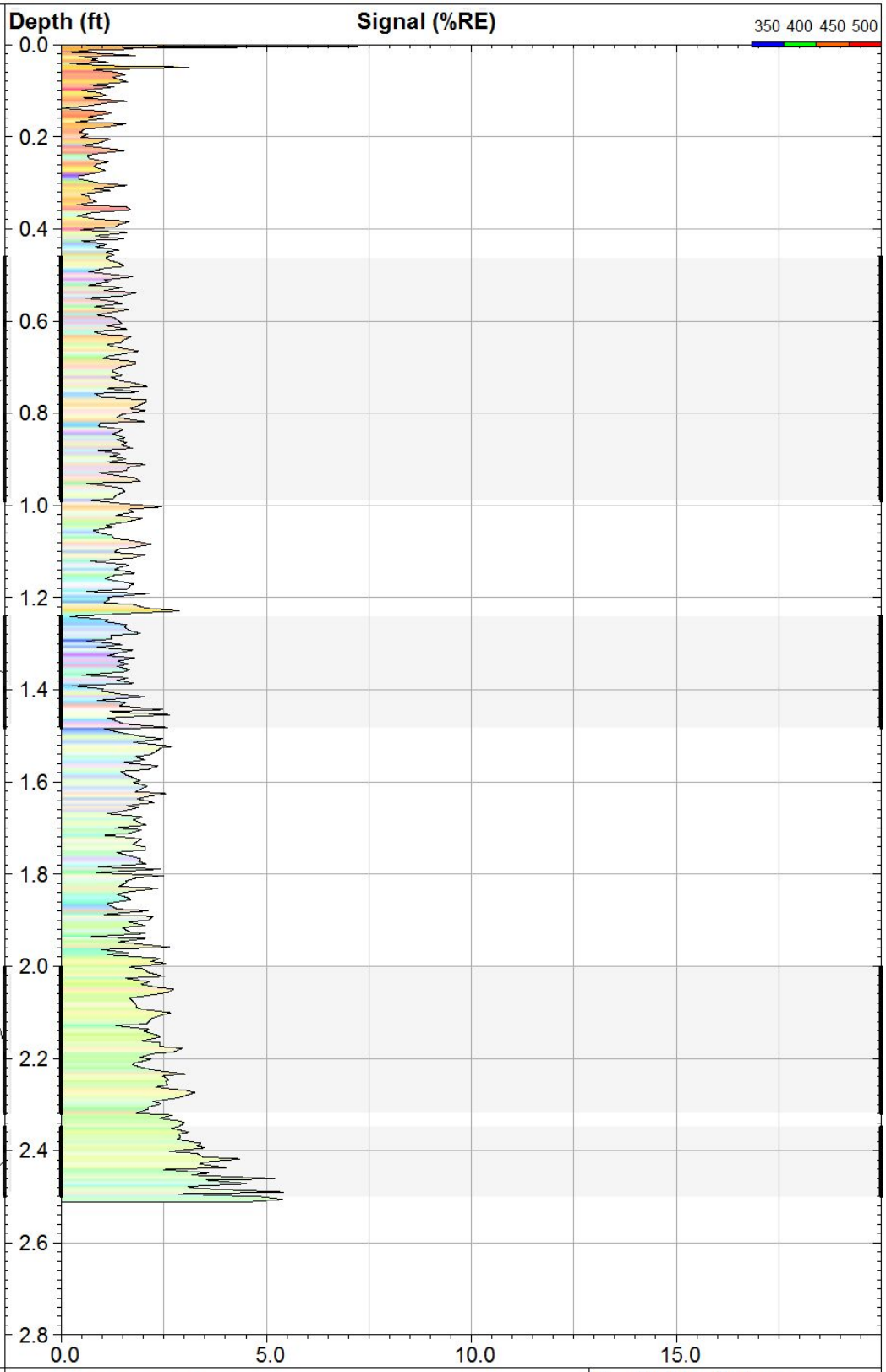
1.24 - 1.48 ft
1.4 %RE (s 0.5)



2.00 - 2.32 ft
2.3 %RE (s 0.4)



2.35 - 2.50 ft
3.5 %RE (s 0.8)



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D-380-DART

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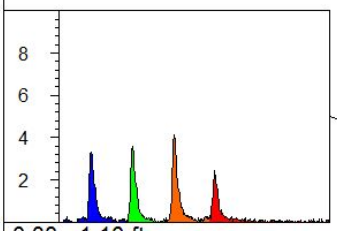
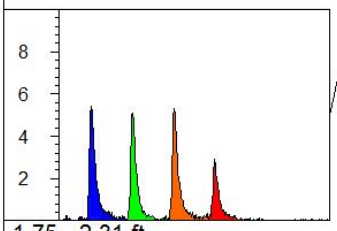
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.51 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **8.2 %RE @ 0.01 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 15:04 CDT**

Callouts

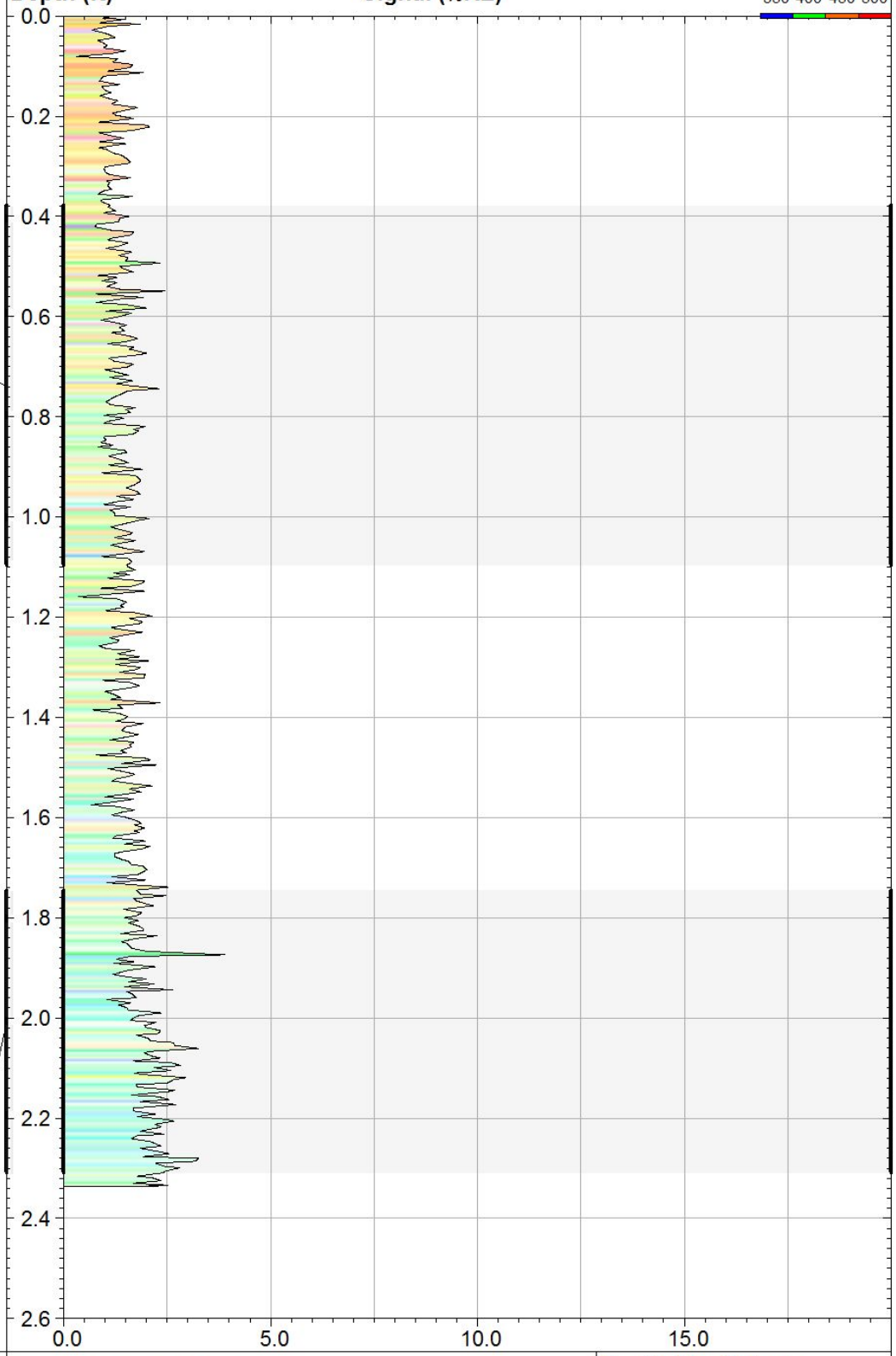
D-400 DART
6/19/18
2.5ft



0.38 - 1.10 ft
1.4 %RE (s 0.3)



1.75 - 2.31 ft
2.0 %RE (s 0.5)



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D-400-DART

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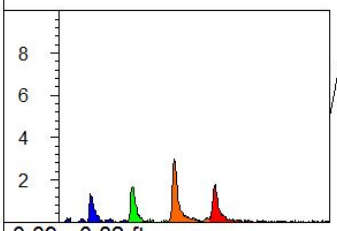
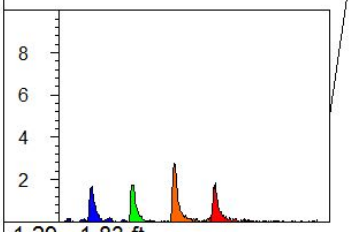
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.34 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.9 %RE @ 1.87 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 10:39 CDT**

Callouts

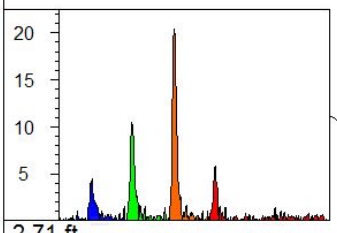
D-400-D DART
6/19/18
3ft



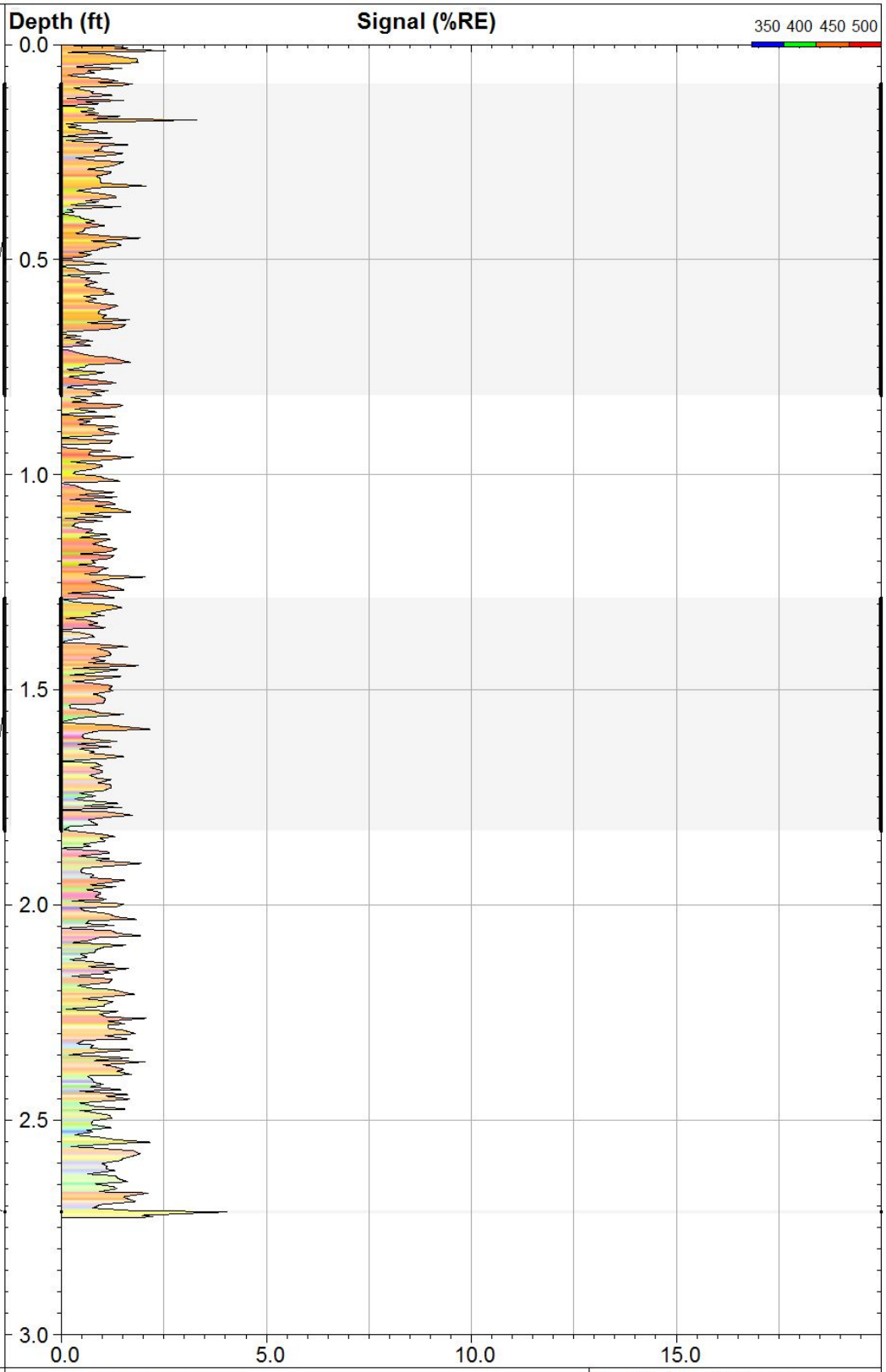
0.09 - 0.82 ft
0.8 %RE (s 0.5)



1.29 - 1.83 ft
0.8 %RE (s 0.5)



2.71 ft
4.1 %RE



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D-400-D-DART

Darts By Dakota
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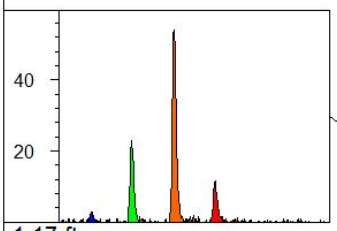
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.73 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.1 %RE @ 2.71 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 14:19 CDT**

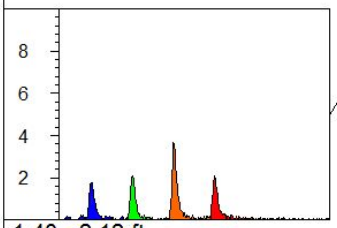
Callouts

D-420 DART
6/19/18
3.3ft

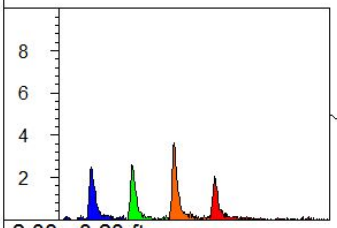
Small tear at 1.2' fiberglass pole visible



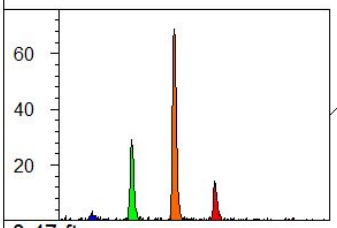
1.17 ft
5.6 %RE
fiberglass



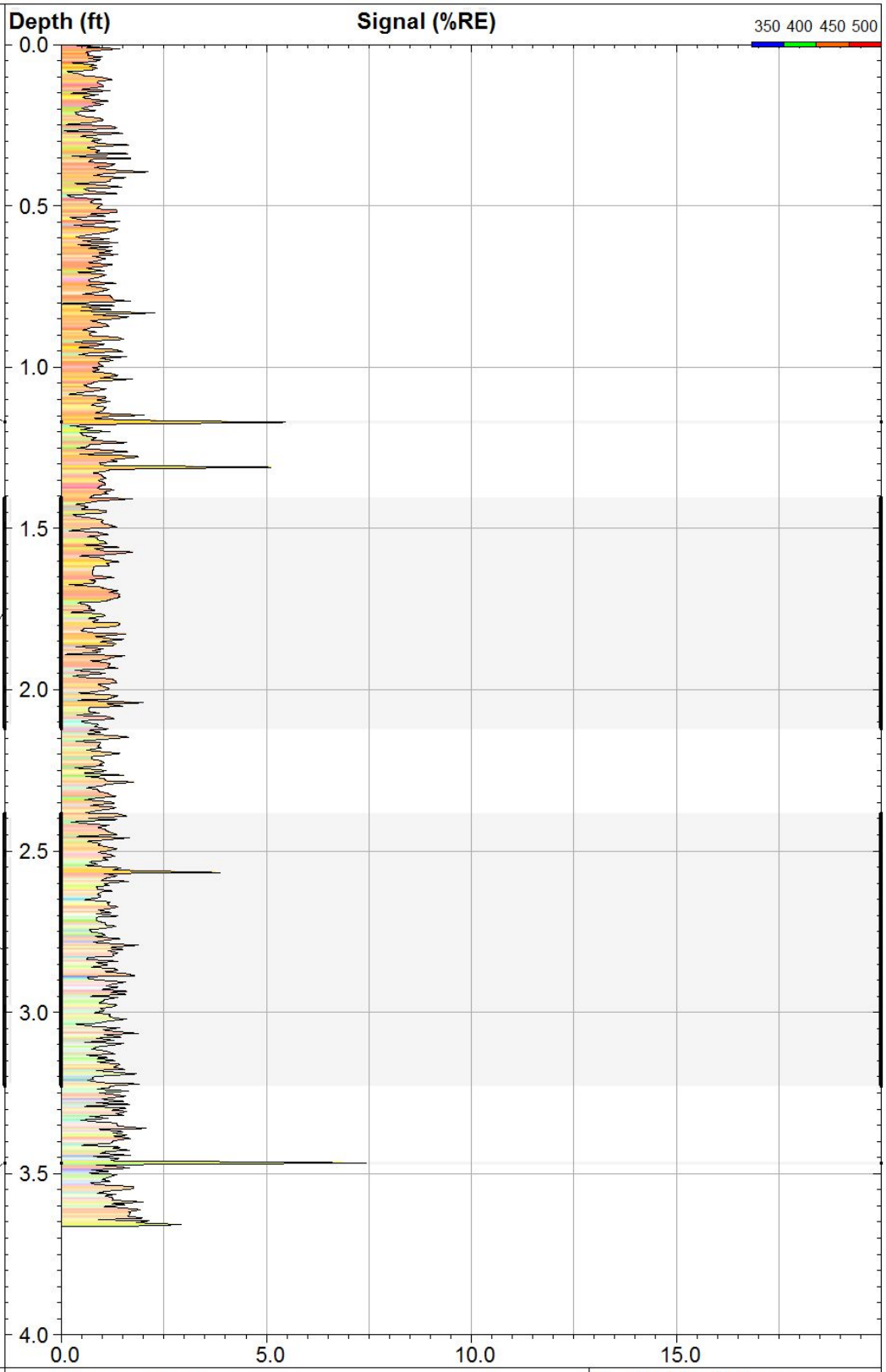
1.40 - 2.12 ft
0.9 %RE (s 0.4)



2.38 - 3.23 ft
1.1 %RE (s 0.4)



3.47 ft
7.6 %RE



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D-420-DART

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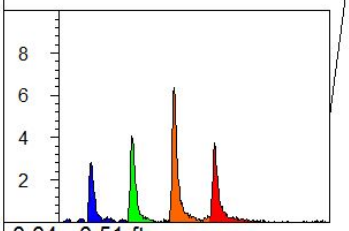
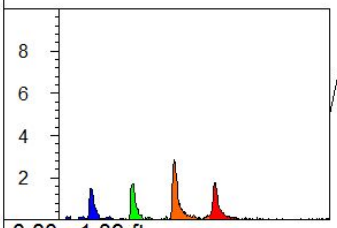
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **3.66 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **7.6 %RE @ 3.47 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 10:56 CDT**

Callouts

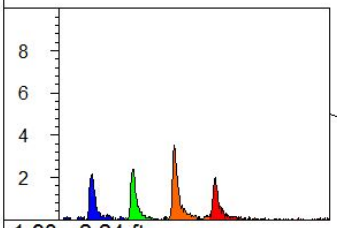
D-440 DART
6/19/18
3ft



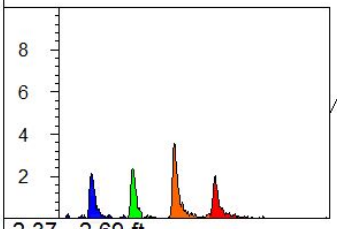
0.04 - 0.51 ft
1.7 %RE (s 0.5)



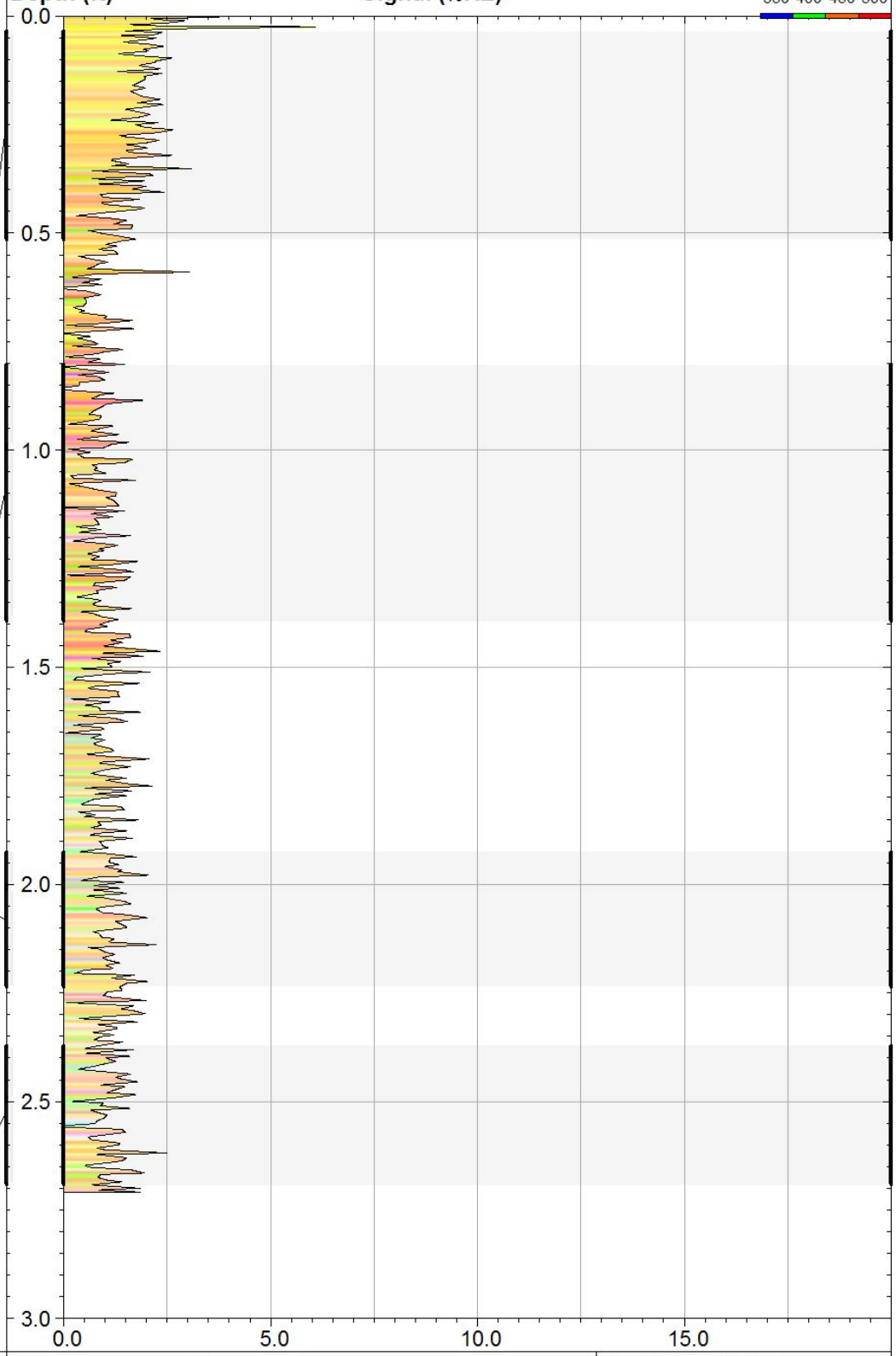
0.80 - 1.39 ft
0.9 %RE (s 0.5)



1.93 - 2.24 ft
1.2 %RE (s 0.4)



2.37 - 2.69 ft
1.1 %RE (s 0.5)



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D-440-DART

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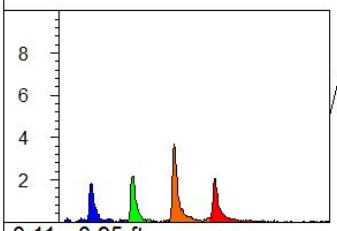
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.71 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.3 %RE @ 0.03 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 14:03 CDT**

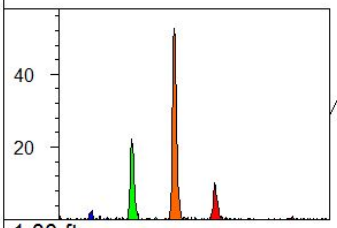
Callouts

D-460- DART
6/19/18
3ft

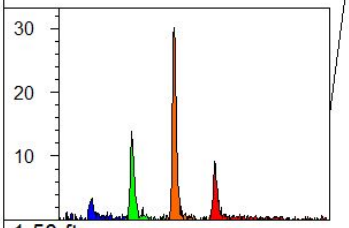
Tear at .19-.25ft fibeglass exposed



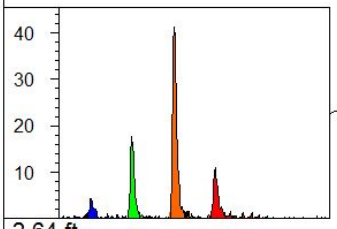
0.11 - 0.95 ft
1.0 %RE (s 0.5)



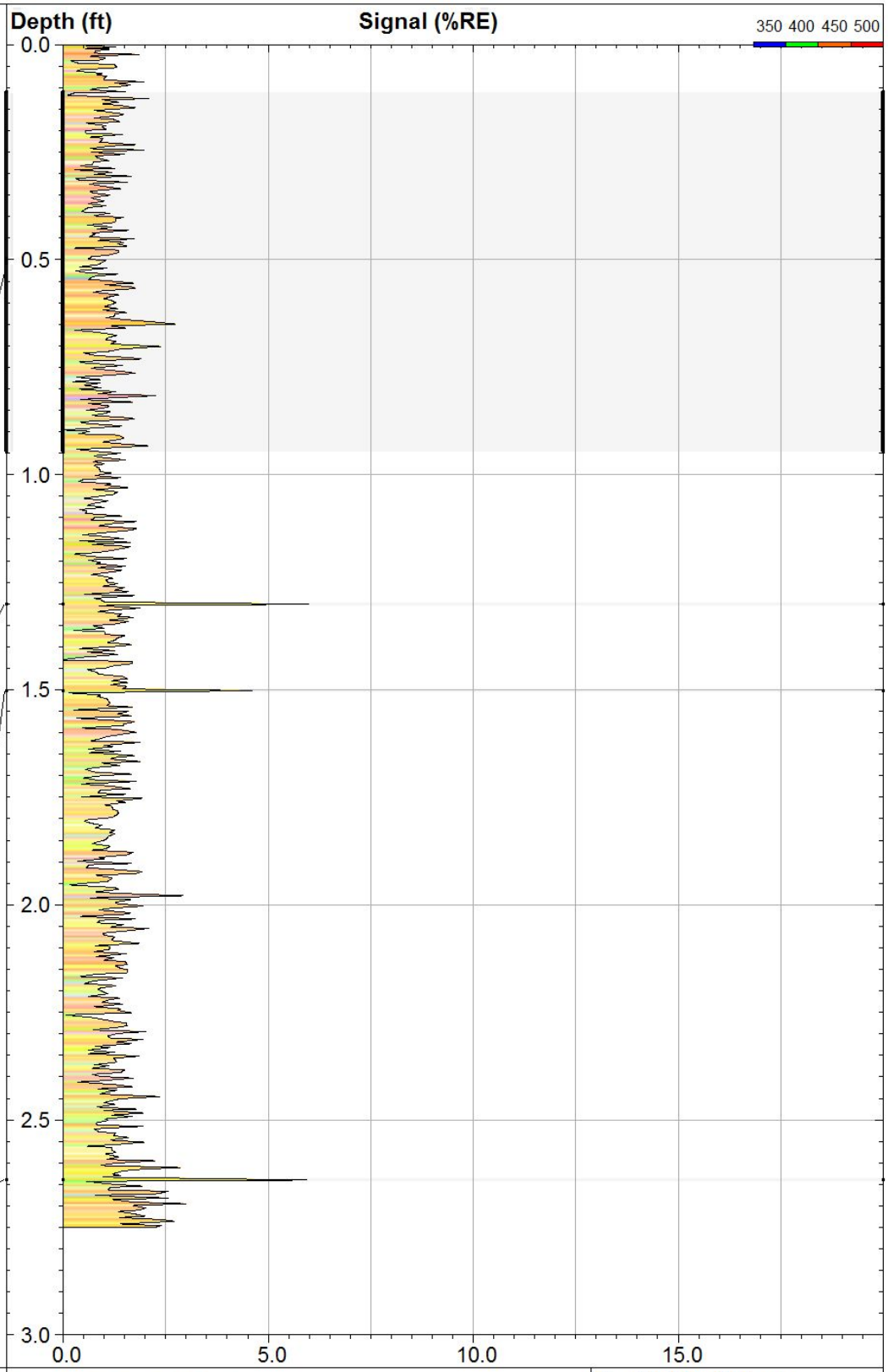
1.30 ft
6.2 %RE



1.50 ft
4.7 %RE



2.64 ft
5.9 %RE



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D-460-DART

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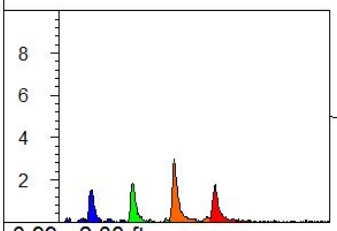
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.75 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.2 %RE @ 1.30 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 14:33 CDT**

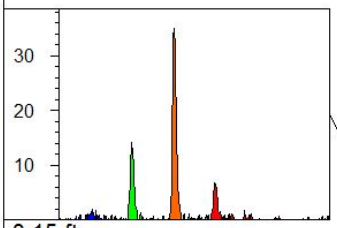
Callouts

D-480 DART
6/19/18
6ft

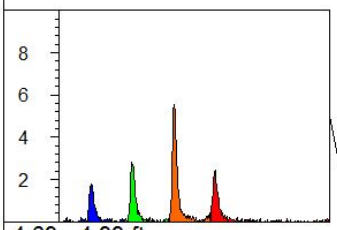
Tears between 4.75-5ft
fiberglass pole visible



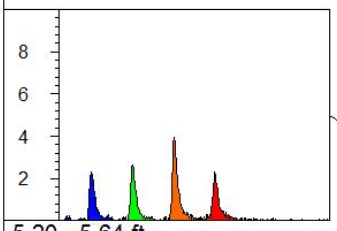
0.99 - 2.38 ft
0.8 %RE (s 0.4)



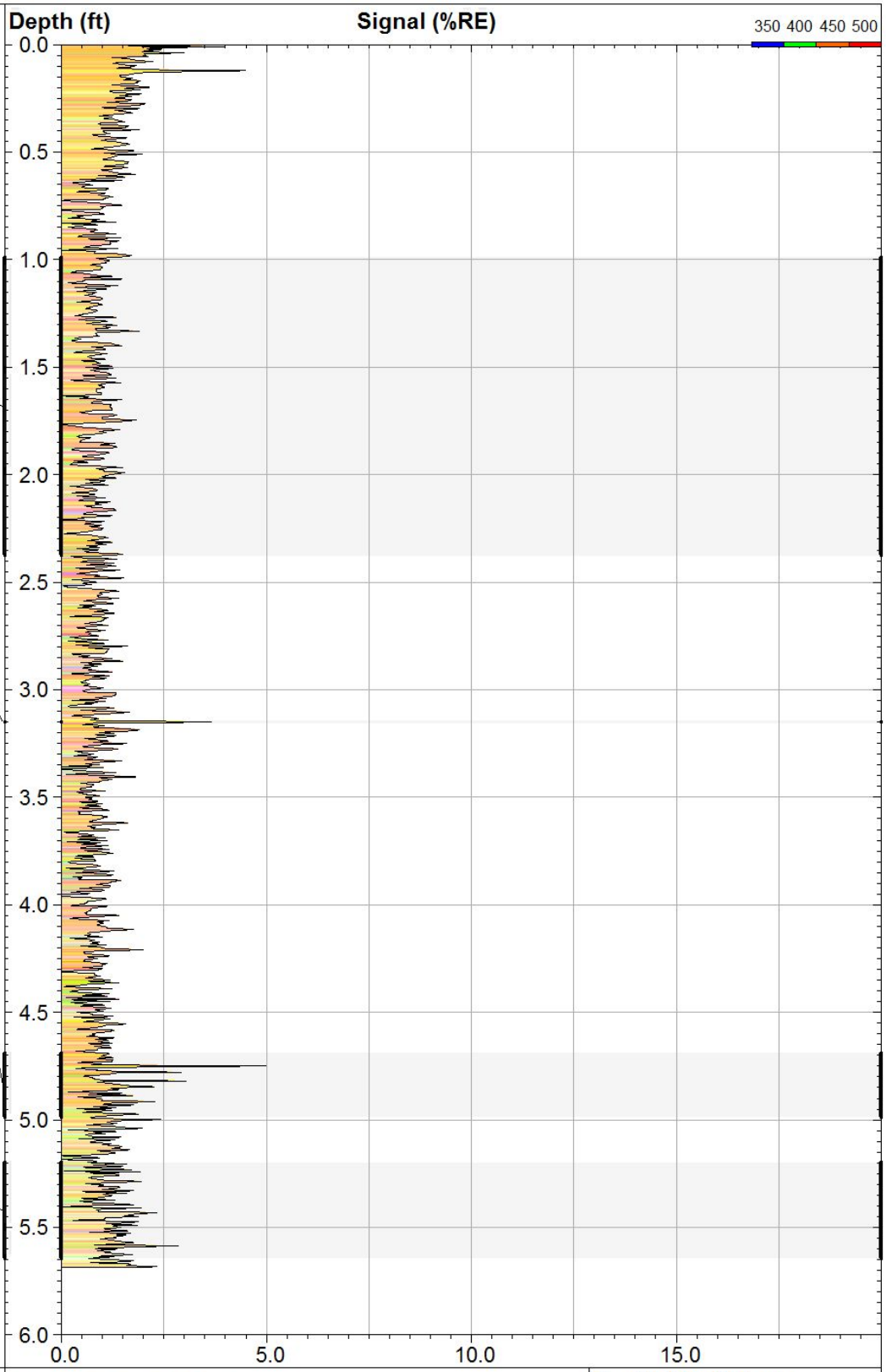
3.15 ft
3.8 %RE



4.69 - 4.99 ft
1.2 %RE (s 0.8)
Tear in Dart material



5.20 - 5.64 ft
1.2 %RE (s 0.5)



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D-480-DART

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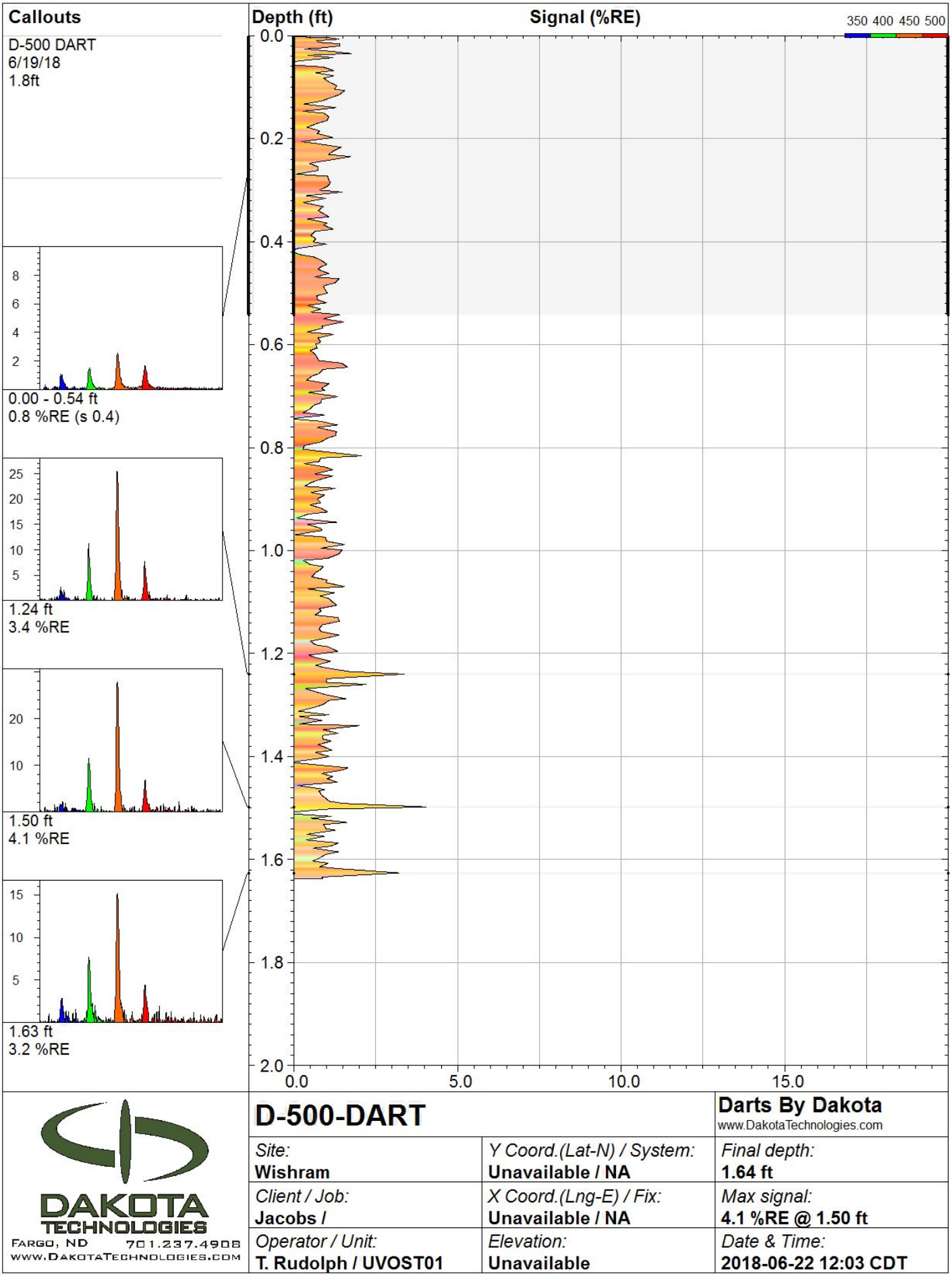
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.69 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.2 %RE @ 4.75 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 11:29 CDT**



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D-500-DART

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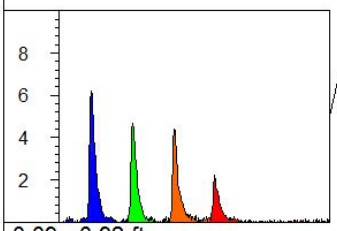
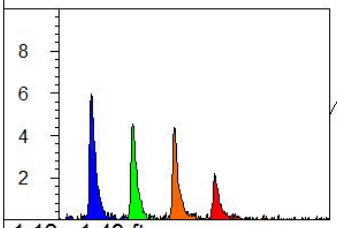
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **1.64 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.1 %RE @ 1.50 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-22 12:03 CDT**

Callouts

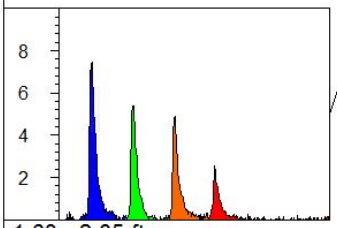
E-250-DART
6/24/18
3ft



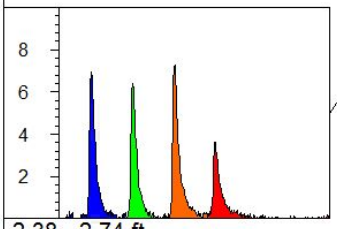
0.09 - 0.92 ft
1.7 %RE (s 0.4)



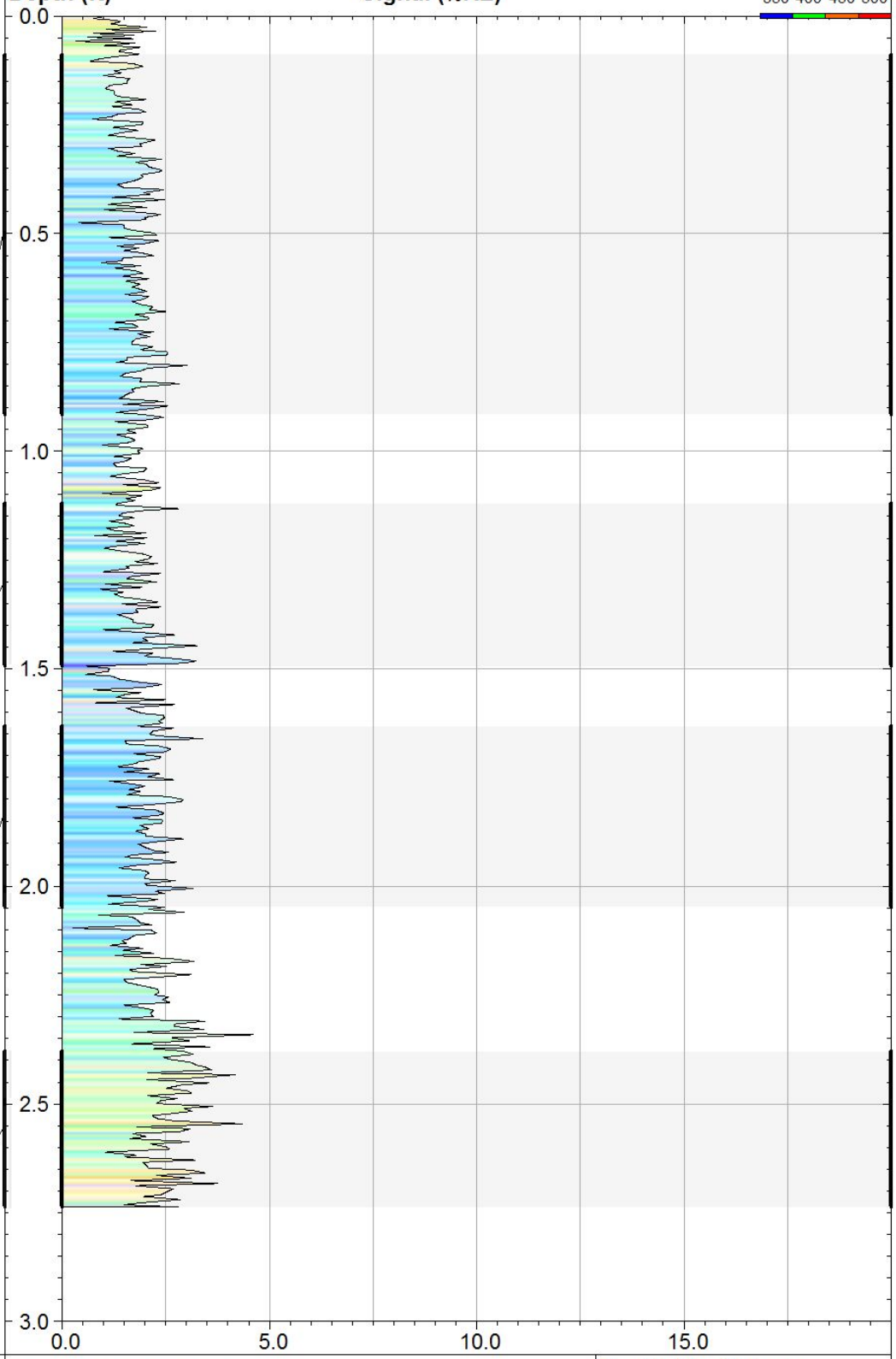
1.12 - 1.49 ft
1.8 %RE (s 0.6)



1.63 - 2.05 ft
2.1 %RE (s 0.5)



2.38 - 2.74 ft
2.6 %RE (s 0.7)



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E-250-DART

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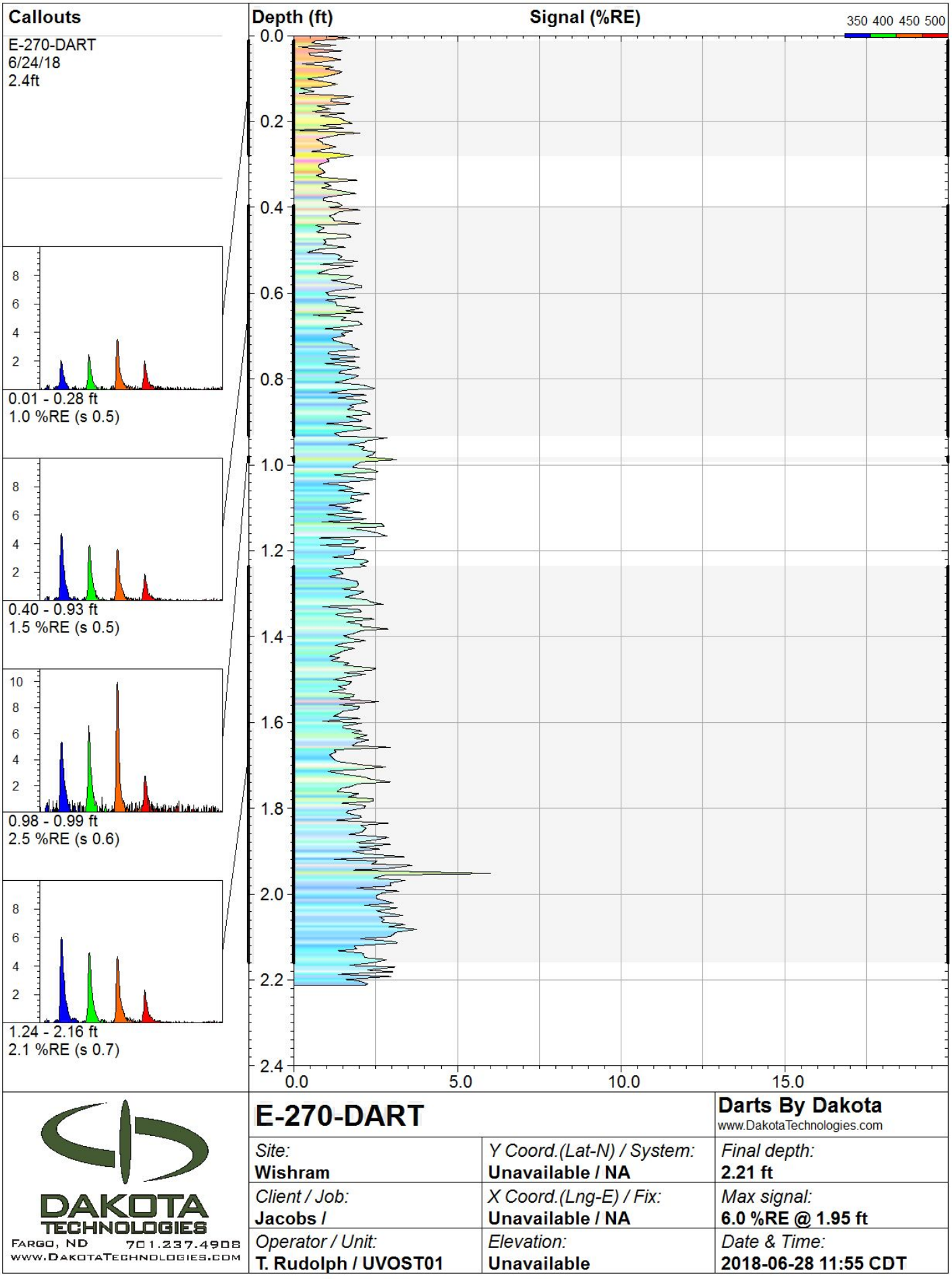
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.74 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.6 %RE @ 2.34 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 14:00 CDT**



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E-270-DART

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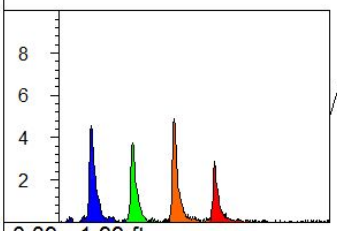
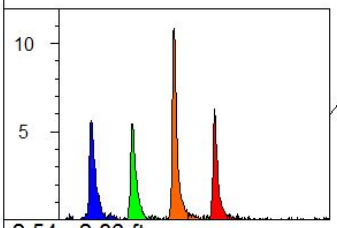
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.21 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.0 %RE @ 1.95 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 11:55 CDT**

Callouts

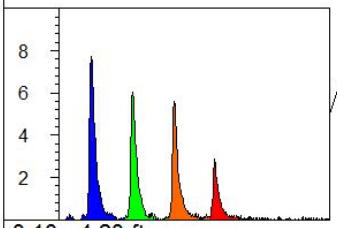
E-290-DART
6/24/18
5.8ft



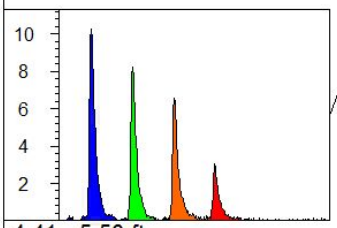
0.39 - 1.99 ft
1.6 %RE (s 0.5)



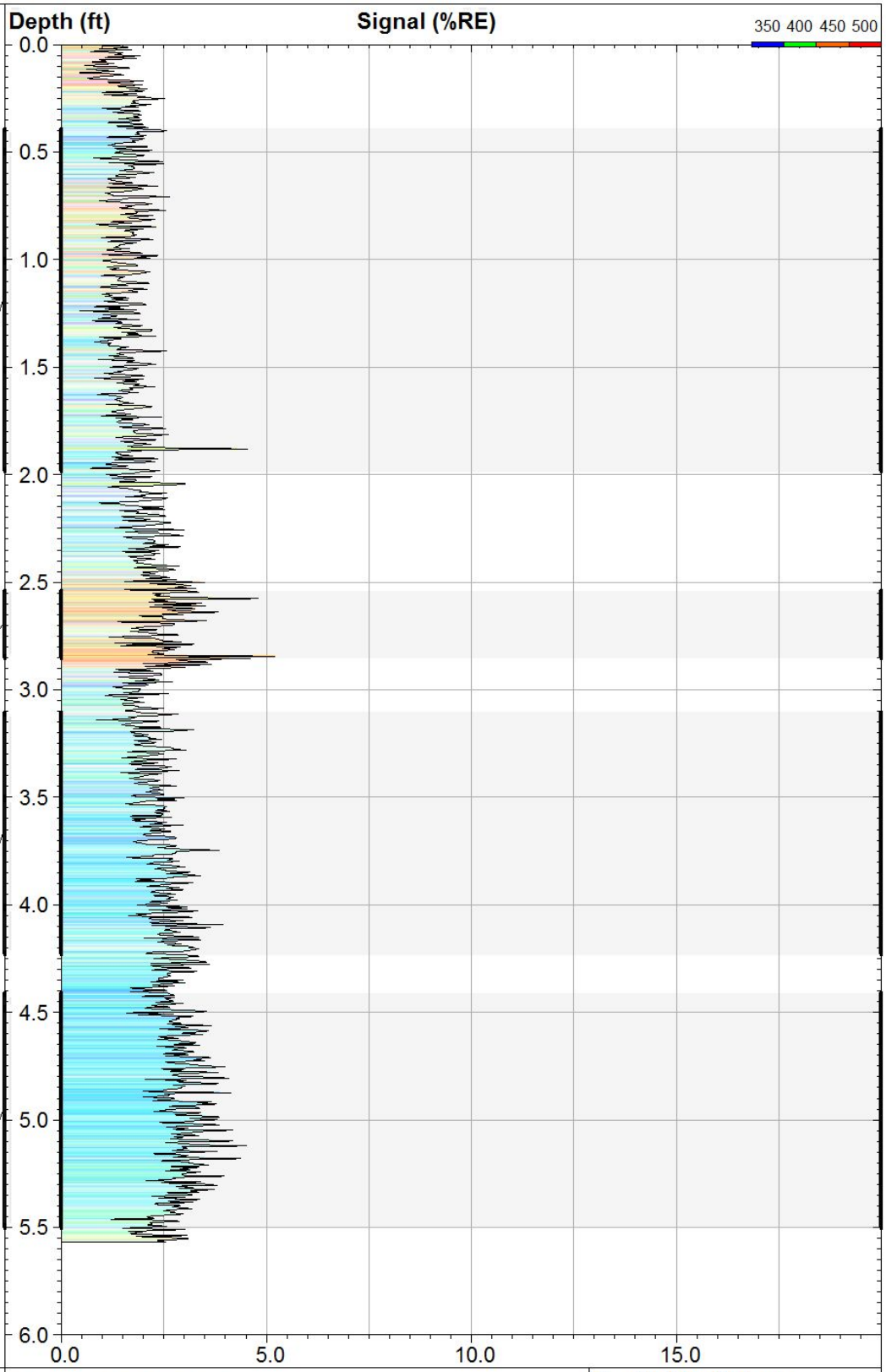
2.54 - 2.86 ft
2.6 %RE (s 0.8)



3.10 - 4.23 ft
2.4 %RE (s 0.5)



4.41 - 5.50 ft
2.9 %RE (s 0.6)



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E-290-DART

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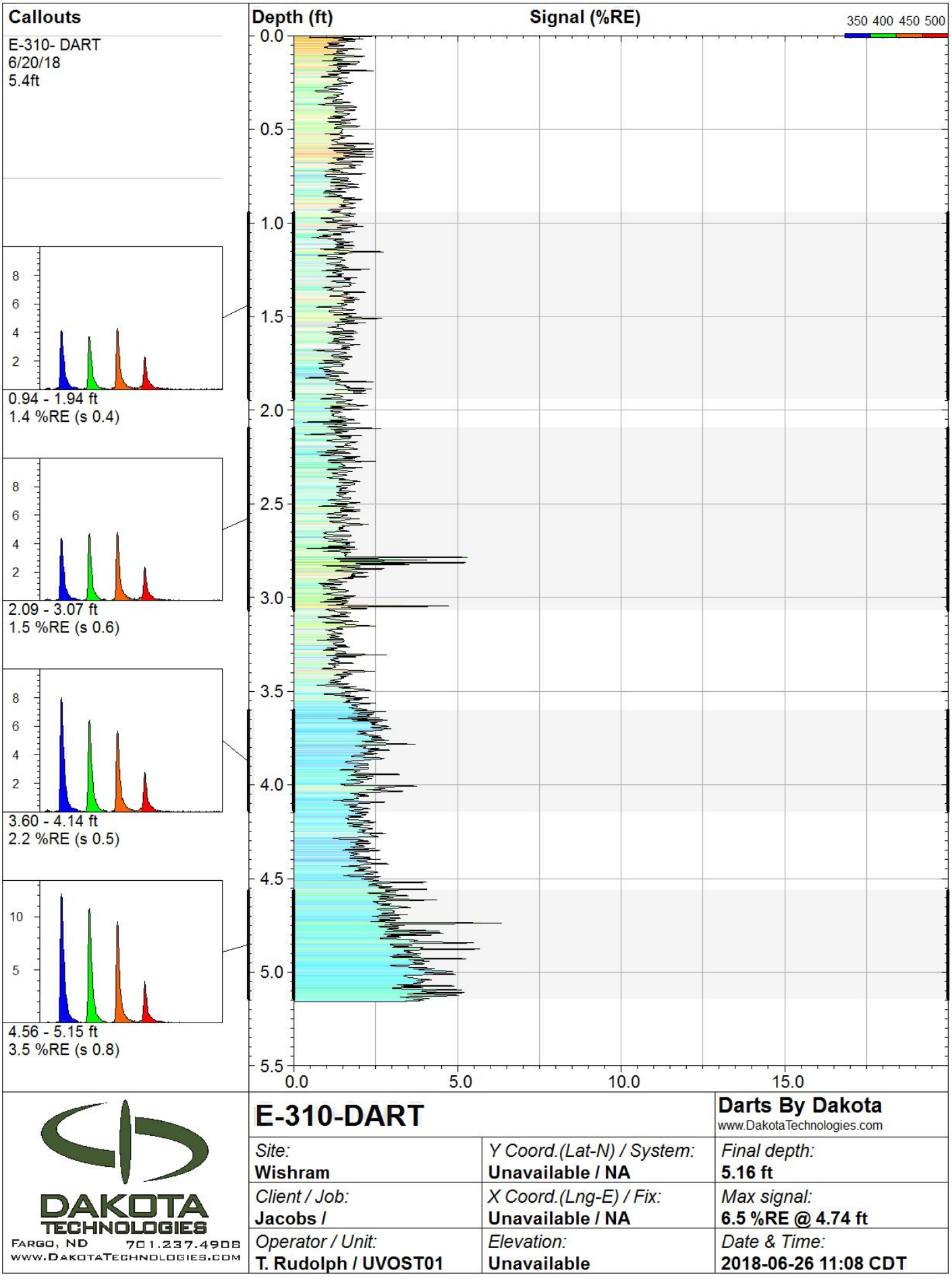
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.57 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.4 %RE @ 2.85 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 11:09 CDT**



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E-310-DART

Darts By Dakota
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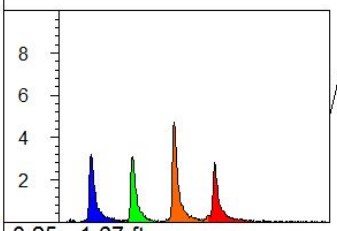
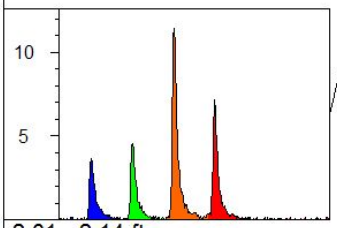
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.16 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.5 %RE @ 4.74 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 11:08 CDT**

Callouts

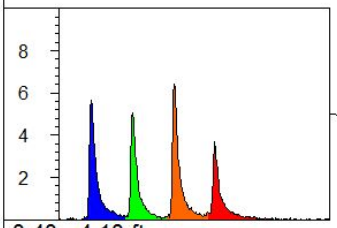
E-330- DART
6/20/18
5.3ft



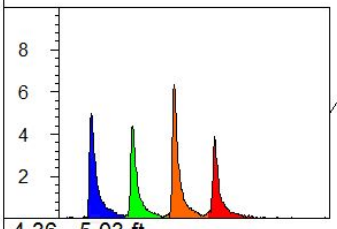
0.25 - 1.67 ft
1.7 %RE (s 0.6)



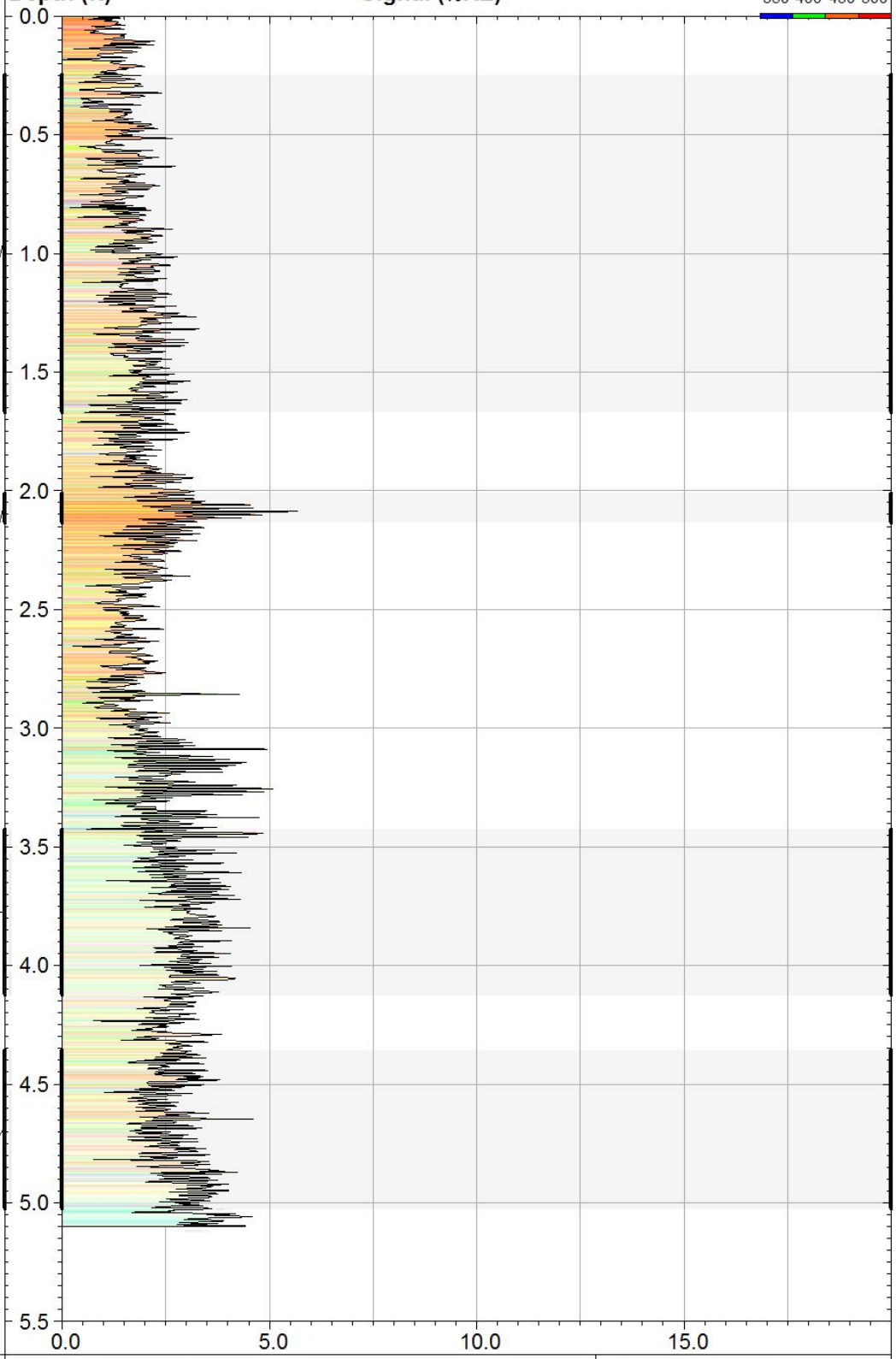
2.01 - 2.14 ft
3.0 %RE (s 1.1)



3.43 - 4.13 ft
2.9 %RE (s 0.8)



4.36 - 5.03 ft
2.7 %RE (s 0.7)



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E-330-DART

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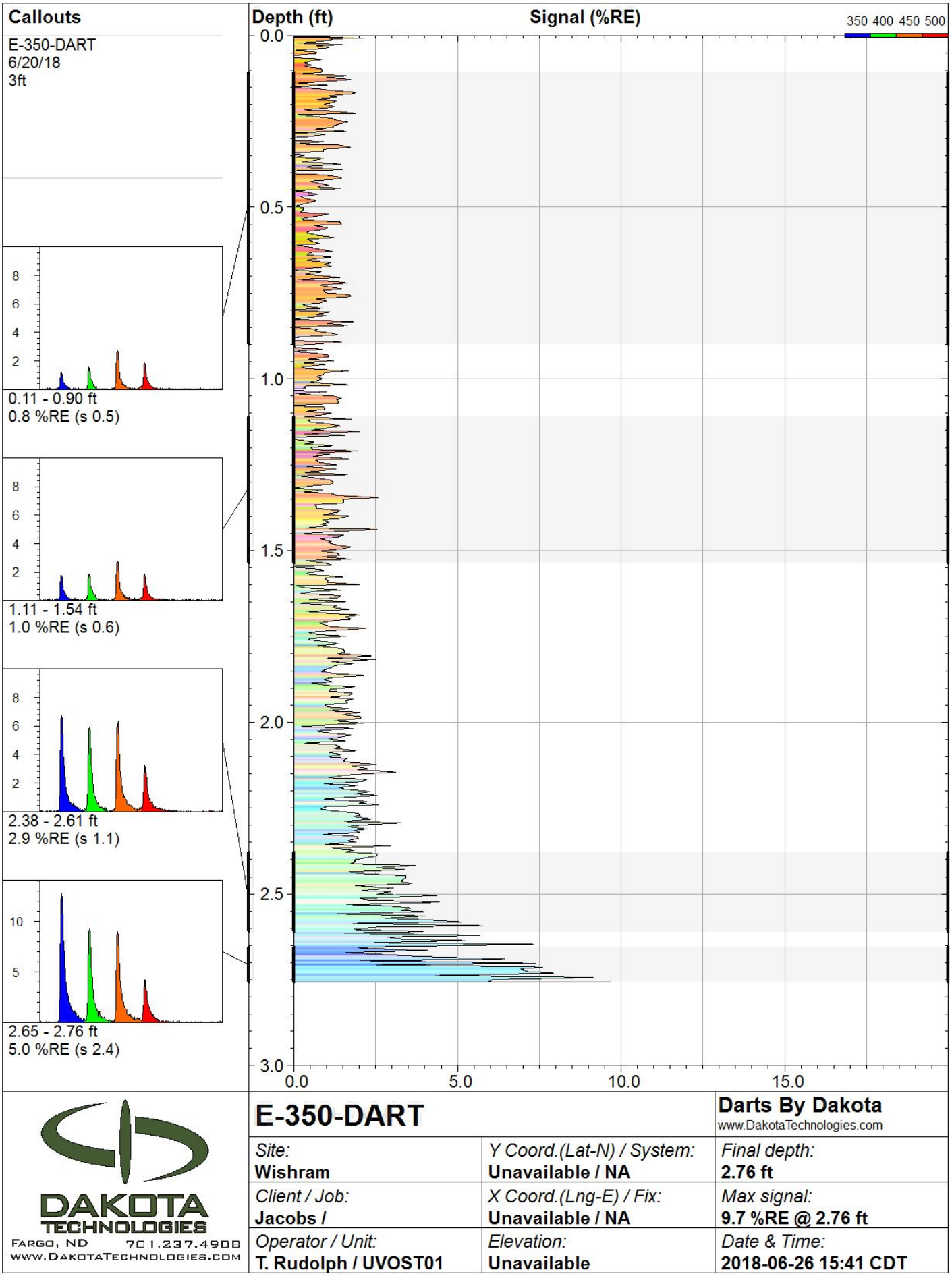
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.10 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.8 %RE @ 2.09 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 13:00 CDT**



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E-350-DART

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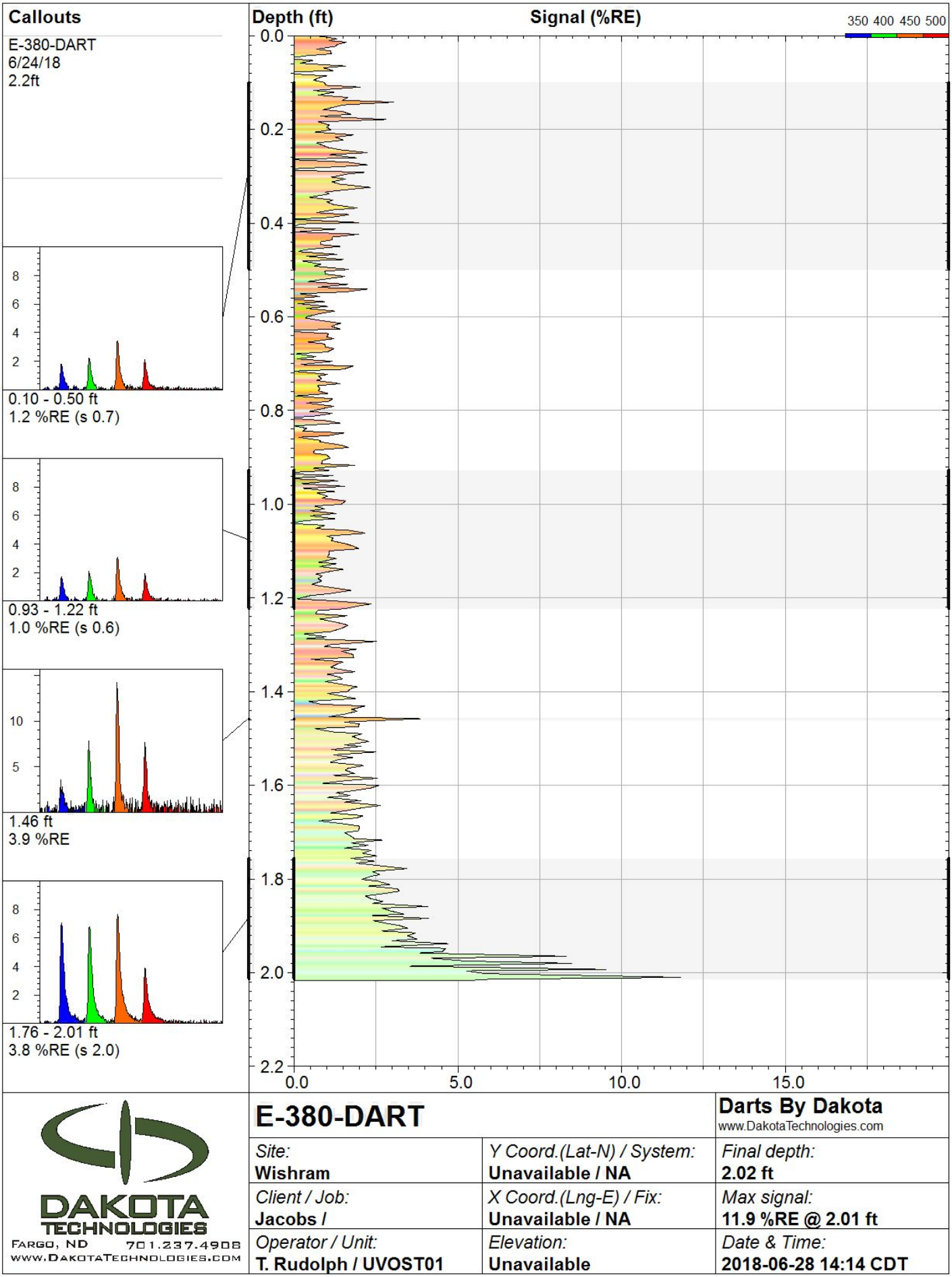
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.76 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **9.7 %RE @ 2.76 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-26 15:41 CDT**



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E-380-DART

Darts By Dakota
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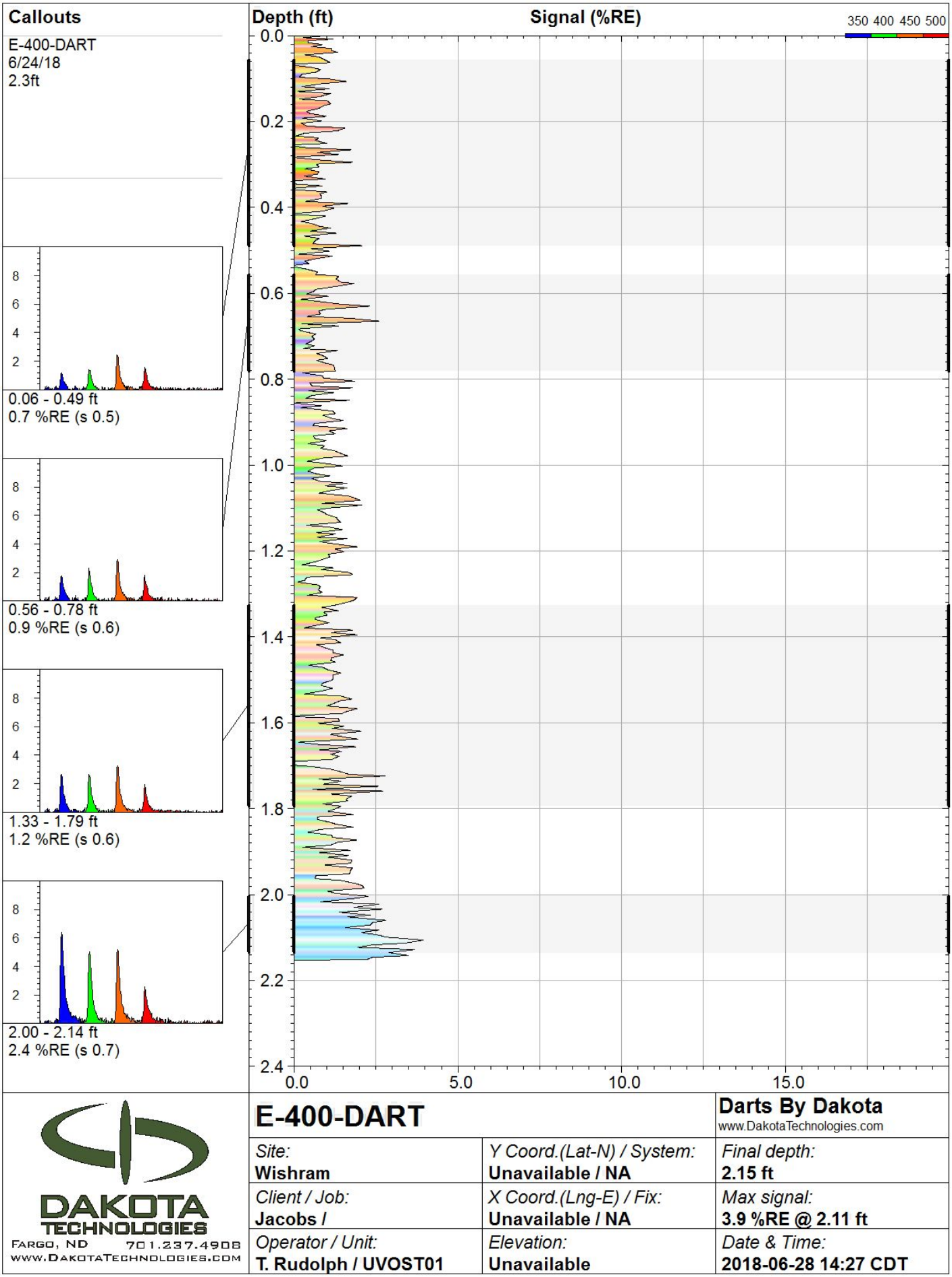
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.02 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **11.9 %RE @ 2.01 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 14:14 CDT**



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E-400-DART

Darts By Dakota
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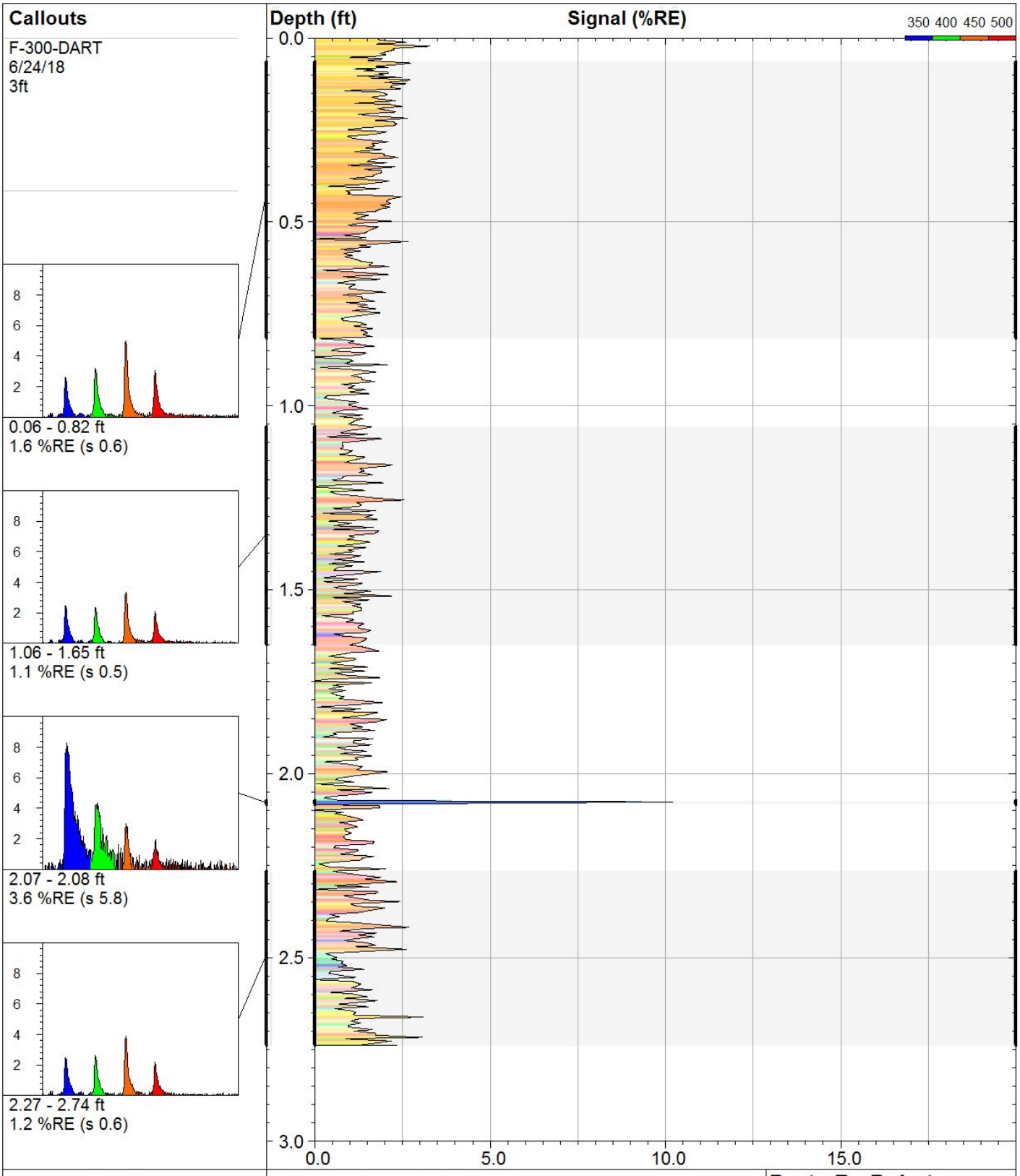
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.15 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.9 %RE @ 2.11 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 14:27 CDT**



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F-300-DART

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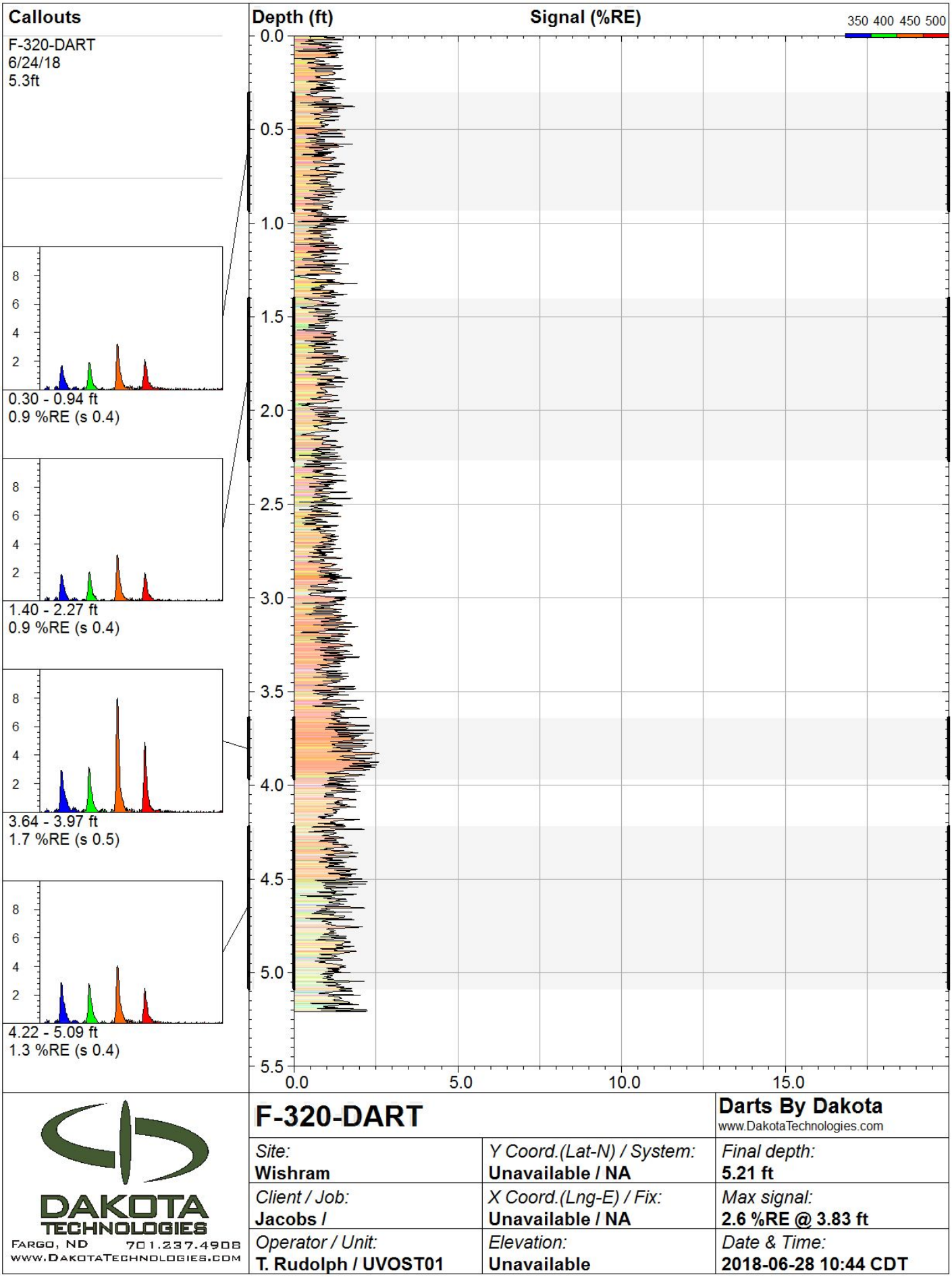
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.74 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **10.3 %RE @ 2.08 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 14:36 CDT**



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F-320-DART

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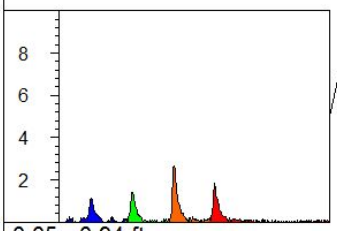
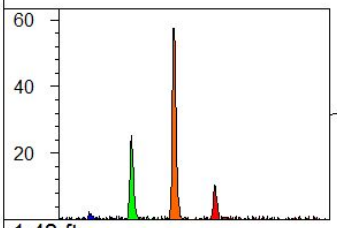
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **5.21 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **2.6 %RE @ 3.83 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 10:44 CDT**

Callouts

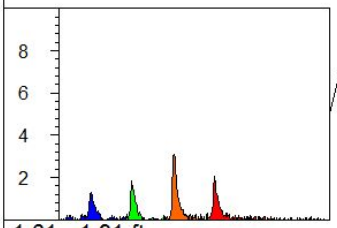
F-340-DART
6/24/18
3ft



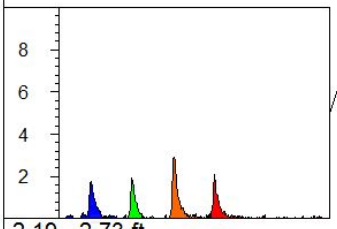
0.05 - 0.94 ft
0.8 %RE (s 0.5)



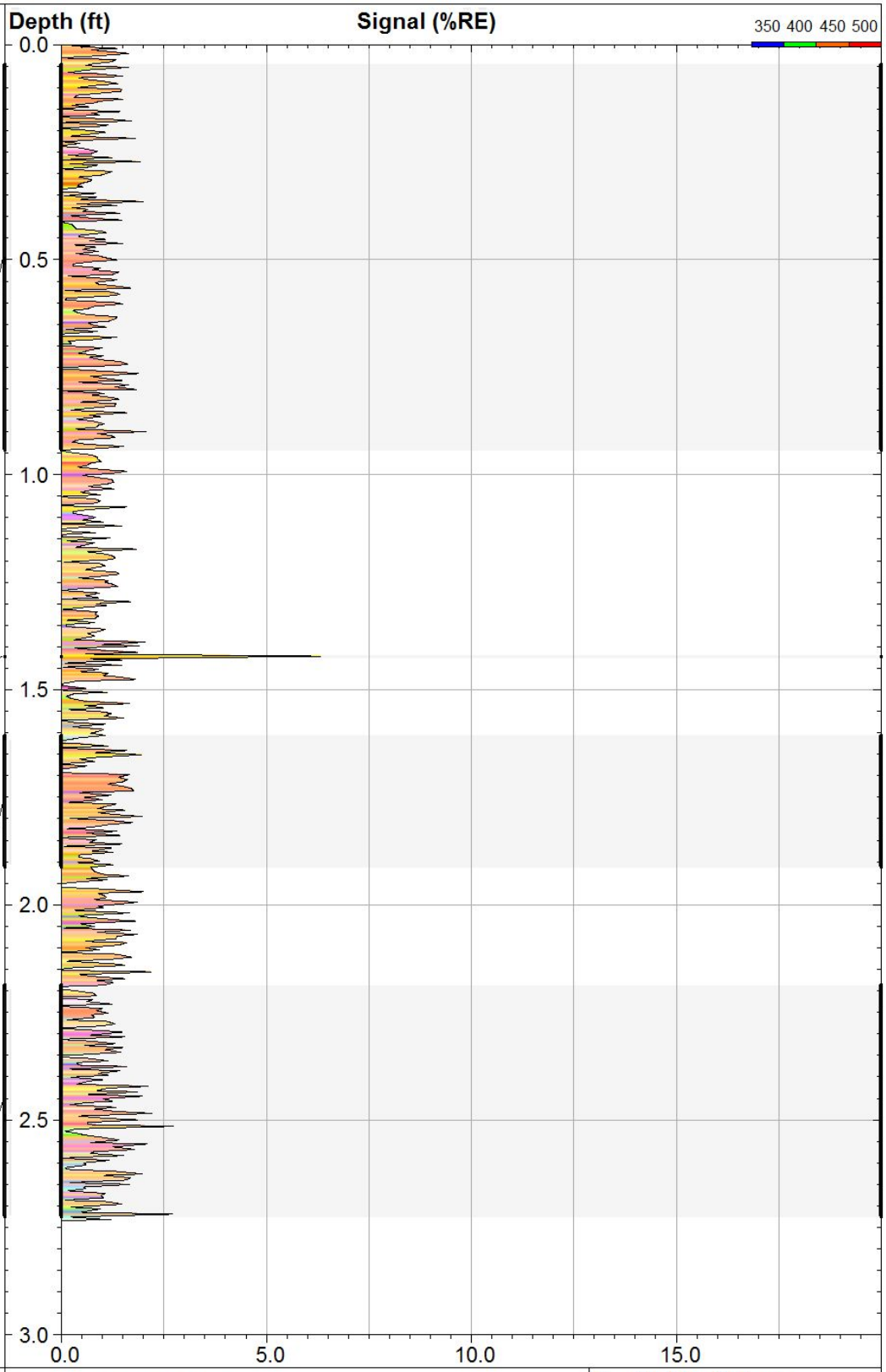
1.42 ft
6.5 %RE



1.61 - 1.91 ft
0.9 %RE (s 0.6)



2.19 - 2.73 ft
0.9 %RE (s 0.6)



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F-340-DART

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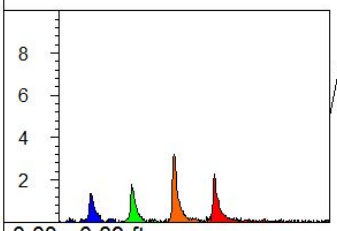
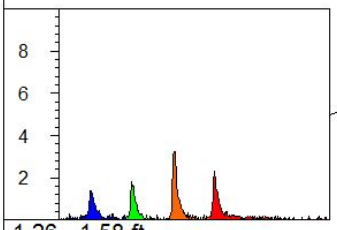
Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.73 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.5 %RE @ 1.42 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 15:01 CDT**

Callouts

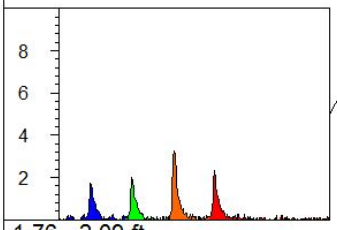
F-360-DART
6/24/18
3ft



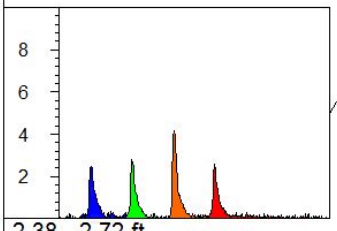
0.03 - 0.89 ft
1.0 %RE (s 0.6)



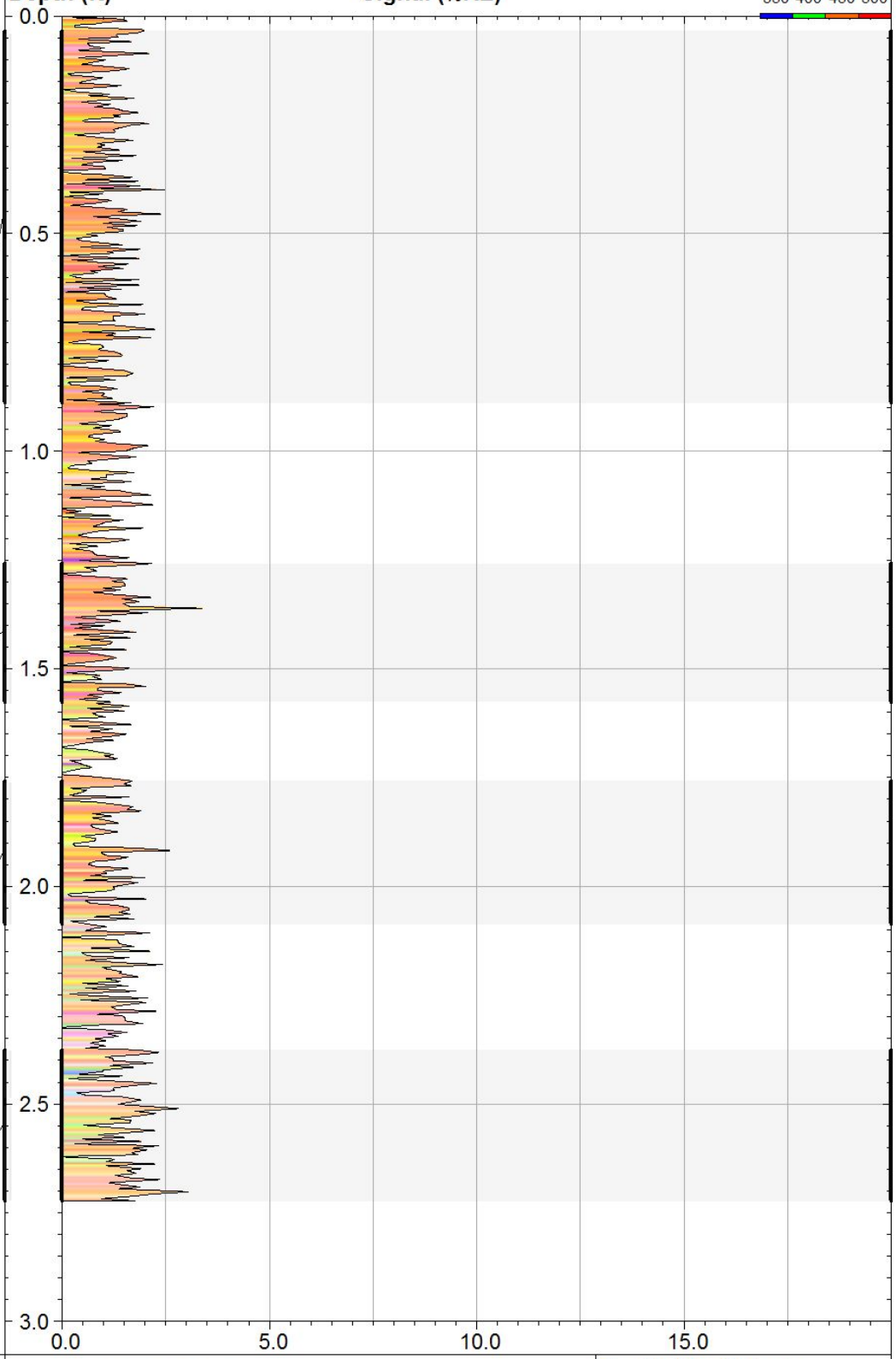
1.26 - 1.58 ft
1.1 %RE (s 0.7)



1.76 - 2.09 ft
1.1 %RE (s 0.6)



2.38 - 2.72 ft
1.5 %RE (s 0.6)



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F-360-DART

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Site: **Wishram**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **2.72 ft**
Client / Job: **Jacobs /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.4 %RE @ 1.36 ft**
Operator / Unit: **T. Rudolph / UVOST01**	*Elevation:* **Unavailable**	*Date & Time:* **2018-06-28 15:21 CDT**

Appendix B
Sediment Core Logs

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	D200	**Easting (X) (ft):**	1520546.37		**Attempt 1** **Refusal? Y/N**
Sampling:	Yes	**Northing (Y) (ft):**	118008.00	**Penetration (ft):**	7.0 ft bss
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	4.3 ft bss
		Depth (ft):	4.0	**Date/Time:**	8/7/2018
		Water Surface Elevation:	160.1		
		St. Arrival:	12:00		**Attempt 2** **Refusal? Y/N**
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	12:30	**Penetration (ft):**	
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**	
Collector Information:				**Date/Time:**	

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Silty sand	SW-SM	Olive gray	Well-graded	Non-cohesive		Wet	Fine-grained					0.0 / 0.0			Micaceous, roots/woody debris, chunks of rock chert/basalt 0-6" saturated cannot note consistency Collected surface grab sample "D200-GS-080718" for NWTPH Ox, EPH10 First 2-4" shells, woody debris, milfoil roots
0.5													0.0 / 0.0			
1													0.0 / 0.0			
1.5													0.0 / 0.0			
2													0.0 / 0.0			
2.5													0.0 / 0.0	A		Collected sediment sample from core for COD/TOC only at 16:40 core "D200-SC-080718"
3													0.0 / 0.0			
3.5													0.0 / 0.0			
4													0.0 / 0.0			
4.3													0.0 / 0.0			End of recovery 4.3 ft bss

Additional Notes/Comments: Sediment samples/cores collected in river below sediment surface

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
4.5																
5																
5.5																
6																
6.5																
7																
7.5																
8																
8.5																
9																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)													
D200-GS-080718		8/7/2018	0-0.5 ft													
D200-SC-080718-A		8/7/2018 16:40	3 ft													

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	F360	**Easting (X) (ft):**	1520713.94		**Attempt 1**	**Refusal? Y/N**	
Sampling:	Yes	**Northing (Y) (ft):**	117981.3	**Penetration (ft):**	6.4 ft bss		
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	3.9 ft bss		
		Depth (ft):	8.8	**Date/Time:**	8/8/2018		
		Water Surface Elevation:	162.3				
		St. Arrival:	7:30		**Attempt 2**	**Refusal? Y/N**	
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	8:30	**Penetration (ft):**			
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**			
Collector Information:				**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Sand	SW	Olive gray	Well-graded			dry	Fine-grained, >massive					0.0 / 0.0			Micaceous
0.5													0.0 / 0.0	A		Bi-valves present upper 6" - 1 ft Collect sample "F360-SC-080818-A" at 1310 for TOC and COD
1																
1.5													0.0 / 0.0			
2	Sandy silt	SM-SW	Olive gray		Increasing plasticity toward bottom		moist						0.0 / 0.0		free product observed throughout	Angular pebble, some woody debris present, free product observed throughout, greatest toward bottom of core,
2.5													0.0 / 3.6			
3													0.0 / 8.7			
3.5													0.0 / 14.3			Collect sample "F360-SC-080818" at 1315 TOC and COD
3.9													0.0 / 48.6			Most prevalent/ free product, few minor lenses of oxidation last 3" End of recovery at 3.9 ft bss
4																
5																

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5.5																
6																End of boring 6.0 ft bss
7																
7.5																
8																
8.5																
9																
9.5																
10																
10.5																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)													
F360-SC-080818-A		8/8/2018 13:10	0.5 ft													
F360-SC-080818		8/8/2018 13:15	3.9 ft													

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	F400 A (first 2 ft only) and F400B	**Easting (X) (ft):**	1520753.13		**Attempt 1**	**Refusal? Y/N**	
Sampling:	Yes	**Northing (Y) (ft):**	117980.18	**Penetration (ft):**	2.5 ft bss		
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	1.8 ft bss		
		Depth (ft):	9.1	**Date/Time:**	8/8/2018		
		Water Surface Elevation:	162.2				
		St. Arrival:	8:45		**Attempt 2**	**Refusal? Y/N**	
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	10:50	**Penetration (ft):**	10 ft bss		
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**	6.5 ft bss		
Collector Information:				**Date/Time:**	8/8/2018		

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Sand	SW	Olive gray	Well-graded			dry	Fine-grained	no odor				0.0 / 0.0		no staining	Micaceous, clean sand, no odor/staining, some gravel, cobbles present in upper 6", zebra muscles (?)/bivalves in 0-6"
																Woody debris present from ~0.5-2 ft
0.5													0.0 / 0.0			
																Collect sample "F400B-SC-080818-A" at 1 ft BSS for TOC/COD
1													0.0 / 0.0	A		
1.5													0.0 / 0.0			
2	Silty sand	SW-SM	Olive gray	Well-graded	Low plasticity		dry	Fine-grained	no odor				0.0 / 0.0		no staining	Micaceous, clean, no staining, no odor
2.5													0.0 / 0.0			
3													0.0 / 0.0			
3.5													0.0 / 0.0			
4													0.0 / 0.0			
4.5	Silt	SM	Olive gray		Increasing plasticity, non-cohesive		wet	Fine-grained					0.0 / 0.0			Increasing plasticity near bottom of interval
5													0.0 / 0.0	B		Collect sample "F400B-SC-080818-B" at 5 ft bss for TOC and COD

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5.5	Silty sand	SM-SW	Olive gray	Well-graded	Low plasticity		dry	Fine-grained					0.0 / 0.0			Micaceous, clean
6																
6.5													0.0 / 0.0			End of recovery 6.5 ft bss
7																
7.5																
8																
8.5																
9																
9.5																
10																End of boring 10 ft bss

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)
F400B-SC-080818-A		8/8/2018 11:55	1 ft
F400B-SC-080818-B		8/8/2018 12:00	5 ft

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID: G200	**Easting (X) (ft):** 1520554.09			**Attempt 1**	**Refusal? Y/N**
Sampling: Yes	**Northing (Y) (ft):** 117949.19	**Penetration (ft):**	6.9 ft bss		
Crew/Company: Gravity	**Datum:** NAVD88	**Recovery (ft):**	4.3 ft bss		
	Depth (ft): 10.2	**Date/Time:**	8/7/2018		
	Water Surface Elevation: 160.1				
	St. Arrival: 15:00			**Attempt 2**	**Refusal? Y/N**
Vessel: 26-foot aluminum flat-bottom w/3 spuds	**St. Depart:** 15:20	**Penetration (ft):**			
Collection: Direct-Push (Power Pro 9100 P)	**Logged by:** J. Ulrich	**Recovery (ft):**			
Collector Information:		**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0.5	Silty sand	SW-SM	Olive gray	Well-graded	Non-cohesive		Moist	Fine-grained					0.7			Strong petro odor when casing brought to surface, small marks of smeared product like (smell, etc.) substance on outside of casing Bi-valves present in upper 0-6", micaceous
1													1.3			
1.5																
2																
2.5	Silt with sand	SM	Dark gray with black staining		High plasticity			Fine-grained								Some woody debris, distinct free product throughout, often in "roots" and finer woody strains/debris, much less debris than G260 location
3																
3.5														A		
4																Broken glass jar and metal lid observed at 4.2 feet
4.3																End of recovery at 4.3 ft BSS
4.5																

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5																
5.5																
6																
6.9																End of boring at 6.9 ft BSS
7																
8																
8.5																
9																
9.5																
10																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)													
G200-GS-080718		8/7/2018 18:50	0.5													
G200-SC-080718-A		8/7/2018 18:40	3.5													

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID: G260	**Easting (X) (ft):** 1520611.41			**Attempt 1**	**Refusal? Y/N**
Sampling: Yes	**Northing (Y) (ft):** 117951.16	**Penetration (ft):**	7.0 ft bss		
Crew/Company: Gravity	**Datum:** NAVD88	**Recovery (ft):**	4.25 ft bss		
	Depth (ft): 10.2	**Date/Time:**	8/7/2018		
	Water Surface Elevation: 160.1				
	St. Arrival: 14:00			**Attempt 2**	**Refusal? Y/N**
Vessel: 26-foot aluminum flat-bottom w/3 spuds	**St. Depart:** 14:15	**Penetration (ft):**			
Collection: Direct-Push (Power Pro 9100 P)	**Logged by:** J. Ulrich	**Recovery (ft):**			
Collector Information:		**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0 0.5 1 1.5	Silty sand	SW-SM	Olive gray	Well-graded	Non-cohesive		Damp	Fine-grained					0.0 / 0.1 0.0 / 0.5 0.0 / 0.3			Recovered 4.25 ft of material, petro odor noted when casing brought to surface micaceous, zebra (?) muscles at 1st 1-4"
2 2.5 3 3.5 4 4.25	Silt with sand	SM	Dark gray-black staining		High plasticity increasingly stiff near bottom (last 6")			Fine-grained					0.0 / 2.8 0.0 / 23.2 0.2 / 98.7 0.5 / 101.99 0.4 / 114.9		Free product	Distinct lithology change /contamination present down in woody debris, dark gray-black staining particularly in woody debris, present throughout, black iridescent free product most notable in woody debris End of recovery 4.25 ft bss

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
4.5																
5																
5.5																
6																
6.5																
7																End of boring at 7.0 ft BSS
7.5																
8																
8.5																
9																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)
G260-GS-080718		8/7/2018 18:00	0-0.5
G260-SC-080718-A		8/7/2018 17:25	3.5
G260-SC-080718-A-1		8/7/2018 17:30	3.5
G260-SC-080718-B		8/7/2018 17:10	4

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	I400	**Easting (X) (ft):**	1520760.93		**Attempt 1**	**Refusal? Y/N**	
Sampling:	Yes	**Northing (Y) (ft):**	117914.32	**Penetration (ft):**	7.8 ft bss		
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	5.8 ft bss		
		Depth (ft):	18.0	**Date/Time:**	8/9/2018		
		Water Surface Elevation:	162.3				
		St. Arrival:	8:50		**Attempt 2**	**Refusal? Y/N**	
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	9:22	**Penetration (ft):**			
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**			
Collector Information:				**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Sand	SP	Olive gray-olive	Poorly-graded	Non-cohesive		Moist	Fine-grained	No odor				0.0 / 0.0		No staining	Clean sand, micaceous, no odor/staining 0-0.5 ft bss grab sample "I400-GS-08"
0.5													0.0 / 0.0			
1													0.0 / 0.0			
1.5													0.0 / 0.0			Same as above, bivalves and minor "roots"/organic matter
2		SP											0.0 / 0.0			
2.5	Silty sand	SM	dark gray	Soft	non-cohesive	discontinuous	moist						0.0 / 0.0	A		Darker/ stiff/ brittle silt-rich section, slightly cemented from 2.5-2.9 ft bss, Core sample at 2.5 ft bss
3	Sand	SP		Poorly-graded				Fine-grained					0.0 / 0.0			Transitions back to poorly-graded, fine-grained micaceous sand
3.5													0.0 / 0.0			
4													0.0 / 0.0			
4.5													0.0 / 0.0			

Additional Notes/Comments: Field team indicates penetration depth of 5.8 ft bss, with observation of recovery to 7.8 ft bss (expansion/vacuuming up additional when retrieving) ? Did not see same recovery in core when logging

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5													0.0 / 0.0			
5.5	Gravel	GW		Well-graded									0.0 / 0.0			Gravel, sub-rounded - well-rounded pebbles and river rock up to 2.5 in diameter
5.8														B		Core sample at bottom End of recovery at 5.8 ft BSS
6																
6.5																
7																
7.8																End of boring at 7.8 ft BSS
8																
8.5																
9																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)
I400-GS-08		8/9/2018 10:00	0-0.5
I400-SC-080918-A		8/9/2018 10:15	2.5
I400-SC-080918-B		8/9/2018 11:00	5.8

Reviewed by: DF Date: 12/20/2018

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	J260	**Easting (X) (ft):**	1520614.66		**Attempt 1**	**Refusal? Y/N**	
Sampling:	Yes	**Northing (Y) (ft):**	117891.71	**Penetration (ft):**	7.4 ft bss		
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	5.4 ft bss		
		Depth (ft):	14.7	**Date/Time:**	8/8/2018		
		Water Surface Elevation:	161.9				
		St. Arrival:	13:32		**Attempt 2**	**Refusal? Y/N**	
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	14:15	**Penetration (ft):**			
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**			
Collector Information:				**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Sand	SW / SW-SM	Olive gray / dark brown	Well sorted	Cemented silty sand			Fine-grained	Light to no odor				0.0 / 0.0			Micaceous, bivalve in upper 3-4", transitions to heavily rooted with dense cementation around "root" structures
0.5	Silty sand	SM		Med. density	Low plasticity, decreasing plasticity	Lacking structure / turbation (bio?)			Light to no odor				0.0 / 3.6		Dark black NAPL, iridescent, very tacky	Micaceous, "roots"/organic matter, NAPL present, particularly in organic matter clusters, increasing sand content at bottom 4"
1													0.0 / 26.8			
1.5													0.0 / 20.8			
2									Strong petro like odor				0.0 / 15.1			
2.5													0.0 / 79.3			core sampled at 2.5 ft bss
3													0.0 / 62.4			
3.5													0.0 / 23.2 0.0 / 72.5			
4	Sand	SW	Olive gray	Well graded, dense					No odor				0.0 / 18.4		No staining	Micaceous, laminar, minor small "roots"/ organic debris, no staining / no odor
4.5													0.0 / 15.3			

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5													0.0 / 4.0			
5.4													0.0 / 2.2			End of recovery 5.4 ft bss
6																
6.5																
7																
7.4																End of boring @ 7.4 ft bss
8																
8.5																
9																
9.5																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)	
J260-GS-080818		8/8/2018 17:40	0-0.5	
J260-SC-080818-A		8/8/2018 17:45	2.5	

Reviewed by: DF Date:

JACOBS®

Site Name: BNSF Track Switching Facility
Project Number: 693282
Project Location: Wishram, WA
Survey Duration:

Station ID:	K120	**Easting (X) (ft):**	1520484.45		**Attempt 1**	**Refusal? Y/N**	
Sampling:	Yes	**Northing (Y) (ft):**	117855.27	**Penetration (ft):**	5.4 ft bss		
Crew/Company:	Gravity	**Datum:**	NAVD88	**Recovery (ft):**	3.7 ft bss		
		Depth (ft):	18.9	**Date/Time:**	8/8/2018		
		Water Surface Elevation:	161.7				
		St. Arrival:	14:45		**Attempt 2**	**Refusal? Y/N**	
Vessel:	26-foot aluminum flat-bottom w/3 spuds	**St. Depart:**	15:18	**Penetration (ft):**			
Collection:	Direct-Push (Power Pro 9100 P)	**Logged by:**	J. Ulrich	**Recovery (ft):**			
Collector Information:				**Date/Time:**			

Note: Location Coordinates reference NAD 83 WA South State Plane

Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
0	Sand	SW	Olive gray	Well-graded			dry	Fine-grained, massive					0.0 / 0.0			Collect surface grab sample, "K120-GS-080818" at 0-6" at 1640 oxidized zone about 3-6" bss, med. orangish/brown, bivalves present in upper 1 ft
0.5													0.0 / 0.0			
1.1		SW					moist									Same as above but with inclusion of black, high plasticity silt/clay lens discontinuous ~2-3". Does not exhibit on sides of core
1.5																
2													0.0 / 0.2	A		Sandy/silt intrusion, low plasticity at 2.3-2.5 ft
2.5																
3																
3.5		SW														Collect core sample "K120-SC-080818-A" at 1655 Same as above with minimal organic debris
3.7													0.0 / 0.0			Same as above, compact/dense sand at bottom 3" End of recovery at 3.7 ft bss
4.5																

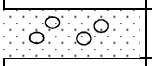
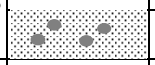
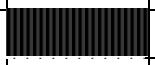
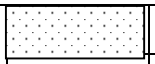
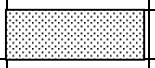
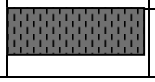
Depth below mudline (ft)	Lithology	Type	Color (Munsell)	Consistency/ Density	Cementation/ Plasticity	Structure	Moisture Content	Maximum particle size	Odor	% gravel	% sand	% fines	Breathing Zone / Headspace PID Reading (ppm)	Sample IDs (Single Letter)	Evidence of Contamination	Comments
5																
5.4																End of boring 5.4 ft bss
6																
6.5																
7																
7.5																
8																
8.5																
9																
9.5																

Sample Summary (check boxes for analysis):

Sample ID	Sample Type (N/FD/MSD)	Sample Date/Time	Depth Interval (ft)												
K120-GS-080818		8/8/2018 16:40	0-0.5 ft												
K120-SC-080818-A		8/8/2018 16:55	3.4												

Reviewed by: DF Date: 12/20/2018

Sediment Core Log Key

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	DESCRIPTION
COARSE-GRAINED MATERIAL	GRAVELS	CLEAN GRAVELS		GW	Well-graded gravel Well-graded gravel with sand
				GP	Poorly graded gravel Poorly graded gravel with sand
		GRAVELS WITH FINES		GW-GM	Well-graded gravel with silt Well-graded gravel with silt and sand
				GW-GC	Well-graded gravel with clay Well graded gravel with clay and sand
				GP-GM	Poorly graded gravel with silt Poorly graded gravel with silt and sand
				GP-GC	Poorly graded gravel with clay Poorly graded gravel with clay and sand
				GM	Silty gravel Silty gravel with sand
				GC	Clayey gravel Clayey gravel with sand
	SANDS	CLEAN SANDS		SW	Well-graded sands Well-graded sand and gravel
				SP	Poorly-graded sands Poorly graded sand with gravel
		SANDS WITH FINES		SW-SM	Well-graded sand with silt Well-graded sand with silt and gravel
				SW-SC	Well-graded sand with clay Well-graded sand with clay and gravel
				SP-SM	Poorly-graded sand with silt Poorly-graded sand with silt and gravel
				SP-SC	Poorly-graded sand with clay Poorly-graded sand with clay and gravel
				SM	Silty sand Silty sand and with gravel
				SC	Clayey sand Clayey sand and with gravel
FINE-GRAINED MATERIALS	SILTS AND CLAYS			CL	Lean clay * Lean clay with sand or gravel * Sandy lean clay * Sandy lean clay with gravel * Gravelly lean clay * Gravelly lean clay with sand
				ML	Silt * Silty with sand or gravel * Sandy silt * Sandy silt with gravel * Gravelly silt * Gravelly silt with sand
				CH	Fat clay * Fat clay with sand or gravel * Sandy fat clay * Gravelly fat clay * Gravelly fat clay with sand
				MH	Elastic silt * Elastic silt with sand or gravel * Sandy elastic silt * Sandy elastic silt with gravel * Gravelly elastic silt * Gravelly elastic silt with sand
				OL/OH	Organic silt * Organic silt with sand or gravel * Sandy organic silt * Sandy organic soil with gravel * Gravelly organic soil * Gravelly organic soil with sand

Well Graded (Engineering) = Poorly Sorted (Geological) = grains of all different sizes mixed together

Poorly Graded (Engineering) = Well Sorted (Geological) = grains are all same size

Shell hash

Peat/organic matter

CONSISTENCY
Penetration of thumb:
<0.25 cm = hard (H)
0.25 - 2.0 cm = firm (F)
2.0 - 4.0 cm = soft (S)
>4.0 cm = very soft (VS)

CEMENTATION
N = not cemented
W = weakly cemented
M = Moderately cemented
S = Strongly cemented

STRUCTURE
H = Homogeneous
S = Stratified
L = Laminated
M = Mottled

COLOR
from Munsell chart

MAXIMUM PARTICLE SIZE
SC = Small Cobble
CP = Coarse Pebble
MP = Medium Pebble
SP = Small Pebble
CS = Coarse Sand
MS = Medium Sand
FS = Fine Sand
VFS = Very Fine Sand
Z = Silt

SA = Sub-angular
VA = Very angular

ODOR
N = None
UNC = Unclassified
S = Sulfur-like
T = Tar-like
PHC = Petroleum hydrocarbon-like

Quantifying Descriptors
Strong
Moderate
Faint

Moisture Content
Wet
Moist
Dry

VISIBLE CONTAMINATION DESCRIPTORS

which can be distinguished by its tendency to break up on the water surface at angles whereas petroleum sheen will be continuous and will not break up.

the soil.

Coated - soil grains are coated with free product – there is not sufficient free-phase material present to saturate the pore spaces.

Blebs - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically this is residual product.

Saturated - the entirety of the pore space for a sample is saturated with NAPL. Care should be taken to ensure that you're not observing water saturating the pore spaces if you use this term. Depending on viscosity, free-phase saturated materials may freely drain from a soil sample.

Appendix C
Laboratory Analytical Reports

STAT Analysis Corporation
2242 West Harrison St., Suite 200, Chicago, IL 60612-3766
Tel: (312) 733-0551 Fax: (312) 733-2386 STATinfo@STATAnalysis.com
Accreditations: IEPA ELAP 100445; ORELAP IL300001; AIHA-LAP, LLC 101160; NVLAP LabCode 101202-0

September 05, 2018

CH2M Hill
2020 SW 4th Avenue
Portland, OR 97201
Telephone:
Fax: (503) 736-2063

Analytical Report for STAT Work Order: 18080529 Revision 0

RE: 693282, BNSF-Wishram, Wishram, WA

Dear Carrie Andrews:

STAT Analysis received 26 samples for the referenced project on 8/14/2018 12:02:00 PM. The analytical results are presented in the following report.

All analyses were performed in accordance with methods as referenced on the analytical report. Those analytical results expressed on a dry weight basis are also noted on the analytical report.

Thank you for the opportunity to serve you and I look forward to working with you in the future. If you have any questions regarding the enclosed materials, please contact me at (312) 733-0551.

Sincerely,

Craig Chawla
Project Manager

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA
Work Order: 18080529 Revision 0

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date	Date Received
18080529-001A	D240-GS-080618		8/6/2018 2:50:00 PM	8/14/2018
18080529-002A	D260-GS-080618		8/6/2018 3:30:00 PM	8/14/2018
18080529-003A	D420-GS-080618		8/6/2018 4:55:00 PM	8/14/2018
18080529-004A	D150-GS-080718		8/7/2018 7:30:00 AM	8/14/2018
18080529-005A	D220-GS-080718		8/7/2018 7:55:00 AM	8/14/2018
18080529-006A	BG-US01-080718		8/7/2018 8:50:00 AM	8/14/2018
18080529-007A	D200-GS-080718		8/7/2018 12:30:00 PM	8/14/2018
18080529-008A	D200-SC-080718-A		8/7/2018 4:40:00 PM	8/14/2018
18080529-009A	G260-SC-080718-A		8/7/2018 5:25:00 PM	8/14/2018
18080529-010A	G260-SC-080718-A-1		8/7/2018 5:30:00 PM	8/14/2018
18080529-011A	G260-SC-080718-B		8/7/2018 5:10:00 PM	8/14/2018
18080529-012A	G260-GS-080718		8/7/2018 6:00:00 PM	8/14/2018
18080529-013A	G200-GS-080718		8/7/2018 6:50:00 PM	8/14/2018
18080529-014A	G200-SC-080718		8/7/2018 6:40:00 PM	8/14/2018
18080529-015A	F400B-SC-080818-A		8/8/2018 11:55:00 AM	8/14/2018
18080529-016A	F400B-SC-080818-B		8/8/2018 12:00:00 PM	8/14/2018
18080529-017A	F360-SC-080818-A		8/8/2018 1:10:00 PM	8/14/2018
18080529-018A	F360-SC-080818-B		8/8/2018 1:15:00 PM	8/14/2018
18080529-019A	K120-GS-080818		8/8/2018 4:40:00 PM	8/14/2018
18080529-020A	K120-SC-080818-A		8/8/2018 4:55:00 PM	8/14/2018
18080529-021A	J260-GS-080818		8/8/2018 5:40:00 PM	8/14/2018
18080529-022A	J260-SC-080818-A		8/8/2018 5:45:00 PM	8/14/2018
18080529-023A	I400-GS-080918		8/9/2018 10:00:00 AM	8/14/2018
18080529-024A	I400-SC-080918-A		8/9/2018 10:10:00 AM	8/14/2018
18080529-025A	I400-SC-080918-B		8/9/2018 10:15:00 AM	8/14/2018
18080529-026A	Unlabeled Bag		8/9/2018 11:00:00 AM	8/14/2018

STAT Analysis Corporation

Date: *September 05, 2018*

CLIENT: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA
Work Order: 18080529 Revision 0

CASE NARRATIVE

The soil samples in this work order were analyzed for COD by preparing a suspension of 1 gram in 10 mL of lab grade water. The samples were mixed using a stir bar and magnetic mixer. Results are expressed on an as received basis.

STAT Analysis Corporation
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Accreditations:IEPA ELAP 100445;ORELAP IL300001;AIHA-LAP, LLC 101160;NVLAP LabCode 101202-0

Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-001 **Collection Date:** 8/6/2018 2:50:00 PM
Client Sample ID: D240-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	ND	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-002 **Collection Date:** 8/6/2018 3:30:00 PM
Client Sample ID: D260-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-003 **Collection Date:** 8/6/2018 4:55:00 PM
Client Sample ID: D420-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-004 **Collection Date:** 8/7/2018 7:30:00 AM
Client Sample ID: D150-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-005 **Collection Date:** 8/7/2018 7:55:00 AM
Client Sample ID: D220-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-006 **Collection Date:** 8/7/2018 8:50:00 AM
Client Sample ID: BG-US01-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-007 **Collection Date:** 8/7/2018 12:30:00 PM
Client Sample ID: D200-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-008 **Collection Date:** 8/7/2018 4:40:00 PM
Client Sample ID: D200-SC-080718-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	350	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-009 **Collection Date:** 8/7/2018 5:25:00 PM
Client Sample ID: G260-SC-080718-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-010 **Collection Date:** 8/7/2018 5:30:00 PM
Client Sample ID: G260-SC-080718-A-1 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- HT - Sample received past holding time
- * - Non-accredited parameter
- RL - Reporting / Quantitation Limit for the analysis
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-011 **Collection Date:** 8/7/2018 5:10:00 PM
Client Sample ID: G260-SC-080718-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-012 **Collection Date:** 8/7/2018 6:00:00 PM
Client Sample ID: G260-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-013 **Collection Date:** 8/7/2018 6:50:00 PM
Client Sample ID: G200-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-014 **Collection Date:** 8/7/2018 6:40:00 PM
Client Sample ID: G200-SC-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-015 **Collection Date:** 8/8/2018 11:55:00 AM
Client Sample ID: F400B-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- HT - Sample received past holding time
- * - Non-accredited parameter
- RL - Reporting / Quantitation Limit for the analysis
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-016 **Collection Date:** 8/8/2018 12:00:00 PM
Client Sample ID: F400B-SC-080818-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-017 **Collection Date:** 8/8/2018 1:10:00 PM
Client Sample ID: F360-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	480	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-018 **Collection Date:** 8/8/2018 1:15:00 PM
Client Sample ID: F360-SC-080818-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-019 **Collection Date:** 8/8/2018 4:40:00 PM
Client Sample ID: K120-GS-080818 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-020 **Collection Date:** 8/8/2018 4:55:00 PM
Client Sample ID: K120-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-021 **Collection Date:** 8/8/2018 5:40:00 PM
Client Sample ID: J260-GS-080818 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-022 **Collection Date:** 8/8/2018 5:45:00 PM
Client Sample ID: J260-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-023 **Collection Date:** 8/9/2018 10:00:00 AM
Client Sample ID: I400-GS-080918 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	ND	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-024 **Collection Date:** 8/9/2018 10:10:00 AM
Client Sample ID: I400-SC-080918-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-025 **Collection Date:** 8/9/2018 10:15:00 AM
Client Sample ID: I400-SC-080918-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

STAT Analysis Corporation

2242 W. Harrison Suite 200, Chicago, Illinois 60612 Phone: (312) 733-0551 Fax: (312) 733-2386
e-mail address: STATinfo@STATAnalysis.com

WD

CHAIN OF CUSTODY RECORD **Nº: 917130** **Page: 1 of 2**

Company: CH2M JACOBS
Project Number: 693282 Client Tracking No.:
Project Name: BNSF-Wishram
Project Location: Wishram, WA
Sampler(s): Jennifer Ulrich
Report To: Carrie Andrews Phone: 503 348 9500
Barr-JUB Fax:
QC Level: 1 ___ 2 ___ 3 ___ 4 ___ e-mail: carrie.andrews@jacobs.com

Quote No.:
P.O. No.:
Turn Around Time (Days): 1 2 3 4 5-7 10
Results Needed: / / am/pm

Client Sample Number/Description:	Date Taken	Time Taken	Matrix	Comp.	Grab	Preserv.	No. of Containers		Additional Information:	Lab No.:
D240-GS-080618	8/6/18	1450	SS		X		1	1		001
D260-GS-080618	8/6/18	1530	SS		X		1	1		002
D420-GS-080618	8/6/18	1655	SS		X		1	1		003
D150-GS-080718	8/7/18	0730	SS		X		1	1		004
D220-GS-080718	8/7/18	0758	SS		X		1	1		005
BG-US01-080718	8/7/18	0850	SS		X		1	1		006
D200-GS-080718	8/7/18	1230	SS		X		1	1		007
D200-SC-080718-A	8/7/18	1640	SS		X		1	1		008
G260-SC-080718-A	8/7/18	1725	SS		X		1	1		009
G260-SC-080718-A-1	8/7/18	1730	SS		X		1	1		010
G260-SC-080718-B	8/7/18	1710	SS		X		1	1		011
G260-GS-080718	8/7/18	1800	SS		X		1	1		012
G200-GS-080718	8/7/18	1850	SS		X		1	1		013
G200-SC-080718	8/7/18	1840	SS		X		1	1		014
F400B-SC-080818-A	8/8/18	1155	SS		X		1	1		015
F400B-SC-080818-B	8/8/18	1200	SS		X		1	1		016
F360-SC-080818-A	8/8/18	1310	SS		X		1	1		017
F360-SC-080818-B	8/8/18	1315	SS		X		1	1		018
K120-GS-080818	8/8/18	1640	SS		X		1	1		019
K120-SC-080818-A	8/8/18	1655	SS		X		1	1		020

Relinquished by: (Signature) Jennifer Ulrich Date/Time: 8/13/18 1200
Received by: (Signature) 782280849754 Date/Time:
Relinquished by: (Signature) FedEX Date/Time:
Received by: (Signature) Elm Date/Time: 8/14/18 12:02
Relinquished by: (Signature) Date/Time:
Received by: (Signature) Date/Time:

Comments:

Preservation Code: A = None B = HNO_3 C = NaOH D = H_2SO_4 E = HCl F = 5035/EnCore G = Other

Laboratory Work Order No.: 18080529

Received on Ice: Yes ✓ No

Temperature: 3.3 °C

9 of 11

COLD

STAT Analysis Corporation

2242 W. Harrison Suite 200, Chicago, Illinois 60612 Phone: (312) 733-0551 Fax: (312) 733-2386
e-mail address: STATinfo@STATAnalysis.com

CHAIN OF CUSTODY RECORD

Nº: 917131 **Page: 2 of 2**

Company: CH2M
Project Number: 693282 Client Tracking No.:
Project Name: BNSF-WISHRAM
Project Location: Wishram, WA
Sampler(s): JMF
Report To: Carrie Andrews Phone: 503 348 9500
Fax:
QC Level: 1 ___ 2 ___ 3 ___ 4 ___ e-mail: carrie.andrewse@jacobs.com

Quote No.:
P.O. No.:
Turn Around Time (Days): 1 2 3 4 5-7 10
Results Needed: / / am/pm

	Client Sample Number/Description:	Date Taken	Time Taken	Matrix	Comp.	Grab	Preserv.	No. of Containers	SOA	Additional Information:	Lab No.:
1	J260-GS-080818	8/8/18	1740	SS		X		1	1		021
2	J260-SC-080818-A	8/8/18	1745	SS		X		1	1		022
3	I400-GS-080918	8/9/18	1000	SS		X		1	1		023
4	I400-SC-080918-A	8/9/18	1010	SS		X		1	1		024
5	I400-SC-080918-B	8/9/18	1015	SS		X		1	1		025
6	UNLABELED BAG	8/9/18	1100	SS						HOLD FOR ANALYSIS	026

Relinquished by: (Signature) Jennifer Ulrich Date/Time: 8/13/18 1200
Received by: (Signature) 782280849759 Date/Time:
Relinquished by: (Signature) FedEx Date/Time:
Received by: (Signature) [signature] Date/Time: 8/14/18 12:07
Relinquished by: (Signature) Date/Time:
Received by: (Signature) Date/Time:

Comments:

Preservation Code: A = None B = HNO_3 C = NaOH D = H_2SO_4 E = HCl F = 5035/EnCore G = Other

Laboratory Work Order No.: 18080529

Received on Ice: Yes ☑ No ☐

Temperature: 3.3 °C

STAT Analysis Corporation

Sample Receipt Checklist

Client Name CH2 - PORTLAND | Date and Time Received: 8/14/2018 12:02:00 PM

Work Order Number 18080529 | Received by: EAA

Checklist completed by: _____ (Signature) 8/14/18 (Date) | Reviewed by: _____ (Initials) 8/15/18 (Date)

Matrix: | Carrier name FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels/containers?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container or Temp Blank temperature in compliance?	Yes ☑	No ☐	Temperature 3.3 °C
Water - VOA vials have zero headspace?	No VOA vials submitted ☒	Yes ☒	No ☒
Water - Samples pH checked?	Yes ☒	No ☒	Checked by:
Water - Samples properly preserved?	Yes ☒	No ☒	pH Adjusted?

Any No response must be detailed in the comments section below.

Comments:

Client / Person contacted: | Date contacted: | Contacted by:

Response:

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-79568-1
Client Project/Site: BNSF-Wishram

For:
CH2M Hill, Inc.
2020 SW 4th Ave
Suite 300
Portland, Oregon 97201

Attn: Ms. Carrie Andrews

Kristine D. Allen

Authorized for release by:
9/28/2018 4:15:57 PM
Kristine Allen, Manager of Project Management
(253)248-4970
kristine.allen@testamericainc.com

Designee for

Elaine Walker, Project Manager II
(253)248-4972
elaine.walker@testamericainc.com

Table of Contents

Job ID: 580-79568-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-79568-1

Receipt
Thirteen samples were received on 8/14/2018 9:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.4º C.

Receipt Exceptions

The container submitted for the following sample was not sufficiently sealed: TB-01-080618 (580-79568-13). Loss of volatiles may have occurred.

Grain Size is requested on the COC however containers were not given for this analysis.

GC/MS VOA
Method(s) 5035: The following sample was provided to the laboratory with a significantly different initial weight than the required (10g): The weight should not deviate by more than 20%. The amount provided was below this amount.: D240-GS-080618 (580-79568-1), D420-GS-080618-1 (580-79568-4), D220-GS-080718 (580-79568-5), D200-GS-080718 (580-79568-7), G200-GS-080718 (580-79568-9), K120-GS-080818 (580-79568-10), J260-GS-080818 (580-79568-11), and I400-GS-080918 (580-79568-12).

The tare weight for sample D420-GS-080618 (580-79568-3) was estimated; no mass was listed and the tare weight was illegible on the container label.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC VOA
Method(s) NWTPH/VPH: Result may be elevated due to elevated baseline on instrument. Insufficient hold time remaining for reanalysis for the following samples: D240-GS-080618 (580-79568-1), D260-GS-080618 (580-79568-2), D420-GS-080618 (580-79568-3), D420-GS-080618-1 (580-79568-4), D220-GS-080718 (580-79568-5), BG-US01-080718 (580-79568-6), D200-GS-080718 (580-79568-7), G260-GS-080718 (580-79568-8), G200-GS-080718 (580-79568-9), K120-GS-080818 (580-79568-10), J260-GS-080818 (580-79568-11), I400-GS-080918 (580-79568-12), TB-01-080618 (580-79568-13), (CCB 490-537369/22), (CCV 490-537369/2), (CCV 490-537369/24), (CCV 490-537369/30), (LCS 490-537369/19), (LCS 490-537369/26), (LCSD 490-537369/20), (LCSD 490-537369/27), (MB 490-537369/28) and (MB 490-537369/3)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC Semi VOA
Method(s) NWTPH/EPH: Surrogate recovery for the following samples were outside control limits: D240-GS-080618 (580-79568-1), D260-GS-080618 (580-79568-2) and D220-GS-080718 (580-79568-5). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

Method(s) NWTPH/EPH: Surrogate recovery for the following samples were outside of acceptance limits: D420-GS-080618-1 (580-79568-4) and BG-US01-080718 (580-79568-6). There was insufficient sample to perform a re-extraction; therefore, the data have been reported.

Method(s) NWTPH/EPH: The laboratory control sample duplicate (LCSD) for preparation batch 580-281918 and 580-284550 and analytical batch 580-284723 recovered outside acceptance limits for 1-chlorooctadecane (59 %R, >60% required), and C10-C12 aliphatic compounds (69 %R, >70% required).

Method(s) NWTPH/EPH: The following samples were re-prepared outside of preparation holding time due to failing C10-C12 Aliphatics in the original extraction's LCS/LCSD: D240-GS-080618 (580-79568-1), D260-GS-080618 (580-79568-2), D420-GS-080618 (580-79568-3), D420-GS-080618-1 (580-79568-4), D220-GS-080718 (580-79568-5), BG-US01-080718 (580-79568-6), D200-GS-080718 (580-79568-7), G260-GS-080718 (580-79568-8), G200-GS-080718 (580-79568-9), K120-GS-080818 (580-79568-10), J260-GS-080818 (580-79568-11) and I400-GS-080918 (580-79568-12).

Job ID: 580-79568-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

Method(s) NWTPH/EPH: Surrogate 1-Chlorooctadecane failed in the below samples. Since the samples are out-of-hold re-extracts, the data is qualified and reported. K120-GS-080818 (580-79568-10) and I400-GS-080918 (580-79568-12)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
Method(s) 3550B: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Insufficient amount of available spike; agreed to use 100uL instead

VOA Prep
Method(s) 5035: Sample already had methanol removed and no mass was listed and the tare weight was scratched up. The tare weight was estimated.
D420-GS-080618 (580-79568-3)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Qualifiers

GC VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC Semi VOA

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
X	Surrogate is outside control limits
*	LCS or LCSD is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: D240-GS-080618
Date Collected: 08/06/18 14:50
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-1
Matrix: Solid
Percent Solids: 65.3

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C6-C8 aliphatic (adjusted)	ND		7.7	3.1	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C8-C10 aliphatic (adjusted)	ND		7.7	3.1	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		7.7	3.1	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C10-C12 Aliphatics	ND		20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C5-C6 aliphatics (adjusted)	ND		7.7	3.1	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C10-C12 Aromatics	**13**	**J ***	20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1
C12-C13 Aromatics	**8.0**	**J**	20	7.9	mg/Kg	☼	08/18/18 19:11	08/20/18 17:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*101*		*60 - 140*	*08/18/18 19:11*	*08/20/18 17:48*	*1*
2,5-Dibromotoluene (pid)	*107*		*60 - 140*	*08/18/18 19:11*	*08/20/18 17:48*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		36	6.1	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C12-C16 Aromatics	ND		36	3.2	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C16-C21 Aromatics	**37**		36	4.7	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C21-C34 Aromatics	**230**		36	7.3	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C10-C12 Aliphatics	ND	H	30	2.9	mg/Kg	☼	09/06/18 09:37	09/19/18 23:29	1
C10-C12 Aliphatics	ND	*	36	3.5	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C12-C16 Aliphatics	**19**	**J**	36	3.2	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C16-C21 Aliphatics	**78**		36	4.5	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5
C21-C34 Aliphatics	**270**		36	8.8	mg/Kg	☼	08/18/18 11:53	09/23/18 22:51	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*88*		*60 - 140*	*09/06/18 09:37*	*09/19/18 23:29*	*1*
1-Chlorooctadecane	*55*	*X*	*60 - 140*	*08/18/18 11:53*	*09/23/18 22:51*	*5*
o-Terphenyl	*52*	*X*	*60 - 140*	*08/18/18 11:53*	*09/23/18 22:51*	*5*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**65.3**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**34.7**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: D260-GS-080618
Date Collected: 08/06/18 15:30
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-2
Matrix: Solid
Percent Solids: 62.7

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C6-C8 aliphatic (adjusted)	ND		8.0	3.2	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C8-C10 aliphatic (adjusted)	ND		8.0	3.2	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		8.0	3.2	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C10-C12 Aliphatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C5-C6 aliphatics (adjusted)	ND		8.0	3.2	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C10-C12 Aromatics	**8.1**	**J ***	12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1
C12-C13 Aromatics	ND		12	4.7	mg/Kg	☼	08/18/18 19:11	08/20/18 18:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*100*		*60 - 140*	*08/18/18 19:11*	*08/20/18 18:21*	*1*
2,5-Dibromotoluene (pid)	*107*		*60 - 140*	*08/18/18 19:11*	*08/20/18 18:21*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		7.9	1.3	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C12-C16 Aromatics	ND		7.9	0.70	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C16-C21 Aromatics	**5.6**	**J**	7.9	1.0	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C21-C34 Aromatics	**47**		7.9	1.6	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C10-C12 Aliphatics	ND	H	31	3.0	mg/Kg	☼	09/06/18 09:37	09/19/18 23:55	1
C10-C12 Aliphatics	ND	*	7.9	0.76	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C12-C16 Aliphatics	**2.1**	**J**	7.9	0.70	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C16-C21 Aliphatics	**11**		7.9	0.97	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1
C21-C34 Aliphatics	**50**		7.9	1.9	mg/Kg	☼	08/18/18 11:53	09/23/18 23:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*89*		*60 - 140*	*09/06/18 09:37*	*09/19/18 23:55*	*1*
1-Chlorooctadecane	*57*	*X*	*60 - 140*	*08/18/18 11:53*	*09/23/18 23:16*	*1*
o-Terphenyl	*59*	*X*	*60 - 140*	*08/18/18 11:53*	*09/23/18 23:16*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**62.7**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**37.3**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: D420-GS-080618
Date Collected: 08/06/18 16:55
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-3
Matrix: Solid
Percent Solids: 72.7

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C6-C8 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C8-C10 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C10-C12 Aliphatics	**5.8**	**J**	13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C5-C6 aliphatics (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C10-C12 Aromatics	**8.9**	**J ***	13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1
C12-C13 Aromatics	ND		13	5.2	mg/Kg	☼	08/18/18 19:11	08/20/18 18:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*102*		*60 - 140*	*08/18/18 19:11*	*08/20/18 18:53*	*1*
2,5-Dibromotoluene (pid)	*108*		*60 - 140*	*08/18/18 19:11*	*08/20/18 18:53*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		6.9	1.2	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C12-C16 Aromatics	ND		6.9	0.60	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C16-C21 Aromatics	**1.2**	**J**	6.9	0.88	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C21-C34 Aromatics	**4.6**	**J**	6.9	1.4	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C10-C12 Aliphatics	**3.0**	**J H**	14	1.3	mg/Kg	☼	09/06/18 09:37	09/20/18 00:20	1
C10-C12 Aliphatics	ND	*	6.9	0.66	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C12-C16 Aliphatics	ND		6.9	0.60	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C16-C21 Aliphatics	**1.1**	**J**	6.9	0.84	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1
C21-C34 Aliphatics	**3.2**	**J**	6.9	1.6	mg/Kg	☼	08/18/18 11:53	09/23/18 23:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*123*		*60 - 140*	*09/06/18 09:37*	*09/20/18 00:20*	*1*
1-Chlorooctadecane	*79*		*60 - 140*	*08/18/18 11:53*	*09/23/18 23:42*	*1*
o-Terphenyl	*81*		*60 - 140*	*08/18/18 11:53*	*09/23/18 23:42*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**72.7**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**27.3**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: D420-GS-080618-1
Date Collected: 08/06/18 17:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-4
Matrix: Solid
Percent Solids: 72.2

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	**5.3**	**J**	12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C6-C8 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C8-C10 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C10-C12 Aliphatics	ND		12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C5-C6 aliphatics (adjusted)	**5.3**	**J**	6.9	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C10-C12 Aromatics	**9.4**	**J ***	12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1
C12-C13 Aromatics	ND		12	4.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*102*		*60 - 140*	*08/18/18 19:11*	*08/20/18 19:26*	*1*
2,5-Dibromotoluene (pid)	*108*		*60 - 140*	*08/18/18 19:11*	*08/20/18 19:26*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		6.8	1.1	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C12-C16 Aromatics	ND		6.8	0.59	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C16-C21 Aromatics	**0.92**	**J**	6.8	0.86	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C21-C34 Aromatics	**3.2**	**J**	6.8	1.4	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C10-C12 Aliphatics	ND	H	14	1.3	mg/Kg	☼	09/06/18 09:37	09/20/18 00:46	1
C10-C12 Aliphatics	ND	*	6.8	0.65	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C12-C16 Aliphatics	ND		6.8	0.59	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C16-C21 Aliphatics	ND		6.8	0.82	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1
C21-C34 Aliphatics	**2.9**	**J**	6.8	1.6	mg/Kg	☼	08/18/18 11:53	09/24/18 00:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*79*		*60 - 140*	*09/06/18 09:37*	*09/20/18 00:46*	*1*
1-Chlorooctadecane	*64*		*60 - 140*	*08/18/18 11:53*	*09/24/18 00:07*	*1*
o-Terphenyl	*51*	*X*	*60 - 140*	*08/18/18 11:53*	*09/24/18 00:07*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**72.2**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**27.8**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: D220-GS-080718
Date Collected: 08/07/18 07:55
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-5
Matrix: Solid
Percent Solids: 66.1

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C6-C8 aliphatic (adjusted)	ND		7.6	3.0	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C8-C10 aliphatic (adjusted)	ND		7.6	3.0	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		7.6	3.0	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C10-C12 Aliphatics	ND		15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C5-C6 aliphatics (adjusted)	ND		7.6	3.0	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C10-C12 Aromatics	**11**	**J ***	15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1
C12-C13 Aromatics	**7.5**	**J**	15	5.8	mg/Kg	☼	08/18/18 19:11	08/20/18 19:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*101*		*60 - 140*	*08/18/18 19:11*	*08/20/18 19:58*	*1*
2,5-Dibromotoluene (pid)	*106*		*60 - 140*	*08/18/18 19:11*	*08/20/18 19:58*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		37	6.2	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C12-C16 Aromatics	ND		37	3.3	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C16-C21 Aromatics	**33**	**J**	37	4.7	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C21-C34 Aromatics	**190**		37	7.4	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C10-C12 Aliphatics	ND	H	29	2.8	mg/Kg	☼	09/06/18 09:37	09/20/18 01:12	1
C10-C12 Aliphatics	ND	*	37	3.6	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C12-C16 Aliphatics	**16**	**J**	37	3.3	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C16-C21 Aliphatics	**55**		37	4.5	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5
C21-C34 Aliphatics	**180**		37	8.9	mg/Kg	☼	08/18/18 11:53	09/24/18 00:32	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*63*		*60 - 140*	*09/06/18 09:37*	*09/20/18 01:12*	*1*
1-Chlorooctadecane	*44*	*X*	*60 - 140*	*08/18/18 11:53*	*09/24/18 00:32*	*5*
o-Terphenyl	*50*	*X*	*60 - 140*	*08/18/18 11:53*	*09/24/18 00:32*	*5*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**66.1**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**33.9**		0.1	0.1	%			08/16/18 09:59	1

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: BG-US01-080718
Date Collected: 08/07/18 08:50
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-6
Matrix: Solid
Percent Solids: 73.0

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	**3.8**	**J**	9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C6-C8 aliphatic (adjusted)	ND		6.9	2.7	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C8-C10 aliphatic (adjusted)	ND		6.9	2.7	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.9	2.7	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C10-C12 Aliphatics	ND		9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C5-C6 aliphatics (adjusted)	**3.8**	**J**	6.9	2.7	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C10-C12 Aromatics	**7.0**	**J ***	9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1
C12-C13 Aromatics	ND		9.6	3.8	mg/Kg	☼	08/18/18 19:11	08/20/18 20:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*99*		*60 - 140*	*08/18/18 19:11*	*08/20/18 20:32*	*1*
2,5-Dibromotoluene (pid)	*106*		*60 - 140*	*08/18/18 19:11*	*08/20/18 20:32*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		6.6	1.1	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C12-C16 Aromatics	ND		6.6	0.58	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C16-C21 Aromatics	ND		6.6	0.85	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C21-C34 Aromatics	ND		6.6	1.3	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C10-C12 Aliphatics	ND	H	6.7	0.65	mg/Kg	☼	09/06/18 09:37	09/20/18 01:38	1
C10-C12 Aliphatics	ND	*	6.6	0.63	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C12-C16 Aliphatics	ND		6.6	0.58	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C16-C21 Aliphatics	ND		6.6	0.81	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1
C21-C34 Aliphatics	ND		6.6	1.6	mg/Kg	☼	08/18/18 11:53	09/24/18 00:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*88*		*60 - 140*	*09/06/18 09:37*	*09/20/18 01:38*	*1*
1-Chlorooctadecane	*61*		*60 - 140*	*08/18/18 11:53*	*09/24/18 00:57*	*1*
o-Terphenyl	*52*	*X*	*60 - 140*	*08/18/18 11:53*	*09/24/18 00:57*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**73.0**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**27.0**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: D200-GS-080718
Date Collected: 08/07/18 12:30
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-7
Matrix: Solid
Percent Solids: 67.4

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C6-C8 aliphatic (adjusted)	ND		7.4	3.0	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C8-C10 aliphatic (adjusted)	ND		7.4	3.0	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		7.4	3.0	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C10-C12 Aliphatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C5-C6 aliphatics (adjusted)	ND		7.4	3.0	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C10-C12 Aromatics	**5.1**	**J ***	7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1
C12-C13 Aromatics	ND		7.2	2.9	mg/Kg	☼	08/18/18 19:11	08/20/18 21:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*93*		*60 - 140*	*08/18/18 19:11*	*08/20/18 21:05*	*1*
2,5-Dibromotoluene (pid)	*101*		*60 - 140*	*08/18/18 19:11*	*08/20/18 21:05*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		7.3	1.2	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C12-C16 Aromatics	**1.5**	**J**	7.3	0.65	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C16-C21 Aromatics	**9.4**		7.3	0.94	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C21-C34 Aromatics	**31**		7.3	1.5	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C10-C12 Aliphatics	**0.85**	**J H**	7.2	0.69	mg/Kg	☼	09/06/18 09:37	09/20/18 02:03	1
C10-C12 Aliphatics	ND	*	7.3	0.70	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C12-C16 Aliphatics	**4.3**	**J**	7.3	0.65	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C16-C21 Aliphatics	**11**		7.3	0.90	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1
C21-C34 Aliphatics	**30**		7.3	1.8	mg/Kg	☼	08/18/18 11:53	09/24/18 01:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*74*		*60 - 140*	*09/06/18 09:37*	*09/20/18 02:03*	*1*
1-Chlorooctadecane	*64*		*60 - 140*	*08/18/18 11:53*	*09/24/18 01:22*	*1*
o-Terphenyl	*65*		*60 - 140*	*08/18/18 11:53*	*09/24/18 01:22*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**67.4**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**32.6**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: G260-GS-080718
Date Collected: 08/07/18 18:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-8
Matrix: Solid
Percent Solids: 70.7

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C6-C8 aliphatic (adjusted)	ND		7.1	2.8	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C8-C10 aliphatic (adjusted)	ND		7.1	2.8	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		7.1	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C10-C12 Aliphatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C5-C6 aliphatics (adjusted)	ND		7.1	2.8	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C10-C12 Aromatics	**5.3**	**J ***	8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1
C12-C13 Aromatics	ND		8.0	3.2	mg/Kg	☼	08/18/18 19:11	08/20/18 21:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*97*		*60 - 140*	*08/18/18 19:11*	*08/20/18 21:37*	*1*
2,5-Dibromotoluene (pid)	*105*		*60 - 140*	*08/18/18 19:11*	*08/20/18 21:37*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		7.0	1.2	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C12-C16 Aromatics	ND		7.0	0.61	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C16-C21 Aromatics	**1.4**	**J**	7.0	0.89	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C21-C34 Aromatics	**4.1**	**J**	7.0	1.4	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C10-C12 Aliphatics	ND	H	7.0	0.67	mg/Kg	☼	09/06/18 09:37	09/20/18 02:54	1
C10-C12 Aliphatics	ND	*	7.0	0.67	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C12-C16 Aliphatics	ND		7.0	0.61	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C16-C21 Aliphatics	**1.1**	**J**	7.0	0.85	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1
C21-C34 Aliphatics	**4.4**	**J**	7.0	1.7	mg/Kg	☼	08/18/18 11:53	09/24/18 02:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*79*		*60 - 140*	*09/06/18 09:37*	*09/20/18 02:54*	*1*
1-Chlorooctadecane	*67*		*60 - 140*	*08/18/18 11:53*	*09/24/18 02:12*	*1*
o-Terphenyl	*76*		*60 - 140*	*08/18/18 11:53*	*09/24/18 02:12*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**70.7**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**29.3**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: G200-GS-080718
Date Collected: 08/07/18 18:50
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-9
Matrix: Solid
Percent Solids: 70.1

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C6-C8 aliphatic (adjusted)	ND		7.1	2.9	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C8-C10 aliphatic (adjusted)	ND		7.1	2.9	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		7.1	2.9	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C10-C12 Aliphatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C5-C6 aliphatics (adjusted)	ND		7.1	2.9	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C10-C12 Aromatics	**5.2**	**J ***	7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1
C12-C13 Aromatics	ND		7.7	3.1	mg/Kg	☼	08/18/18 19:11	08/20/18 22:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*96*		*60 - 140*	*08/18/18 19:11*	*08/20/18 22:10*	*1*
2,5-Dibromotoluene (pid)	*103*		*60 - 140*	*08/18/18 19:11*	*08/20/18 22:10*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		7.0	1.2	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C12-C16 Aromatics	ND		7.0	0.62	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C16-C21 Aromatics	**4.3**	**J**	7.0	0.90	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C21-C34 Aromatics	**19**		7.0	1.4	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C10-C12 Aliphatics	ND	H	14	1.3	mg/Kg	☼	09/06/18 09:37	09/20/18 03:20	1
C10-C12 Aliphatics	ND	*	7.0	0.67	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C12-C16 Aliphatics	**1.3**	**J**	7.0	0.62	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C16-C21 Aliphatics	**3.8**	**J**	7.0	0.86	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1
C21-C34 Aliphatics	**14**		7.0	1.7	mg/Kg	☼	08/18/18 11:53	09/24/18 02:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*74*		*60 - 140*	*09/06/18 09:37*	*09/20/18 03:20*	*1*
1-Chlorooctadecane	*66*		*60 - 140*	*08/18/18 11:53*	*09/24/18 02:37*	*1*
o-Terphenyl	*71*		*60 - 140*	*08/18/18 11:53*	*09/24/18 02:37*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**70.1**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**29.9**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: K120-GS-080818
Date Collected: 08/08/18 16:40
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-10
Matrix: Solid
Percent Solids: 77.3

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C6-C8 aliphatic (adjusted)	ND		6.5	2.6	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C8-C10 aliphatic (adjusted)	ND		6.5	2.6	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.5	2.6	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C10-C12 Aliphatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C5-C6 aliphatics (adjusted)	ND		6.5	2.6	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C10-C12 Aromatics	**6.4**	**J ***	10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1
C12-C13 Aromatics	ND		10	4.2	mg/Kg	☼	08/18/18 19:11	08/20/18 22:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*95*		*60 - 140*	*08/18/18 19:11*	*08/20/18 22:42*	*1*
2,5-Dibromotoluene (pid)	*102*		*60 - 140*	*08/18/18 19:11*	*08/20/18 22:42*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		6.4	1.1	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C12-C16 Aromatics	ND		6.4	0.56	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C16-C21 Aromatics	**2.5**	**J**	6.4	0.82	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C21-C34 Aromatics	**20**		6.4	1.3	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C10-C12 Aliphatics	ND	H	13	1.2	mg/Kg	☼	09/06/18 09:37	09/20/18 03:45	1
C10-C12 Aliphatics	ND	*	6.4	0.61	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C12-C16 Aliphatics	**0.84**	**J**	6.4	0.56	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C16-C21 Aliphatics	**3.9**	**J**	6.4	0.78	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1
C21-C34 Aliphatics	**17**		6.4	1.5	mg/Kg	☼	08/18/18 11:53	09/24/18 03:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*58*	*X*	*60 - 140*	*09/06/18 09:37*	*09/20/18 03:45*	*1*
1-Chlorooctadecane	*74*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:02*	*1*
o-Terphenyl	*77*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:02*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**77.3**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**22.7**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: J260-GS-080818
Date Collected: 08/08/18 17:40
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-11
Matrix: Solid
Percent Solids: 78.7

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C6-C8 aliphatic (adjusted)	ND		6.4	2.5	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C8-C10 aliphatic (adjusted)	ND		6.4	2.5	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.4	2.5	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C10-C12 Aliphatics	**4.1**	**J**	10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C5-C6 aliphatics (adjusted)	ND		6.4	2.5	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C10-C12 Aromatics	**5.3**	**J ***	10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1
C12-C13 Aromatics	**11**		10	4.1	mg/Kg	☼	08/18/18 19:11	08/21/18 17:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*87*		*60 - 140*	*08/18/18 19:11*	*08/21/18 17:21*	*1*
2,5-Dibromotoluene (pid)	*86*		*60 - 140*	*08/18/18 19:11*	*08/21/18 17:21*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		25	4.3	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C12-C16 Aromatics	**6.5**	**J**	25	2.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C16-C21 Aromatics	**180**		25	3.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C21-C34 Aromatics	**890**		25	5.1	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C10-C12 Aliphatics	**21**	**J H**	130	12	mg/Kg	☼	09/06/18 09:37	09/20/18 04:11	1
C10-C12 Aliphatics	ND	*	25	2.4	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C12-C16 Aliphatics	**32**		25	2.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C16-C21 Aliphatics	**87**		25	3.1	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1
C21-C34 Aliphatics	**310**		25	6.1	mg/Kg	☼	08/18/18 11:53	09/24/18 03:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*71*		*60 - 140*	*09/06/18 09:37*	*09/20/18 04:11*	*1*
1-Chlorooctadecane	*66*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:27*	*1*
o-Terphenyl	*80*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:27*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**78.7**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**21.3**		0.1	0.1	%			08/16/18 09:59	1

Client Sample ID: I400-GS-080918
Date Collected: 08/09/18 10:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-12
Matrix: Solid
Percent Solids: 74.1

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C6-C8 aliphatic (adjusted)	ND		6.7	2.7	mg/Kg	☼		08/31/18 07:23	1
C6-C8 Aliphatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C8-C10 aliphatic (adjusted)	ND		6.7	2.7	mg/Kg	☼		08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		6.7	2.7	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aliphatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C10-C12 Aliphatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C5-C6 aliphatics (adjusted)	ND		6.7	2.7	mg/Kg	☼		08/31/18 07:23	1
C8-C10 Aromatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C10-C12 Aromatics	**4.5**	**J ***	7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1
C12-C13 Aromatics	ND		7.1	2.8	mg/Kg	☼	08/18/18 19:11	08/20/18 23:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*94*		*60 - 140*	*08/18/18 19:11*	*08/20/18 23:15*	*1*
2,5-Dibromotoluene (pid)	*102*		*60 - 140*	*08/18/18 19:11*	*08/20/18 23:15*	*1*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		13	2.3	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C12-C16 Aromatics	ND		13	1.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C16-C21 Aromatics	**8.0**	**J**	13	1.7	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C21-C34 Aromatics	**60**		13	2.7	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C10-C12 Aliphatics	ND	H	27	2.6	mg/Kg	☼	09/06/18 09:37	09/20/18 04:36	1
C10-C12 Aliphatics	ND	*	13	1.3	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C12-C16 Aliphatics	**2.6**	**J**	13	1.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C16-C21 Aliphatics	**15**		13	1.6	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1
C21-C34 Aliphatics	**64**		13	3.2	mg/Kg	☼	08/18/18 11:53	09/24/18 03:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*52*	*X*	*60 - 140*	*09/06/18 09:37*	*09/20/18 04:36*	*1*
1-Chlorooctadecane	*73*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:52*	*1*
o-Terphenyl	*86*		*60 - 140*	*08/18/18 11:53*	*09/24/18 03:52*	*1*

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**74.1**		0.1	0.1	%			08/16/18 09:59	1
Percent Moisture	**25.9**		0.1	0.1	%			08/16/18 09:59	1

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: TB-01-080618
Date Collected: 08/06/18 09:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-13
Matrix: Solid

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C6-C8 aliphatic (adjusted)	ND		5.0	2.0	mg/Kg			08/31/18 07:23	1
C6-C8 Aliphatics	ND		5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C8-C10 aliphatic (adjusted)	ND		5.0	2.0	mg/Kg			08/31/18 07:23	1
C10-C12 aliphatic (adjusted)	ND		5.0	2.0	mg/Kg			08/31/18 07:23	1
C8-C10 Aliphatics	ND		5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C10-C12 Aliphatics	**2.4**	**J**	5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C5-C6 aliphatics (adjusted)	ND		5.0	2.0	mg/Kg			08/31/18 07:23	1
C8-C10 Aromatics	ND		5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C10-C12 Aromatics	**4.2**	**J ***	5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1
C12-C13 Aromatics	ND		5.0	2.0	mg/Kg		08/18/18 19:11	08/20/18 17:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*104*		*60 - 140*	*08/18/18 19:11*	*08/20/18 17:16*	*1*
2,5-Dibromotoluene (pid)	*112*		*60 - 140*	*08/18/18 19:11*	*08/20/18 17:16*	*1*

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC)

Lab Sample ID: MB 490-537369/28
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C6-C8 Aliphatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C8-C10 Aliphatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C10-C12 Aliphatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C8-C10 Aromatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C10-C12 Aromatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1
C12-C13 Aromatics	ND		5.0	2.0	mg/Kg			08/21/18 16:49	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*92*		*60 - 140*		*08/21/18 16:49*	*1*
2,5-Dibromotoluene (pid)	*93*		*60 - 140*		*08/21/18 16:49*	*1*

Lab Sample ID: MB 490-537369/3
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C6 Aliphatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C6-C8 Aliphatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C8-C10 Aliphatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C10-C12 Aliphatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C8-C10 Aromatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C10-C12 Aromatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1
C12-C13 Aromatics	ND		5.0	2.0	mg/Kg			08/20/18 16:40	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,5-Dibromotoluene (fid)	*111*		*60 - 140*		*08/20/18 16:40*	*1*
2,5-Dibromotoluene (pid)	*116*		*60 - 140*		*08/20/18 16:40*	*1*

Lab Sample ID: LCS 490-537369/19
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
C5-C6 Aliphatics			15.0	13.8		mg/Kg		92	70 - 130		
C6-C8 Aliphatics			10.0	8.52		mg/Kg		85	70 - 130		
C8-C10 Aliphatics			30.0	28.3		mg/Kg		94	70 - 130		
C10-C12 Aliphatics			10.0	10.7		mg/Kg		107	70 - 130		
C8-C10 Aromatics			20.0	20.8		mg/Kg		104	70 - 130		
C10-C12 Aromatics			5.00	8.82	*	mg/Kg		176	70 - 130		
C12-C13 Aromatics			10.0	10.0		mg/Kg		100	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,5-Dibromotoluene (fid)	*92*		*60 - 140*
2,5-Dibromotoluene (pid)	*100*		*60 - 140*

Method: NWTPH/VPH - Northwest - Volatile Petroleum Hydrocarbons (GC) (Continued)

Lab Sample ID: LCS 490-537369/26
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
C5-C6 Aliphatics			15.0	15.9		mg/Kg		106	70 - 130		
C6-C8 Aliphatics			10.0	10.2		mg/Kg		102	70 - 130		
C8-C10 Aliphatics			30.0	29.1		mg/Kg		97	70 - 130		
C10-C12 Aliphatics			10.0	12.4		mg/Kg		124	70 - 130		
C8-C10 Aromatics			20.0	19.5		mg/Kg		97	70 - 130		
C10-C12 Aromatics			5.00	7.88	*	mg/Kg		158	70 - 130		
C12-C13 Aromatics			10.0	9.68		mg/Kg		97	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,5-Dibromotoluene (fid)	*95*		*60 - 140*
2,5-Dibromotoluene (pid)	*94*		*60 - 140*

Lab Sample ID: LCSD 490-537369/20
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
C5-C6 Aliphatics			15.0	13.3		mg/Kg		89	70 - 130	3	25
C6-C8 Aliphatics			10.0	8.67		mg/Kg		87	70 - 130	2	25
C8-C10 Aliphatics			30.0	26.9		mg/Kg		90	70 - 130	5	25
C10-C12 Aliphatics			10.0	9.98		mg/Kg		100	70 - 130	7	25
C8-C10 Aromatics			20.0	20.0		mg/Kg		100	70 - 130	4	25
C10-C12 Aromatics			5.00	8.60	*	mg/Kg		172	70 - 130	3	25
C12-C13 Aromatics			10.0	9.55		mg/Kg		95	70 - 130	5	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,5-Dibromotoluene (fid)	*91*		*60 - 140*
2,5-Dibromotoluene (pid)	*99*		*60 - 140*

Lab Sample ID: LCSD 490-537369/27
Matrix: Solid
Analysis Batch: 537369

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
C5-C6 Aliphatics			15.0	16.3		mg/Kg		109	70 - 130	3	25
C6-C8 Aliphatics			10.0	10.2		mg/Kg		102	70 - 130	0	25
C8-C10 Aliphatics			30.0	29.8		mg/Kg		99	70 - 130	2	25
C10-C12 Aliphatics			10.0	12.5		mg/Kg		125	70 - 130	1	25
C8-C10 Aromatics			20.0	19.7		mg/Kg		98	70 - 130	1	25
C10-C12 Aromatics			5.00	7.67	*	mg/Kg		153	70 - 130	3	25
C12-C13 Aromatics			10.0	9.26		mg/Kg		93	70 - 130	4	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,5-Dibromotoluene (fid)	*94*		*60 - 140*
2,5-Dibromotoluene (pid)	*93*		*60 - 140*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC)

Lab Sample ID: MB 580-281918/1-B
Matrix: Solid
Analysis Batch: 284723

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 281918

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aromatics	ND		5.0	0.84	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C12-C16 Aromatics	ND		5.0	0.44	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C16-C21 Aromatics	ND		5.0	0.64	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C21-C34 Aromatics	ND		5.0	1.0	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C10-C12 Aliphatics	ND		5.0	0.48	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C12-C16 Aliphatics	ND		5.0	0.44	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C16-C21 Aliphatics	ND		5.0	0.61	mg/Kg		08/18/18 11:53	09/23/18 21:35	1
C21-C34 Aliphatics	ND		5.0	1.2	mg/Kg		08/18/18 11:53	09/23/18 21:35	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*76*		*60 - 140*	*08/18/18 11:53*	*09/23/18 21:35*	*1*
o-Terphenyl	*83*		*60 - 140*	*08/18/18 11:53*	*09/23/18 21:35*	*1*

Lab Sample ID: LCS 580-281918/2-B
Matrix: Solid
Analysis Batch: 284723

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 281918

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
C10-C12 Aromatics	6.67	5.33		mg/Kg		80	70 - 130
C12-C16 Aromatics	20.0	16.9		mg/Kg		84	70 - 130
C16-C21 Aromatics	33.3	29.9		mg/Kg		90	70 - 130
C21-C34 Aromatics	53.3	49.9		mg/Kg		94	70 - 130
C10-C12 Aliphatics	6.67	5.30		mg/Kg		79	70 - 130
C12-C16 Aliphatics	13.3	11.9		mg/Kg		89	70 - 130
C16-C21 Aliphatics	20.0	19.2		mg/Kg		96	70 - 130
C21-C34 Aliphatics	40.0	41.9		mg/Kg		105	70 - 130

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1-Chlorooctadecane	*70*		*60 - 140*
o-Terphenyl	*86*		*60 - 140*

Lab Sample ID: LCSD 580-281918/3-B
Matrix: Solid
Analysis Batch: 284723

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 281918

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
C10-C12 Aromatics	6.67	4.89	J	mg/Kg		73	70 - 130	9	25
C12-C16 Aromatics	20.0	15.8		mg/Kg		79	70 - 130	6	25
C16-C21 Aromatics	33.3	29.3		mg/Kg		88	70 - 130	2	25
C21-C34 Aromatics	53.3	48.1		mg/Kg		90	70 - 130	4	25
C10-C12 Aliphatics	6.67	4.63	J *	mg/Kg		69	70 - 130	13	25
C12-C16 Aliphatics	13.3	10.7		mg/Kg		80	70 - 130	10	25
C16-C21 Aliphatics	20.0	17.7		mg/Kg		88	70 - 130	9	25
C21-C34 Aliphatics	40.0	37.7		mg/Kg		94	70 - 130	11	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1-Chlorooctadecane	*59*	*X*	*60 - 140*

Method: NWTPH/EPH - Northwest - Extractable Petroleum Hydrocarbons (GC) (Continued)

Lab Sample ID: LCSD 580-281918/3-B
Matrix: Solid
Analysis Batch: 284723

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 281918

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*83*		*60 - 140*

Lab Sample ID: MB 580-283342/1-B
Matrix: Solid
Analysis Batch: 284424

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 283342

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C10-C12 Aliphatics	ND		5.0	0.48	mg/Kg		09/06/18 09:37	09/19/18 22:11	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1-Chlorooctadecane	*94*		*60 - 140*	*09/06/18 09:37*	*09/19/18 22:11*	*1*

Lab Sample ID: LCS 580-283342/2-B
Matrix: Solid
Analysis Batch: 284424

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 283342

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
C10-C12 Aliphatics			1.33	1.62	J	mg/Kg		122	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1-Chlorooctadecane	*106*		*60 - 140*

Lab Sample ID: LCSD 580-283342/3-B
Matrix: Solid
Analysis Batch: 284424

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 283342

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
C10-C12 Aliphatics			1.33	1.51	J	mg/Kg		113	70 - 130	7	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1-Chlorooctadecane	*105*		*60 - 140*

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: D240-GS-080618 — Lab Sample ID: 580-79568-1

Date Collected: 08/06/18 14:50 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D240-GS-080618 — Lab Sample ID: 580-79568-1

Date Collected: 08/06/18 14:50 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 65.3**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 17:48	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/19/18 23:29	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		5	284723	09/23/18 22:51	JCM	TAL SEA

Client Sample ID: D260-GS-080618 — Lab Sample ID: 580-79568-2

Date Collected: 08/06/18 15:30 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D260-GS-080618 — Lab Sample ID: 580-79568-2

Date Collected: 08/06/18 15:30 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 62.7**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 18:21	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/19/18 23:55	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/23/18 23:16	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: D420-GS-080618
Date Collected: 08/06/18 16:55
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D420-GS-080618
Date Collected: 08/06/18 16:55
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-3
Matrix: Solid
Percent Solids: 72.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 18:53	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 00:20	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/23/18 23:42	JCM	TAL SEA

Client Sample ID: D420-GS-080618-1
Date Collected: 08/06/18 17:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-4
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D420-GS-080618-1
Date Collected: 08/06/18 17:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-4
Matrix: Solid
Percent Solids: 72.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 19:26	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 00:46	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 00:07	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: D220-GS-080718 — Lab Sample ID: 580-79568-5

Date Collected: 08/07/18 07:55 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D220-GS-080718 — Lab Sample ID: 580-79568-5

Date Collected: 08/07/18 07:55 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 66.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 19:58	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 01:12	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		5	284723	09/24/18 00:32	JCM	TAL SEA

Client Sample ID: BG-US01-080718 — Lab Sample ID: 580-79568-6

Date Collected: 08/07/18 08:50 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: BG-US01-080718 — Lab Sample ID: 580-79568-6

Date Collected: 08/07/18 08:50 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 73.0**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 20:32	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 01:38	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 00:57	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: D200-GS-080718 — Lab Sample ID: 580-79568-7

Date Collected: 08/07/18 12:30 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: D200-GS-080718 — Lab Sample ID: 580-79568-7

Date Collected: 08/07/18 12:30 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 67.4**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 21:05	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 02:03	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 01:22	JCM	TAL SEA

Client Sample ID: G260-GS-080718 — Lab Sample ID: 580-79568-8

Date Collected: 08/07/18 18:00 — **Matrix: Solid**
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: G260-GS-080718 — Lab Sample ID: 580-79568-8

Date Collected: 08/07/18 18:00 — **Matrix: Solid**
Date Received: 08/14/18 09:45 — **Percent Solids: 70.7**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 21:37	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 02:54	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 02:12	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: G200-GS-080718
Date Collected: 08/07/18 18:50
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-9
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: G200-GS-080718
Date Collected: 08/07/18 18:50
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-9
Matrix: Solid
Percent Solids: 70.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 22:10	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 03:20	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 02:37	JCM	TAL SEA

Client Sample ID: K120-GS-080818
Date Collected: 08/08/18 16:40
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-10
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: K120-GS-080818
Date Collected: 08/08/18 16:40
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-10
Matrix: Solid
Percent Solids: 77.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 22:42	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 03:45	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 03:02	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: J260-GS-080818
Lab Sample ID: 580-79568-11
Date Collected: 08/08/18 17:40
Matrix: Solid
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: J260-GS-080818
Lab Sample ID: 580-79568-11
Date Collected: 08/08/18 17:40
Matrix: Solid
Date Received: 08/14/18 09:45
Percent Solids: 78.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/21/18 17:21	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 04:11	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 03:27	JCM	TAL SEA

Client Sample ID: I400-GS-080918
Lab Sample ID: 580-79568-12
Date Collected: 08/09/18 10:00
Matrix: Solid
Date Received: 08/14/18 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	281716	08/16/18 09:59	BAH	TAL SEA

Client Sample ID: I400-GS-080918
Lab Sample ID: 580-79568-12
Date Collected: 08/09/18 10:00
Matrix: Solid
Date Received: 08/14/18 09:45
Percent Solids: 74.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 23:15	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH
Total/NA	Prep	3550B			283342	09/06/18 09:37	KMS	TAL SEA
Total/NA	Fraction	EPH Frac			283882	09/13/18 10:06	KMS	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284424	09/20/18 04:36	JCM	TAL SEA
Total/NA	Prep	3550B			281918	08/18/18 11:53	BAH	TAL SEA
Total/NA	Fraction	EPH Frac			284550	09/21/18 08:58	BAH	TAL SEA
Total/NA	Analysis	NWTPH/EPH		1	284723	09/24/18 03:52	JCM	TAL SEA

Lab Chronicle

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Client Sample ID: TB-01-080618
Date Collected: 08/06/18 09:00
Date Received: 08/14/18 09:45

Lab Sample ID: 580-79568-13
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			537113	08/18/18 19:11	DHC	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	537369	08/20/18 17:16	FKG	TAL NSH
Total/NA	Analysis	NWTPH/VPH		1	539936	08/31/18 07:23	FKG	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Laboratory: TestAmerica Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-024	01-19-19
ANAB	DoD ELAP		L2236	01-19-19
ANAB	ISO/IEC 17025		L2236	01-19-19
California	State Program	9	2901	11-05-18
Montana (UST)	State Program	8	N/A	04-30-20
Nevada	State Program	9	WA000502019-1	07-31-19
Oregon	NELAP	10	WA100007	11-05-18
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-19

Laboratory: TestAmerica Nashville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
A2LA	ISO/IEC 17025		0453.07	12-31-19
Alaska (UST)	State Program	10	UST-087	06-30-19
Arizona	State Program	9	AZ0473	05-05-19
Arkansas DEQ	State Program	6	88-0737	04-25-19
California	State Program	9	2938	10-31-18
Connecticut	State Program	1	PH-0220	12-31-19
Florida	NELAP	4	E87358	06-30-19
Georgia	State Program	4	NA: NELAP & A2LA	12-31-19
Illinois	NELAP	5	200010	12-09-18
Iowa	State Program	7	131	04-01-20
Kansas	NELAP	7	E-10229	10-31-18
Kentucky (UST)	State Program	4	19	06-30-19
Kentucky (WW)	State Program	4	90038	12-31-18
Louisiana	NELAP	6	30613	06-30-19
Maine	State Program	1	TN00032	11-03-19
Maryland	State Program	3	316	03-31-19
Massachusetts	State Program	1	M-TN032	06-30-19
Minnesota	NELAP	5	047-999-345	12-31-18
Mississippi	State Program	4	N/A	06-30-19
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-19
New Hampshire	NELAP	1	2963	10-09-18
New Jersey	NELAP	2	TN965	06-30-19
New York	NELAP	2	11342	03-31-19
North Carolina (WW/SW)	State Program	4	387	12-31-18
North Dakota	State Program	8	R-146	06-30-19
Ohio VAP	State Program	5	CL0033	07-06-19
Oklahoma	State Program	6	9412	08-31-19
Oregon	NELAP	10	TN200001	04-26-19
Pennsylvania	NELAP	3	68-00585	07-31-19
Rhode Island	State Program	1	LAO00268	12-30-18
South Carolina	State Program	4	84009 (001)	02-28-19
Tennessee	State Program	4	2008	02-23-20
Texas	NELAP	6	T104704077	08-31-19
USDA	Federal		P330-13-00306	12-01-19

Accreditation/Certification Summary

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Laboratory: TestAmerica Nashville (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Utah	NELAP	8	TN00032	07-31-19
Virginia	NELAP	3	460152	06-14-19
Washington	State Program	10	C789	07-19-19
West Virginia DEP	State Program	3	219	02-28-19
Wisconsin	State Program	5	998020430	08-31-19
Wyoming (UST)	A2LA	8	453.07	12-31-19

Sample Summary

Client: CH2M Hill, Inc.
Project/Site: BNSF-Wishram

TestAmerica Job ID: 580-79568-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-79568-1	D240-GS-080618	Solid	08/06/18 14:50	08/14/18 09:45
580-79568-2	D260-GS-080618	Solid	08/06/18 15:30	08/14/18 09:45
580-79568-3	D420-GS-080618	Solid	08/06/18 16:55	08/14/18 09:45
580-79568-4	D420-GS-080618-1	Solid	08/06/18 17:00	08/14/18 09:45
580-79568-5	D220-GS-080718	Solid	08/07/18 07:55	08/14/18 09:45
580-79568-6	BG-US01-080718	Solid	08/07/18 08:50	08/14/18 09:45
580-79568-7	D200-GS-080718	Solid	08/07/18 12:30	08/14/18 09:45
580-79568-8	G260-GS-080718	Solid	08/07/18 18:00	08/14/18 09:45
580-79568-9	G200-GS-080718	Solid	08/07/18 18:50	08/14/18 09:45
580-79568-10	K120-GS-080818	Solid	08/08/18 16:40	08/14/18 09:45
580-79568-11	J260-GS-080818	Solid	08/08/18 17:40	08/14/18 09:45
580-79568-12	I400-GS-080918	Solid	08/09/18 10:00	08/14/18 09:45
580-79568-13	TB-01-080618	Solid	08/06/18 09:00	08/14/18 09:45

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 580
79568

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

EPH / VPH

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: CH2M / Jacobs
Address: 2020 4th Ave, Ste. 300
City: Portland | State: OR | Zip Code: 97201
Project Name and Location (State): BNSF - Wishram | WA
Contract/Purchase Order/Quote No.:

Client Contact: Carrie Andrews
Telephone Number (Area Code)/Fax Number:
Sampler: Jennifer Ulrich
Billing Contact: Carrie Andrews
Lab Contact: Kristine Ellen

Date: 8/13/18
Lab Number:
Chain of Custody Number: 37667
Page 1 of 2

Analysis (Attach list if more space is needed)
- EPH (Grain Size)
- VPH (MeOH)
- Preserve

Special Instructions/ Conditions of Receipt

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	EPH	VPH	Special Instructions/ Conditions of Receipt
D240-GS-080618	8/6/18	1450			X								1	2	
D260-GS-080618	8/6/18	1530			X								1	2	
D420-GS-080618	8/6/18	1655			X								1	1	
D420-GS-080618-1	8/6/18	1700			X								1	2	
~~D150-GS-080718~~	~~8/7/18~~	~~0730~~			~~X~~								1	2	NOT INCLUDED
D220-GS-080718	8/7/18	0755			X								1	2	
BG-USA-080718	8/7/18	0850			X								1	2	
D200-GS-080718	8/7/18	1230			X								1	2	
G260-GS-080718	8/7/18	1800			X								1	2	
G200-GS-080718	8/7/18	1850			X								1	2	~~Remember~~
R120 ~~D260~~-GS-080818	8/8/18	1640			X								1	2	~~Remember~~
D260-GS-080818	8/8/18	1740			X								1	2	~~Remember~~

Cooler: ☑ Yes ☐ No Cooler Temp: _____
Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown
Sample Disposal: ☑ Disposal By Lab ☐ Return To Client ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days)
☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

	Sign/Print	Date	Time
1. Relinquished By	Jennifer Ulrich / Jennifer Ulrich	8/13/18	1200
2. Relinquished By			
3. Relinquished By			
1. Received By	Ken Hobbs	8-14-18	0945
2. Received By			
3. Received By			

Comments

Therm. ID: A2 Cor: 5.4 ° Unc: 5.3 °
Cooler Dsc: Log Gr—
Packing: Bubble
Cust. Seal: Yes ___ No ___
Wet Packs/Dry Ice/None
FedEx: P.O
UPS:
Lab Cour:
Other:

DISTRIBUTION: WHITE – Stays with the Samples; CANA

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

CH2M

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

EPH/VPH

☐ Rush
☐ Short Hold

Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
2020 4th Ave, Ste. 300	Carrie Andrews	8/13/18	37452
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 2**
Portland OR 97201	503 348 9500		
City / **State** / **Zip Code**	**Sampler**	**Lab Contact**	
WISTRAM / WA	Jennifer Ulrich		
Project Name and Location (State)	**Billing Contact**		
BNSF - WISTRAM	Carrie Andrews		
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis (Attach list if more space is needed): EPH/Grain Size	VPH	Special Instructions/ Conditions of Receipt
I400-GS-080918	8/9/18	1000			X		X						1	2	
TB-01-080618	8/6/18	0900		X										2	

Cooler
☒ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months
(A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days)
☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

	Relinquished By Sign/Print	Date	Time	Received By Sign/Print	Date	Time
1.	Jennifer Ulrich / Jennifer Ulrich	8/13/18	1200	Ken Hobbs	8.14.18	945
2.						
3.						

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

9/28/2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

580-79568 Chain of Custody

Cooler Received/Opened On 8/17/2018 @ 1055

Time Samples Removed From Cooler 17:06 Time Samples Placed In Storage 17:18 (2 Hour Window)

1. Tracking # 6262 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17610176 pH Strip Lot _____ Chlorine Strip Lot _____

2. Temperature of rep. sample or temp blank when opened: 2.9 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...(NA)

4. Were custody seals on outside of cooler? (YES)...NO...NA

If yes, how many and where: 1 (Front)

5. Were the seals intact, signed, and dated correctly? (YES)...NO...NA

6. Were custody papers inside cooler? (YES)...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) JJ

7. Were custody seals on containers: YES (NO) and Intact YES...NO...(NA)

Were these signed and dated correctly? YES...NO...(NA)

8. Packing mat'l used? (Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES)...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES)...NO...NA

12. Did all container labels and tags agree with custody papers? (YES)...NO...NA

13a. Were VOA vials received? (YES)...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...(NA)

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES...(NO)...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) JJ

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...(NA)

b. Did the bottle labels indicate that the correct preservatives were used (YES)...NO...NA

16. Was residual chlorine present? YES...NO...(NA)

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) JJ

17. Were custody papers properly filled out (ink, signed, etc)? (YES)...NO...NA

18. Did you sign the custody papers in the appropriate place? (YES)...NO...NA

19. Were correct containers used for the analysis requested? (YES)...NO...NA

20. Was sufficient amount of sample sent in each container? (YES)...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) JJ

I certify that I attached a label with the unique LIMS number to each container (intial) JJ

21. Were there Non-Conformance issues at login? YES...(NO) Was a NCM generated? YES...(NO)...#_____

BIS = Broken in shipment

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Phone (253) 922-2310 Fax (253) 922-5047

Chain of Custody Record

580-79568

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Walker, Elaine M	C No: 0-58205.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: elaine.walker@testamericainc.com	State: Washington	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc		Accreditations Required (See note):	Job #: 580-79568-1
Address: 2960 Foster Creighton Drive, ,	Due Date Requested: 8/21/2018		
City: Nashville	TAT Requested (days):		
State, Zip: TN, 37204			
Phone: 615-726-0177(Tel) 615-726-3404(Fax)	PO #:		
Email:	WO #:		
Project Name: BNSF-Wishram	Project #: 58012524		
Site:	SSOW#:		

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	NWTPH_VPH/5035FM_Calc Northwest VPH	NWTPH_VPH_Calc/ NW VPH (Adjusted Ranges)	Total Number of containers	Special Instructions/Note:
		Preservation Code:								
D240-GS-080618 (580-79568-1)	8/6/18	14:50 Pacific		Solid			X	X	1	
D260-GS-080618 (580-79568-2)	8/6/18	15:30 Pacific		Solid			X	X	1	
D420-GS-080618 (580-79568-3)	8/6/18	16:55 Pacific		Solid			X	X	1	
D420-GS-080618-1 (580-79568-4)	8/6/18	17:00 Pacific		Solid			X	X	1	
D220-GS-080718 (580-79568-5)	8/7/18	07:55 Pacific		Solid			X	X	1	
BG-US01-080718 (580-79568-6)	8/7/18	08:50 Pacific		Solid			X	X	1	
D200-GS-080718 (580-79568-7)	8/7/18	12:30 Pacific		Solid			X	X	1	
G260-GS-080718 (580-79568-8)	8/7/18	18:00 Pacific		Solid			X	X	1	
G200-GS-080718 (580-79568-9)	8/7/18	18:50 Pacific		Solid			X	X	1	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: [signature]	Date/Time: 8-16-18 1414	Company TAS	Received by: [signature] Date/Time: 08/17/18 10:55 Company [illegible]
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company
Custody Seals Intact: ∆ Yes ∆ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: 2.9

Ver: 09/20/2016

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Phone (253) 922-2310 Fax (253) 922-5047

Chain of Custody Record

Loc: 580
79568

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Walker, Elaine M	king No(s):	COC No: 580-58205.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: elaine.walker@testamericainc.com	gin: Washington	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc		Accreditations Required (See note):		Job #: 580-79568-1
Address: 2960 Foster Creighton Drive, ,	Due Date Requested: 8/21/2018			
City: Nashville	TAT Requested (days):			
State, Zip: TN, 37204				
Phone: 615-726-0177(Tel) 615-726-3404(Fax)	PO #:			
Email:	WO #:			
Project Name: BNSF-Wishram	Project #: 58012524			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	NWTPH_VPH/5035FM_Calc Northwest VPH	NWTPH_VPH_Calc/ NW VPH (Adjusted Ranges)	Total Number of containers	Special Instructions/Note:
		Preservation Code:								
K120-GS-080818 (580-79568-10)	8/8/18	16:40 Pacific		Solid			X	X	1	
J260-GS-080818 (580-79568-11)	8/8/18	17:40 Pacific		Solid			X	X	1	
I400-GS-080918 (580-79568-12)	8/9/18	10:00 Pacific		Solid			X	X	1	
TB-01-080618 (580-79568-13)	8/6/18	09:00 Pacific		Solid			X	X	1	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. I

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For _____ Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:		Time:		Method of Shipment:	
Relinquished by:	Date/Time: 8-16-18 1414	Company TASea	Received by:		Date/Time: 08/17/18 10:55	Company TA-NAS	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	
Relinquished by:	Date/Time:	Company	Received by:		Date/Time:	Company	
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: 2.9				

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: CH2M Hill, Inc.

Job Number: 580-79568-1

Login Number: 79568
List Number: 1
Creator: Gall, Brandon A

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	False	Container rec'd broken. Sufficient sample in remaining containers for analysis.
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

August 22, 2018

Jacobs - BNSF Region 1

Sample Delivery Group:	L1017281
Samples Received:	08/14/2018
Project Number:	
Description:	BNSF-Wishram Railyard
Site:	BNSF-WISHRAM
Report To:	Jennifer Ulrich 2020 SW 4th Ave, Ste 300 Portland, OR 97201

Entire Report Reviewed By:

Mark W. Beasley
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

D240-GS-080618 L1017281-01 Solid

Collected by	Collected date/time	Received date/time
	08/06/18 14:50	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153813	1	08/17/18 13:35	08/17/18 13:48	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	10	08/16/18 07:34	08/17/18 05:20	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	100	08/16/18 13:54	08/17/18 19:11	MTJ
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 07:25	DMG

D260-GS-080618 L1017281-02 Solid

Collected by	Collected date/time	Received date/time
	08/06/18 15:30	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153813	1	08/17/18 13:35	08/17/18 13:48	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	10	08/16/18 07:34	08/17/18 05:33	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	2	08/16/18 13:54	08/17/18 00:30	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 06:22	DMG

D420-GS-080618 L1017281-03 Solid

Collected by	Collected date/time	Received date/time
	08/06/18 16:55	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153813	1	08/17/18 13:35	08/17/18 13:48	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	1	08/16/18 07:34	08/17/18 04:39	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 01:08	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 03:54	DMG

D420-GS-080618-1 L1017281-04 Solid

Collected by	Collected date/time	Received date/time
	08/06/18 17:00	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153813	1	08/17/18 13:35	08/17/18 13:48	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	1	08/16/18 07:34	08/17/18 04:53	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 01:21	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 04:15	DMG

D150-GS-080718 L1017281-05 Solid

Collected by	Collected date/time	Received date/time
	08/07/18 07:30	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	10	08/16/18 07:34	08/17/18 05:47	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	20	08/16/18 13:54	08/17/18 03:16	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 07:04	DMG

D220-GS-080718 L1017281-06 Solid

Collected by	Collected date/time	Received date/time
	08/07/18 07:55	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	10	08/16/18 07:34	08/17/18 06:00	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	10	08/16/18 13:54	08/17/18 03:28	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 05:39	DMG

BG-USO1-GS-080718 L1017281-07 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 08:50	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	1	08/16/18 07:34	08/17/18 05:06	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 02:12	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 04:36	DMG

D200-GS-080718 L1017281-08 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 12:30	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1152767	20	08/16/18 07:34	08/17/18 06:14	DMW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	20	08/16/18 13:54	08/17/18 19:24	MTJ
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 07:46	DMG

D200-SC-080718A L1017281-09 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 16:40	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:09	JER

G260-SC-080718-A L1017281-10 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 17:25	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:05	JER

G260-SC-080718-A-1 L1017281-11 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 17:30	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:06	JER

G260-SC-080718-B L1017281-12 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 17:10	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:06	JER

G260-GS-080718 L1017281-13 Solid

			Collected by	Collected date/time	Received date/time
				08/07/18 18:00	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1153401	1	08/17/18 14:33	08/18/18 00:58	AAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 02:24	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 04:57	DMG

G200-GS-080718 L1017281-14 Solid

Collected by	Collected date/time	Received date/time
	08/07/18 18:50	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153814	1	08/17/18 13:18	08/17/18 13:31	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1153401	1	08/17/18 14:33	08/18/18 01:11	AAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 02:37	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 05:18	DMG

G200-SC-080718-A L1017281-15 Solid

Collected by	Collected date/time	Received date/time
	08/07/18 18:40	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:06	JER

F400B-SC-080818-A L1017281-16 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 11:55	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:10	JER

F400B-SC-080818-B L1017281-17 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 12:00	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:08	JER

F360-SC-080818-A L1017281-18 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 13:10	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:08	JER

F360-SC-080818-B L1017281-19 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 13:15	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:06	JER

K120-GS-080818 L1017281-20 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 16:40	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1153401	5	08/17/18 14:33	08/18/18 01:25	AAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	1	08/16/18 13:54	08/17/18 02:49	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 06:00	DMG

K120-SC-080818-A L1017281-21 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 16:55	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:07	JER

J260-GS-080818 L1017281-22 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 17:40	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1153401	1000	08/17/18 14:33	08/18/18 01:52	AAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	200	08/16/18 13:54	08/17/18 19:38	MTJ
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	5	08/15/18 20:50	08/16/18 08:07	DMG

J260-SC-080818-A L1017281-23 Solid

Collected by	Collected date/time	Received date/time
	08/08/18 17:45	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:06	JER

I400-GS-080918 L1017281-24 Solid

Collected by	Collected date/time	Received date/time
	08/09/18 10:00	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153815	1	08/17/18 13:07	08/17/18 13:16	KDW
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT	WG1153401	10	08/17/18 14:33	08/18/18 01:39	AAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1152768	5	08/16/18 13:54	08/17/18 03:02	DMW
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1152773	1	08/15/18 20:50	08/16/18 06:43	DMG

I400-SC-080918-A L1017281-25 Solid

Collected by	Collected date/time	Received date/time
	08/09/18 10:10	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153817	1	08/17/18 12:53	08/17/18 13:04	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:07	JER

I400-SC-080918-B L1017281-26 Solid

Collected by	Collected date/time	Received date/time
	08/09/18 10:15	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1153817	1	08/17/18 12:53	08/17/18 13:04	KDW
Wet Chemistry by Method USDA LOI	WG1153690	1	08/20/18 16:38	08/21/18 14:07	JER

EB-01-080718 L1017281-27 GW

Collected by	Collected date/time	Received date/time
	08/07/18 16:00	08/14/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1152148	1	08/14/18 17:05	08/15/18 07:47	ADF

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Project Manager

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	71.6		1	08/17/2018 13:48	WG1153813

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	180		18.6	55.9	10	08/17/2018 05:20	WG1152767
Residual Range Organics (RRO)	781		46.5	140	10	08/17/2018 05:20	WG1152767
(S) o-Terphenyl	*64.6*			*18.0-148*		*08/17/2018 05:20*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	219	J	186	559	100	08/17/2018 19:11	WG1152768
Residual Range Organics (RRO)	907	J	465	1400	100	08/17/2018 19:11	WG1152768
(S) o-Terphenyl	*135*	J7		*18.0-148*		*08/17/2018 19:11*	WG1152768

Sample Narrative:

L1017281-01 WG1152768: diluted due to viscosity

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	0.00655	J	0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Acenaphthene	U		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Acenaphthylene	0.00630	J	0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Benzo(a)anthracene	0.0233		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Benzo(a)pyrene	0.0275		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Benzo(b)fluoranthene	0.0208		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Benzo(g,h,i)perylene	U		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Benzo(k)fluoranthene	0.0143		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Chrysene	0.0189		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Dibenz(a,h)anthracene	0.00864		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Fluoranthene	U		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Fluorene	0.00210	J	0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Indeno(1,2,3-cd)pyrene	0.0148		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Naphthalene	0.00428	J	0.00280	0.0280	1	08/16/2018 07:25	WG1152773
Phenanthrene	0.0129		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
Pyrene	0.0489		0.000839	0.00839	1	08/16/2018 07:25	WG1152773
1-Methylnaphthalene	U		0.00280	0.0280	1	08/16/2018 07:25	WG1152773
2-Methylnaphthalene	0.00300	J	0.00280	0.0280	1	08/16/2018 07:25	WG1152773
2-Chloronaphthalene	U		0.00280	0.0280	1	08/16/2018 07:25	WG1152773
(S) Nitrobenzene-d5	*106*			*14.0-149*		*08/16/2018 07:25*	WG1152773
(S) 2-Fluorobiphenyl	*68.8*			*34.0-125*		*08/16/2018 07:25*	WG1152773
(S) p-Terphenyl-d14	*68.3*			*23.0-120*		*08/16/2018 07:25*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	70.7		1	08/17/2018 13:48	WG1153813

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	81.5		18.8	56.6	10	08/17/2018 05:33	WG1152767
Residual Range Organics (RRO)	313		47.1	141	10	08/17/2018 05:33	WG1152767
(S) o-Terphenyl	*95.3*			*18.0-148*		*08/17/2018 05:33*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	7.88	J	3.78	11.3	2	08/17/2018 00:30	WG1152768
Residual Range Organics (RRO)	32.3	J6	9.44	28.3	2	08/17/2018 00:30	WG1152768
(S) o-Terphenyl	*80.0*			*18.0-148*		*08/17/2018 00:30*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Acenaphthene	U		0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Acenaphthylene	U		0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Benzo(a)anthracene	0.00391	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Benzo(a)pyrene	0.00424	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Benzo(b)fluoranthene	0.00521	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Benzo(g,h,i)perylene	0.00600	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Benzo(k)fluoranthene	0.00166	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Chrysene	0.00324	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Dibenz(a,h)anthracene	0.000931	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Fluoranthene	0.00398	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Fluorene	U		0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Indeno(1,2,3-cd)pyrene	0.00272	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Naphthalene	U		0.00283	0.0283	1	08/16/2018 06:22	WG1152773
Phenanthrene	0.00149	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
Pyrene	0.00531	J	0.000849	0.00849	1	08/16/2018 06:22	WG1152773
1-Methylnaphthalene	U		0.00283	0.0283	1	08/16/2018 06:22	WG1152773
2-Methylnaphthalene	U		0.00283	0.0283	1	08/16/2018 06:22	WG1152773
2-Chloronaphthalene	U		0.00283	0.0283	1	08/16/2018 06:22	WG1152773
(S) Nitrobenzene-d5	*100*			*14.0-149*		*08/16/2018 06:22*	WG1152773
(S) 2-Fluorobiphenyl	*43.8*			*34.0-125*		*08/16/2018 06:22*	WG1152773
(S) p-Terphenyl-d14	*58.6*			*23.0-120*		*08/16/2018 06:22*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	72.8		1	08/17/2018 13:48	WG1153813

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.83	5.49	1	08/17/2018 04:39	WG1152767
Residual Range Organics (RRO)	U		4.57	13.7	1	08/17/2018 04:39	WG1152767
(S) o-Terphenyl	*83.3*			*18.0-148*		*08/17/2018 04:39*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.83	5.49	1	08/17/2018 01:08	WG1152768
Residual Range Organics (RRO)	U		4.57	13.7	1	08/17/2018 01:08	WG1152768
(S) o-Terphenyl	*71.5*			*18.0-148*		*08/17/2018 01:08*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Acenaphthene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Acenaphthylene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Benzo(a)anthracene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Benzo(a)pyrene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Benzo(b)fluoranthene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Benzo(g,h,i)perylene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Benzo(k)fluoranthene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Chrysene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Dibenz(a,h)anthracene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Fluoranthene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Fluorene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Naphthalene	U		0.00275	0.0275	1	08/16/2018 03:54	WG1152773
Phenanthrene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
Pyrene	U		0.000824	0.00824	1	08/16/2018 03:54	WG1152773
1-Methylnaphthalene	U		0.00275	0.0275	1	08/16/2018 03:54	WG1152773
2-Methylnaphthalene	U		0.00275	0.0275	1	08/16/2018 03:54	WG1152773
2-Chloronaphthalene	U		0.00275	0.0275	1	08/16/2018 03:54	WG1152773
(S) Nitrobenzene-d5	*105*			*14.0-149*		*08/16/2018 03:54*	WG1152773
(S) 2-Fluorobiphenyl	*56.0*			*34.0-125*		*08/16/2018 03:54*	WG1152773
(S) p-Terphenyl-d14	*78.5*			*23.0-120*		*08/16/2018 03:54*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	73.9		1	08/17/2018 13:48	WG1153813

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.80	5.41	1	08/17/2018 04:53	WG1152767
Residual Range Organics (RRO)	5.95	J	4.50	13.5	1	08/17/2018 04:53	WG1152767
(S) o-Terphenyl	*67.5*			*18.0-148*		*08/17/2018 04:53*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	2.39	J	1.80	5.41	1	08/17/2018 01:21	WG1152768
Residual Range Organics (RRO)	7.60	J	4.50	13.5	1	08/17/2018 01:21	WG1152768
(S) o-Terphenyl	*76.7*			*18.0-148*		*08/17/2018 01:21*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Acenaphthene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Acenaphthylene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Benzo(a)anthracene	0.000966	J	0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Benzo(a)pyrene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Benzo(b)fluoranthene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Benzo(g,h,i)perylene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Benzo(k)fluoranthene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Chrysene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Dibenz(a,h)anthracene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Fluoranthene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Fluorene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Naphthalene	U		0.00270	0.0270	1	08/16/2018 04:15	WG1152773
Phenanthrene	U		0.000811	0.00811	1	08/16/2018 04:15	WG1152773
Pyrene	0.000937	J	0.000811	0.00811	1	08/16/2018 04:15	WG1152773
1-Methylnaphthalene	U		0.00270	0.0270	1	08/16/2018 04:15	WG1152773
2-Methylnaphthalene	U		0.00270	0.0270	1	08/16/2018 04:15	WG1152773
2-Chloronaphthalene	U		0.00270	0.0270	1	08/16/2018 04:15	WG1152773
(S) Nitrobenzene-d5	*103*			*14.0-149*		*08/16/2018 04:15*	WG1152773
(S) 2-Fluorobiphenyl	*58.0*			*34.0-125*		*08/16/2018 04:15*	WG1152773
(S) p-Terphenyl-d14	*60.2*			*23.0-120*		*08/16/2018 04:15*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	70.9		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	50.4	J	18.8	56.4	10	08/17/2018 05:47	WG1152767
Residual Range Organics (RRO)	223		47.0	141	10	08/17/2018 05:47	WG1152767
(S) o-Terphenyl	*126*			*18.0-148*		*08/17/2018 05:47*	WG1152767

Sample Narrative:

L1017281-05 WG1152767: Dilution due to matrix impact during extract concentration procedure

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		37.7	113	20	08/17/2018 03:16	WG1152768
Residual Range Organics (RRO)	174	J	94.1	282	20	08/17/2018 03:16	WG1152768
(S) o-Terphenyl	*121*	J7		*18.0-148*		*08/17/2018 03:16*	WG1152768

Sample Narrative:

L1017281-05 WG1152768: diluted due to viscosity

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Acenaphthene	U		0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Acenaphthylene	U		0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Benzo(a)anthracene	0.00185	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Benzo(a)pyrene	0.00248	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Benzo(b)fluoranthene	0.00286	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Benzo(g,h,i)perylene	0.00529	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Benzo(k)fluoranthene	0.00179	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Chrysene	0.00172	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Dibenz(a,h)anthracene	U		0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Fluoranthene	0.00268	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Fluorene	U		0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Indeno(1,2,3-cd)pyrene	0.00183	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Naphthalene	U		0.00282	0.0282	1	08/16/2018 07:04	WG1152773
Phenanthrene	0.00103	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
Pyrene	0.00437	J	0.000847	0.00847	1	08/16/2018 07:04	WG1152773
1-Methylnaphthalene	U		0.00282	0.0282	1	08/16/2018 07:04	WG1152773
2-Methylnaphthalene	U		0.00282	0.0282	1	08/16/2018 07:04	WG1152773
2-Chloronaphthalene	U		0.00282	0.0282	1	08/16/2018 07:04	WG1152773
(S) Nitrobenzene-d5	*95.1*			*14.0-149*		*08/16/2018 07:04*	WG1152773
(S) 2-Fluorobiphenyl	*61.0*			*34.0-125*		*08/16/2018 07:04*	WG1152773
(S) p-Terphenyl-d14	*72.6*			*23.0-120*		*08/16/2018 07:04*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	68.0		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	40.0	J	19.5	58.8	10	08/17/2018 06:00	WG1152767
Residual Range Organics (RRO)	188		48.9	147	10	08/17/2018 06:00	WG1152767
(S) o-Terphenyl	*126*			*18.0-148*		*08/17/2018 06:00*	WG1152767

Sample Narrative:

L1017281-06 WG1152767: Dilution due to matrix impact during extract concentration procedure

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	20.6	J	19.5	58.8	10	08/17/2018 03:28	WG1152768
Residual Range Organics (RRO)	88.8	J	48.9	147	10	08/17/2018 03:28	WG1152768
(S) o-Terphenyl	*93.4*			*18.0-148*		*08/17/2018 03:28*	WG1152768

Sample Narrative:

L1017281-06 WG1152768: diluted due to viscosity

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Acenaphthene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Acenaphthylene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Benzo(a)anthracene	0.00282	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Benzo(a)pyrene	0.00188	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Benzo(b)fluoranthene	0.00107	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Benzo(g,h,i)perylene	0.00325	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Benzo(k)fluoranthene	0.00229	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Chrysene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Dibenz(a,h)anthracene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Fluoranthene	0.00135	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Fluorene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Indeno(1,2,3-cd)pyrene	0.00106	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Naphthalene	U		0.00294	0.0294	1	08/16/2018 05:39	WG1152773
Phenanthrene	U		0.000882	0.00882	1	08/16/2018 05:39	WG1152773
Pyrene	0.00257	J	0.000882	0.00882	1	08/16/2018 05:39	WG1152773
1-Methylnaphthalene	U		0.00294	0.0294	1	08/16/2018 05:39	WG1152773
2-Methylnaphthalene	U		0.00294	0.0294	1	08/16/2018 05:39	WG1152773
2-Chloronaphthalene	U		0.00294	0.0294	1	08/16/2018 05:39	WG1152773
(S) Nitrobenzene-d5	*99.7*			*14.0-149*		*08/16/2018 05:39*	WG1152773
(S) 2-Fluorobiphenyl	*76.4*			*34.0-125*		*08/16/2018 05:39*	WG1152773
(S) p-Terphenyl-d14	*88.1*			*23.0-120*		*08/16/2018 05:39*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	75.8		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.75	5.28	1	08/17/2018 05:06	WG1152767
Residual Range Organics (RRO)	U		4.39	13.2	1	08/17/2018 05:06	WG1152767
(S) o-Terphenyl	*82.2*			*18.0-148*		*08/17/2018 05:06*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.75	5.28	1	08/17/2018 02:12	WG1152768
Residual Range Organics (RRO)	U		4.39	13.2	1	08/17/2018 02:12	WG1152768
(S) o-Terphenyl	*62.2*			*18.0-148*		*08/17/2018 02:12*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Acenaphthene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Acenaphthylene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Benzo(a)anthracene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Benzo(a)pyrene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Benzo(b)fluoranthene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Benzo(g,h,i)perylene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Benzo(k)fluoranthene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Chrysene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Dibenz(a,h)anthracene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Fluoranthene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Fluorene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Naphthalene	U		0.00264	0.0264	1	08/16/2018 04:36	WG1152773
Phenanthrene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
Pyrene	U		0.000791	0.00791	1	08/16/2018 04:36	WG1152773
1-Methylnaphthalene	U		0.00264	0.0264	1	08/16/2018 04:36	WG1152773
2-Methylnaphthalene	U		0.00264	0.0264	1	08/16/2018 04:36	WG1152773
2-Chloronaphthalene	U		0.00264	0.0264	1	08/16/2018 04:36	WG1152773
(S) Nitrobenzene-d5	*101*			*14.0-149*		*08/16/2018 04:36*	WG1152773
(S) 2-Fluorobiphenyl	*49.4*			*34.0-125*		*08/16/2018 04:36*	WG1152773
(S) p-Terphenyl-d14	*56.2*			*23.0-120*		*08/16/2018 04:36*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	78.1		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	459		34.2	102	20	08/17/2018 06:14	WG1152767
Residual Range Organics (RRO)	1380		85.4	256	20	08/17/2018 06:14	WG1152767
(S) o-Terphenyl	*68.1*	J7		*18.0-148*		*08/17/2018 06:14*	WG1152767

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	57.6	J	34.2	102	20	08/17/2018 19:24	WG1152768
Residual Range Organics (RRO)	179	J	85.4	256	20	08/17/2018 19:24	WG1152768
(S) o-Terphenyl	*79.1*	J7		*18.0-148*		*08/17/2018 19:24*	WG1152768

Sample Narrative:

L1017281-08 WG1152768: diluted due to viscosity

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Acenaphthene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Acenaphthylene	0.00827		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Benzo(a)anthracene	0.0173		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Benzo(a)pyrene	0.134		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Benzo(b)fluoranthene	0.0243		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Benzo(g,h,i)perylene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Benzo(k)fluoranthene	0.0177		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Chrysene	0.113		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Dibenz(a,h)anthracene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Fluoranthene	0.00726	J	0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Fluorene	0.00161	J	0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Naphthalene	0.00579	J	0.00256	0.0256	1	08/16/2018 07:46	WG1152773
Phenanthrene	U		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
Pyrene	0.0231		0.000769	0.00769	1	08/16/2018 07:46	WG1152773
1-Methylnaphthalene	U		0.00256	0.0256	1	08/16/2018 07:46	WG1152773
2-Methylnaphthalene	U		0.00256	0.0256	1	08/16/2018 07:46	WG1152773
2-Chloronaphthalene	U		0.00256	0.0256	1	08/16/2018 07:46	WG1152773
(S) Nitrobenzene-d5	*90.1*			*14.0-149*		*08/16/2018 07:46*	WG1152773
(S) 2-Fluorobiphenyl	*52.9*			*34.0-125*		*08/16/2018 07:46*	WG1152773
(S) p-Terphenyl-d14	*59.3*			*23.0-120*		*08/16/2018 07:46*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	78.6		1	08/17/2018 13:31	WG1153814

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	4580		3.33	10.0	1	08/21/2018 14:09	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	67.4		1	08/17/2018 13:31	WG1153814

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	86400		3.33	10.0	1	08/21/2018 14:05	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	73.8		1	08/17/2018 13:31	WG1153814

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	107000		3.33	10.0	1	08/21/2018 14:06	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	84.6		1	08/17/2018 13:31	WG1153814

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	66700		3.33	10.0	1	08/21/2018 14:06	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	70.4		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	4.53	J	1.89	5.68	1	08/18/2018 00:58	WG1153401
Residual Range Organics (RRO)	12.3	J	4.73	14.2	1	08/18/2018 00:58	WG1153401
(S) o-Terphenyl	*57.1*			*18.0-148*		*08/18/2018 00:58*	WG1153401

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.89	5.68	1	08/17/2018 02:24	WG1152768
Residual Range Organics (RRO)	U		4.73	14.2	1	08/17/2018 02:24	WG1152768
(S) o-Terphenyl	*61.2*			*18.0-148*		*08/17/2018 02:24*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Acenaphthene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Acenaphthylene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Benzo(a)anthracene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Benzo(a)pyrene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Benzo(b)fluoranthene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Benzo(g,h,i)perylene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Benzo(k)fluoranthene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Chrysene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Dibenz(a,h)anthracene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Fluoranthene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Fluorene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Naphthalene	U		0.00284	0.0284	1	08/16/2018 04:57	WG1152773
Phenanthrene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
Pyrene	U		0.000852	0.00852	1	08/16/2018 04:57	WG1152773
1-Methylnaphthalene	U		0.00284	0.0284	1	08/16/2018 04:57	WG1152773
2-Methylnaphthalene	U		0.00284	0.0284	1	08/16/2018 04:57	WG1152773
2-Chloronaphthalene	U		0.00284	0.0284	1	08/16/2018 04:57	WG1152773
(S) Nitrobenzene-d5	*102*			*14.0-149*		*08/16/2018 04:57*	WG1152773
(S) 2-Fluorobiphenyl	*57.4*			*34.0-125*		*08/16/2018 04:57*	WG1152773
(S) p-Terphenyl-d14	*76.5*			*23.0-120*		*08/16/2018 04:57*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	72.1		1	08/17/2018 13:31	WG1153814

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	2.70	J	1.84	5.55	1	08/18/2018 01:11	WG1153401
Residual Range Organics (RRO)	14.0		4.62	13.9	1	08/18/2018 01:11	WG1153401
(S) o-Terphenyl	*67.1*			*18.0-148*		*08/18/2018 01:11*	WG1153401

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		1.84	5.55	1	08/17/2018 02:37	WG1152768
Residual Range Organics (RRO)	5.57	J	4.62	13.9	1	08/17/2018 02:37	WG1152768
(S) o-Terphenyl	*62.5*			*18.0-148*		*08/17/2018 02:37*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Acenaphthene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Acenaphthylene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Benzo(a)anthracene	0.00157	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Benzo(a)pyrene	0.00202	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Benzo(b)fluoranthene	0.00227	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Benzo(g,h,i)perylene	0.00251	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Benzo(k)fluoranthene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Chrysene	0.00147	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Dibenz(a,h)anthracene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Fluoranthene	0.00272	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Fluorene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Indeno(1,2,3-cd)pyrene	0.00144	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Naphthalene	U		0.00277	0.0277	1	08/16/2018 05:18	WG1152773
Phenanthrene	U		0.000832	0.00832	1	08/16/2018 05:18	WG1152773
Pyrene	0.00369	J	0.000832	0.00832	1	08/16/2018 05:18	WG1152773
1-Methylnaphthalene	U		0.00277	0.0277	1	08/16/2018 05:18	WG1152773
2-Methylnaphthalene	U		0.00277	0.0277	1	08/16/2018 05:18	WG1152773
2-Chloronaphthalene	U		0.00277	0.0277	1	08/16/2018 05:18	WG1152773
(S) Nitrobenzene-d5	*89.2*			*14.0-149*		*08/16/2018 05:18*	WG1152773
(S) 2-Fluorobiphenyl	*57.4*			*34.0-125*		*08/16/2018 05:18*	WG1152773
(S) p-Terphenyl-d14	*65.6*			*23.0-120*		*08/16/2018 05:18*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	66.0		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	91000		3.33	10.0	1	08/21/2018 14:06	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	79.9		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	3380		3.33	10.0	1	08/21/2018 14:10	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	71.0		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	7510		3.33	10.0	1	08/21/2018 14:08	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	75.5		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	5710		3.33	10.0	1	08/21/2018 14:08	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	61.9		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	57700		3.33	10.0	1	08/21/2018 14:06	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	77.9		1	08/17/2018 13:16	WG1153815

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	U		8.56	25.7	5	08/18/2018 01:25	WG1153401
Residual Range Organics (RRO)	35.2	J	21.4	64.2	5	08/18/2018 01:25	WG1153401
(S) o-Terphenyl	*69.9*			*18.0-148*		*08/18/2018 01:25*	WG1153401

Sample Narrative:

L1017281-20 WG1153401: Cannot run at lower dilution due to viscosity of extract

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	3.95	J	1.71	5.13	1	08/17/2018 02:49	WG1152768
Residual Range Organics (RRO)	19.6		4.27	12.8	1	08/17/2018 02:49	WG1152768
(S) o-Terphenyl	*61.1*			*18.0-148*		*08/17/2018 02:49*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Acenaphthene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Acenaphthylene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Benzo(a)anthracene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Benzo(a)pyrene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Benzo(b)fluoranthene	0.00116	J	0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Benzo(g,h,i)perylene	0.00560	J	0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Benzo(k)fluoranthene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Chrysene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Dibenz(a,h)anthracene	0.000823	J	0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Fluoranthene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Fluorene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Indeno(1,2,3-cd)pyrene	0.00144	J	0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Naphthalene	U		0.00257	0.0257	1	08/16/2018 06:00	WG1152773
Phenanthrene	U		0.000770	0.00770	1	08/16/2018 06:00	WG1152773
Pyrene	0.00104	J	0.000770	0.00770	1	08/16/2018 06:00	WG1152773
1-Methylnaphthalene	U		0.00257	0.0257	1	08/16/2018 06:00	WG1152773
2-Methylnaphthalene	U		0.00257	0.0257	1	08/16/2018 06:00	WG1152773
2-Chloronaphthalene	U		0.00257	0.0257	1	08/16/2018 06:00	WG1152773
(S) Nitrobenzene-d5	*104*			*14.0-149*		*08/16/2018 06:00*	WG1152773
(S) 2-Fluorobiphenyl	*90.0*			*34.0-125*		*08/16/2018 06:00*	WG1152773
(S) p-Terphenyl-d14	*92.3*			*23.0-120*		*08/16/2018 06:00*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	79.6		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	9320		3.33	10.0	1	08/21/2018 14:07	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	72.9		1	08/17/2018 13:16	WG1153815

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	12700		1820	5490	1000	08/18/2018 01:52	WG1153401
Residual Range Organics (RRO)	31000		4570	13700	1000	08/18/2018 01:52	WG1153401
(S) o-Terphenyl	*111*	J7		*18.0-148*		*08/18/2018 01:52*	WG1153401

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	4830		366	1100	200	08/17/2018 19:38	WG1152768
Residual Range Organics (RRO)	12100		915	2740	200	08/17/2018 19:38	WG1152768
(S) o-Terphenyl	*0.000*	J7		*18.0-148*		*08/17/2018 19:38*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	0.195		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Acenaphthene	0.139		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Acenaphthylene	U		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Benzo(a)anthracene	0.169		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Benzo(a)pyrene	1.23		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Benzo(b)fluoranthene	0.0527		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Benzo(g,h,i)perylene	0.305		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Benzo(k)fluoranthene	0.403		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Chrysene	0.741		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Dibenz(a,h)anthracene	U		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Fluoranthene	U		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Fluorene	0.109		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Indeno(1,2,3-cd)pyrene	0.0999		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Naphthalene	0.0605	J	0.0137	0.137	5	08/16/2018 08:07	WG1152773
Phenanthrene	0.399		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
Pyrene	1.82		0.00412	0.0412	5	08/16/2018 08:07	WG1152773
1-Methylnaphthalene	0.335		0.0137	0.137	5	08/16/2018 08:07	WG1152773
2-Methylnaphthalene	0.332		0.0137	0.137	5	08/16/2018 08:07	WG1152773
2-Chloronaphthalene	U		0.0137	0.137	5	08/16/2018 08:07	WG1152773
(S) Nitrobenzene-d5	*63.7*			*14.0-149*		*08/16/2018 08:07*	WG1152773
(S) 2-Fluorobiphenyl	*88.8*			*34.0-125*		*08/16/2018 08:07*	WG1152773
(S) p-Terphenyl-d14	*77.5*			*23.0-120*		*08/16/2018 08:07*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	68.1		1	08/17/2018 13:16	WG1153815

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	37100		3.33	10.0	1	08/21/2018 14:06	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	78.2		1	08/17/2018 13:16	WG1153815

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-NO SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	54.3		17.0	51.2	10	08/18/2018 01:39	WG1153401
Residual Range Organics (RRO)	290		42.6	128	10	08/18/2018 01:39	WG1153401
(S) o-Terphenyl	*75.4*			*18.0-148*		*08/18/2018 01:39*	WG1153401

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Diesel Range Organics (DRO)	14.1	J	8.53	25.6	5	08/17/2018 03:02	WG1152768
Residual Range Organics (RRO)	74.7		21.4	64.0	5	08/17/2018 03:02	WG1152768
(S) o-Terphenyl	*55.4*			*18.0-148*		*08/17/2018 03:02*	WG1152768

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result (dry)	Qualifier	MDL (dry)	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Anthracene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Acenaphthene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Acenaphthylene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Benzo(a)anthracene	0.00211	J	0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Benzo(a)pyrene	0.000869	J	0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Benzo(b)fluoranthene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Benzo(g,h,i)perylene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Benzo(k)fluoranthene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Chrysene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Dibenz(a,h)anthracene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Fluoranthene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Fluorene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Indeno(1,2,3-cd)pyrene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Naphthalene	U		0.00256	0.0256	1	08/16/2018 06:43	WG1152773
Phenanthrene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
Pyrene	U		0.000768	0.00768	1	08/16/2018 06:43	WG1152773
1-Methylnaphthalene	U		0.00256	0.0256	1	08/16/2018 06:43	WG1152773
2-Methylnaphthalene	U		0.00256	0.0256	1	08/16/2018 06:43	WG1152773
2-Chloronaphthalene	U		0.00256	0.0256	1	08/16/2018 06:43	WG1152773
(S) Nitrobenzene-d5	*108*			*14.0-149*		*08/16/2018 06:43*	WG1152773
(S) 2-Fluorobiphenyl	*89.8*			*34.0-125*		*08/16/2018 06:43*	WG1152773
(S) p-Terphenyl-d14	*94.6*			*23.0-120*		*08/16/2018 06:43*	WG1152773

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	71.5		1	08/17/2018 13:04	WG1153817

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	18600		3.33	10.0	1	08/21/2018 14:07	WG1153690

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	73.9		1	08/17/2018 13:04	WG1153817

Wet Chemistry by Method USDA LOI

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
TOC (Total Organic Carbon)	6700		3.33	10.0	1	08/21/2018 14:07	WG1153690

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Anthracene	U		0.0140	0.0500	1	08/15/2018 07:47	WG1152148
Acenaphthene	U		0.0100	0.0500	1	08/15/2018 07:47	WG1152148
Acenaphthylene	U		0.0120	0.0500	1	08/15/2018 07:47	WG1152148
Benzo(a)anthracene	U		0.00410	0.0500	1	08/15/2018 07:47	WG1152148
Benzo(a)pyrene	U		0.0116	0.0500	1	08/15/2018 07:47	WG1152148
Benzo(b)fluoranthene	0.00261	B J	0.00212	0.0500	1	08/15/2018 07:47	WG1152148
Benzo(g,h,i)perylene	U		0.00227	0.0500	1	08/15/2018 07:47	WG1152148
Benzo(k)fluoranthene	U		0.0136	0.0500	1	08/15/2018 07:47	WG1152148
Chrysene	U		0.0108	0.0500	1	08/15/2018 07:47	WG1152148
Dibenz(a,h)anthracene	U		0.00396	0.0500	1	08/15/2018 07:47	WG1152148
Fluoranthene	0.0519		0.0157	0.0500	1	08/15/2018 07:47	WG1152148
Fluorene	0.0211	J	0.00850	0.0500	1	08/15/2018 07:47	WG1152148
Indeno(1,2,3-cd)pyrene	U		0.0148	0.0500	1	08/15/2018 07:47	WG1152148
Naphthalene	0.329		0.0198	0.250	1	08/15/2018 07:47	WG1152148
Phenanthrene	0.0791		0.00820	0.0500	1	08/15/2018 07:47	WG1152148
Pyrene	0.0293	J	0.0117	0.0500	1	08/15/2018 07:47	WG1152148
1-Methylnaphthalene	0.0293	J	0.00821	0.250	1	08/15/2018 07:47	WG1152148
2-Methylnaphthalene	0.0445	J	0.00902	0.250	1	08/15/2018 07:47	WG1152148
2-Chloronaphthalene	U		0.00647	0.250	1	08/15/2018 07:47	WG1152148
(S) Nitrobenzene-d5	*86.3*			*31.0-160*		*08/15/2018 07:47*	WG1152148
(S) 2-Fluorobiphenyl	*108*			*48.0-148*		*08/15/2018 07:47*	WG1152148
(S) p-Terphenyl-d14	*117*			*37.0-146*		*08/15/2018 07:47*	WG1152148

Method Blank (MB)

(MB) R3334836-1 08/17/18 13:48

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000			

L1017280-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1017280-01 08/17/18 13:48 • (DUP) R3334836-3 08/17/18 13:48

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	86.6	85.6	1	1.10		10

Laboratory Control Sample (LCS)

(LCS) R3334836-2 08/17/18 13:48

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	49.9	99.9	85.0-115	

Method Blank (MB)

(MB) R3334835-1 08/17/18 13:31

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.00100			

L1017281-12 Original Sample (OS) • Duplicate (DUP)

(OS) L1017281-12 08/17/18 13:31 • (DUP) R3334835-3 08/17/18 13:31

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	84.6	86.6	1	2.28		10

Laboratory Control Sample (LCS)

(LCS) R3334835-2 08/17/18 13:31

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	49.9	99.9	85.0-115	

Method Blank (MB)

(MB) R3334834-1 08/17/18 13:16

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000			

L1017281-20 Original Sample (OS) • Duplicate (DUP)

(OS) L1017281-20 08/17/18 13:16 • (DUP) R3334834-3 08/17/18 13:16

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	77.9	78.0	1	0.0467		10

Laboratory Control Sample (LCS)

(LCS) R3334834-2 08/17/18 13:16

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3334832-1 08/17/18 13:04

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000			

L1017283-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1017283-01 08/17/18 13:04 • (DUP) R3334832-3 08/17/18 13:04

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	81.6	81.5	1	0.149		10

Laboratory Control Sample (LCS)

(LCS) R3334832-2 08/17/18 13:04

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3335388-1 08/21/18 14:12

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TOC (Total Organic Carbon)	U		3.33	10.0

L1017281-09 Original Sample (OS) • Duplicate (DUP)

(OS) L1017281-09 08/21/18 14:09 • (DUP) R3335388-4 08/21/18 14:09

Analyte	Original Result mg/kg	DUP Result mg/kg	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	4580	5020	1	9.14		20

L1017281-26 Original Sample (OS) • Duplicate (DUP)

(OS) L1017281-26 08/21/18 14:07 • (DUP) R3335388-5 08/21/18 14:07

Analyte	Original Result mg/kg	DUP Result mg/kg	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
TOC (Total Organic Carbon)	6700	6960	1	3.87		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3335388-2 08/21/18 14:24 • (LCSD) R3335388-3 08/21/18 14:30

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
TOC (Total Organic Carbon)	3890	6780	7000	174	180	39.6-180			3.16	20

Method Blank (MB)

(MB) R3334388-1 08/16/18 11:15

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*79.6*			*18.0-148*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3334388-2 08/16/18 11:29 • (LCSD) R3334388-3 08/16/18 11:42

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	25.0	18.4	18.3	73.6	73.2	50.0-150			0.545	20
Residual Range Organics (RRO)	25.0	17.9	16.8	71.6	67.2	50.0-150			6.34	20
(S) o-Terphenyl				*67.6*	*64.9*	*18.0-148*				

L1016957-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1016957-04 08/17/18 01:02 • (MS) R3334388-4 08/17/18 01:16 • (MSD) R3334388-5 08/17/18 01:29

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	31.0	1100	1480	1280	1220	576	10	50.0-150	V	V	14.4	20
Residual Range Organics (RRO)	31.0	U	ND	ND	0.000	0.000	10	50.0-150	J6	J6	0.000	20
(S) o-Terphenyl					*68.3*	*71.8*		*18.0-148*				

Method Blank (MB)

(MB) R3334684-1 08/17/18 19:47

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*61.4*			*18.0-148*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3334684-2 08/17/18 20:00 • (LCSD) R3334684-3 08/17/18 20:14

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	25.0	15.2	15.4	60.8	61.6	50.0-150			1.31	20
Residual Range Organics (RRO)	25.0	16.2	16.0	64.8	64.0	50.0-150			1.24	20
(S) o-Terphenyl				*60.4*	*60.7*	*18.0-148*				

L1017312-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1017312-02 08/17/18 20:27 • (MS) R3334684-4 08/17/18 20:41 • (MSD) R3334684-5 08/17/18 20:55

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	32.0	3.60	17.6	18.3	43.6	46.0	1	50.0-150	J6	J6	4.29	20
Residual Range Organics (RRO)	32.0	6.47	22.0	22.4	48.6	49.8	1	50.0-150	J6	J6	1.73	20
(S) o-Terphenyl					*42.8*	*38.6*		*18.0-148*				

Method Blank (MB)

(MB) R3334595-1 08/16/18 23:53

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Diesel Range Organics (DRO)	U		1.33	4.00
Residual Range Organics (RRO)	U		3.33	10.0
(S) o-Terphenyl	*83.5*			*18.0-148*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3334595-2 08/17/18 00:05 • (LCSD) R3334595-3 08/17/18 00:18

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	25.0	19.2	21.0	76.8	84.0	50.0-150			8.96	20
Residual Range Organics (RRO)	25.0	16.0	16.4	64.0	65.6	50.0-150			2.47	20
(S) o-Terphenyl				*71.3*	*76.0*	*18.0-148*				

L1017281-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1017281-02 08/17/18 00:30 • (MS) R3334595-4 08/17/18 00:43 • (MSD) R3334595-5 08/17/18 00:56

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Diesel Range Organics (DRO)	35.4	7.88	32.4	32.3	69.3	68.9	1	50.0-150			0.438	20
Residual Range Organics (RRO)	35.4	32.3	33.1	36.9	2.40	13.2	1	50.0-150	J6	J6	10.9	20
(S) o-Terphenyl					*74.9*	*73.3*		*18.0-148*				

Method Blank (MB)

(MB) R3333750-3 08/15/18 01:14

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Anthracene	U		0.0140	0.0500
Acenaphthene	U		0.0100	0.0500
Acenaphthylene	U		0.0120	0.0500
Benzo(a)anthracene	U		0.00410	0.0500
Benzo(a)pyrene	U		0.0116	0.0500
Benzo(b)fluoranthene	0.00284	J	0.00212	0.0500
Benzo(g,h,i)perylene	0.00249	J	0.00227	0.0500
Benzo(k)fluoranthene	U		0.0136	0.0500
Chrysene	U		0.0108	0.0500
Dibenz(a,h)anthracene	U		0.00396	0.0500
Fluoranthene	U		0.0157	0.0500
Fluorene	U		0.00850	0.0500
Indeno(1,2,3-cd)pyrene	U		0.0148	0.0500
Naphthalene	U		0.0198	0.250
Phenanthrene	U		0.00820	0.0500
Pyrene	U		0.0117	0.0500
1-Methylnaphthalene	U		0.00821	0.250
2-Methylnaphthalene	U		0.00902	0.250
2-Chloronaphthalene	U		0.00647	0.250
(S) Nitrobenzene-d5	*93.0*			*31.0-160*
(S) 2-Fluorobiphenyl	*108*			*48.0-148*
(S) p-Terphenyl-d14	*113*			*37.0-146*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3333750-1 08/15/18 00:31 • (LCSD) R3333750-2 08/15/18 00:52

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	2.00	2.31	2.44	115	122	64.0-142			5.47	20
Acenaphthene	2.00	2.10	2.16	105	108	66.0-132			2.82	20
Acenaphthylene	2.00	2.20	2.26	110	113	65.0-132			2.69	20
Benzo(a)anthracene	2.00	2.17	2.25	108	112	59.0-134			3.62	20
Benzo(a)pyrene	2.00	2.28	2.33	114	117	61.0-145			2.17	20
Benzo(b)fluoranthene	2.00	2.16	2.23	108	111	57.0-136			3.19	20
Benzo(g,h,i)perylene	2.00	2.32	2.39	116	119	54.0-140			2.97	20
Benzo(k)fluoranthene	2.00	2.31	2.43	115	122	57.0-141			5.06	20
Chrysene	2.00	2.17	2.28	108	114	63.0-140			4.94	20
Dibenz(a,h)anthracene	2.00	2.49	2.55	124	128	49.0-141			2.38	20
Fluoranthene	2.00	2.35	2.40	117	120	65.0-143			2.11	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3333750-1 08/15/18 00:31 • (LCSD) R3333750-2 08/15/18 00:52

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Fluorene	2.00	2.20	2.26	110	113	64.0-129			2.69	20
Indeno(1,2,3-cd)pyrene	2.00	2.41	2.47	120	123	53.0-141			2.46	20
Naphthalene	2.00	2.12	2.18	106	109	68.0-129			2.79	20
Phenanthrene	2.00	2.14	2.24	107	112	62.0-132			4.57	20
Pyrene	2.00	2.10	2.15	105	108	58.0-156			2.35	20
1-Methylnaphthalene	2.00	2.26	2.32	113	116	68.0-137			2.62	20
2-Methylnaphthalene	2.00	2.14	2.21	107	111	68.0-134			3.22	20
2-Chloronaphthalene	2.00	2.14	2.20	107	110	65.0-129			2.76	20
(S) Nitrobenzene-d5				*90.5*	*92.5*	*31.0-160*				
(S) 2-Fluorobiphenyl				*104*	*107*	*48.0-148*				
(S) p-Terphenyl-d14				*110*	*115*	*37.0-146*				

Method Blank (MB)

(MB) R3334164-3 08/16/18 01:05

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Anthracene	U		0.000600	0.00600
Acenaphthene	U		0.000600	0.00600
Acenaphthylene	U		0.000600	0.00600
Benzo(a)anthracene	U		0.000600	0.00600
Benzo(a)pyrene	U		0.000600	0.00600
Benzo(b)fluoranthene	U		0.000600	0.00600
Benzo(g,h,i)perylene	U		0.000600	0.00600
Benzo(k)fluoranthene	U		0.000600	0.00600
Chrysene	U		0.000600	0.00600
Dibenz(a,h)anthracene	U		0.000600	0.00600
Fluoranthene	U		0.000600	0.00600
Fluorene	U		0.000600	0.00600
Indeno(1,2,3-cd)pyrene	U		0.000600	0.00600
Naphthalene	U		0.00200	0.0200
Phenanthrene	U		0.000600	0.00600
Pyrene	U		0.000600	0.00600
1-Methylnaphthalene	U		0.00200	0.0200
2-Methylnaphthalene	U		0.00200	0.0200
2-Chloronaphthalene	U		0.00200	0.0200
(S) Nitrobenzene-d5	*114*			*14.0-149*
(S) 2-Fluorobiphenyl	*99.4*			*34.0-125*
(S) p-Terphenyl-d14	*97.8*			*23.0-120*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3334164-1 08/16/18 00:23 • (LCSD) R3334164-2 08/16/18 00:44

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	0.0800	0.0702	0.0721	87.8	90.1	50.0-125			2.67	20
Acenaphthene	0.0800	0.0725	0.0713	90.6	89.1	52.0-120			1.67	20
Acenaphthylene	0.0800	0.0743	0.0726	92.9	90.8	51.0-120			2.31	20
Benzo(a)anthracene	0.0800	0.0731	0.0722	91.4	90.3	46.0-121			1.24	20
Benzo(a)pyrene	0.0800	0.0657	0.0671	82.1	83.9	42.0-121			2.11	20
Benzo(b)fluoranthene	0.0800	0.0745	0.0752	93.1	94.0	42.0-123			0.935	20
Benzo(g,h,i)perylene	0.0800	0.0708	0.0702	88.5	87.8	43.0-128			0.851	20
Benzo(k)fluoranthene	0.0800	0.0743	0.0728	92.9	91.0	45.0-128			2.04	20
Chrysene	0.0800	0.0735	0.0733	91.9	91.6	48.0-127			0.272	20
Dibenz(a,h)anthracene	0.0800	0.0744	0.0732	93.0	91.5	43.0-132			1.63	20
Fluoranthene	0.0800	0.0773	0.0766	96.6	95.8	49.0-129			0.910	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3334164-1 08/16/18 00:23 • (LCSD) R3334164-2 08/16/18 00:44

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Fluorene	0.0800	0.0733	0.0729	91.6	91.1	50.0-120			0.547	20
Indeno(1,2,3-cd)pyrene	0.0800	0.0731	0.0727	91.4	90.9	44.0-131			0.549	20
Naphthalene	0.0800	0.0699	0.0682	87.4	85.3	50.0-120			2.46	20
Phenanthrene	0.0800	0.0685	0.0681	85.6	85.1	48.0-120			0.586	20
Pyrene	0.0800	0.0808	0.0791	101	98.9	48.0-135			2.13	20
1-Methylnaphthalene	0.0800	0.0764	0.0771	95.5	96.4	52.0-122			0.912	20
2-Methylnaphthalene	0.0800	0.0736	0.0733	92.0	91.6	52.0-120			0.408	20
2-Chloronaphthalene	0.0800	0.0718	0.0701	89.8	87.6	50.0-120			2.40	20
(S) Nitrobenzene-d5				*125*	*113*	*14.0-149*				
(S) 2-Fluorobiphenyl				*102*	*98.6*	*34.0-125*				
(S) p-Terphenyl-d14				*100*	*98.4*	*23.0-120*				

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
MDL (dry)	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
RDL (dry)	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
V	The sample concentration is too high to evaluate accurate spike recoveries.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

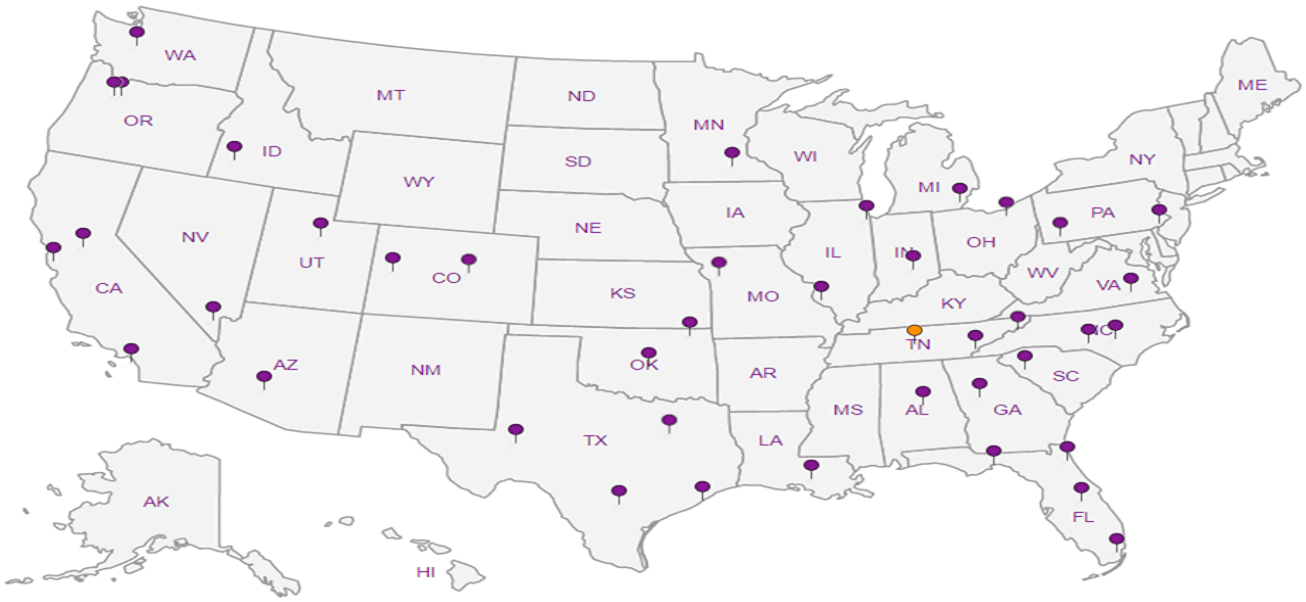
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



NWTPH-Dx | PAH | TOC

Jacobs - BNSF Region 1

2020 SW 4th Ave, Ste 300
Portland, OR 97201

Billing Information:
Carrie Andrews
2020 SW 4th Ave, Ste 300
Portland, OR 97201

Pres Chk

Report to: Jennifer Ulrich

Email To: carrie.andrews@ch2m.com; jennifer.ulrich@ch2m.com

Project Description: **BNSF-Wishram Railyard**

City/State Collected: Wishram, WA

Phone: **503-348-9500**
Fax:

Client Project #

Lab Project # **BNSF1JACOBS-WISHRAM**

Collected by (print): Jennifer Ulrich

Site/Facility ID # BNSF-Wishram

P.O. #

Collected by (signature): Jennifer Ulrich

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Date Results Needed

Quote #

Analysis / Container / Preservative

Chain of Custody Page 1 of 3

ESC LABORATORY SCIENCES
a subsidiary of Pace Analytical

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Phone: 800-767-5859
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L# L1017281
E176

Acctnum: **BNSF1JACOBS**
Template: **T137632**
Prelogin: **P659706**
TSR: **134 - Mark W. Beasley**
PB: 6-22-18
Shipped Via: **FedEX Ground**

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	NWTPHDX w/SGT 4ozClr-NoPres	NWTPHDX w/out SGT 4ozClr-NoPres	PAHSIMLVID 40mlAmb-NoPres-WT	SV8270PAHSIMD, TS 4ozClr-NoPres	TOC 4ozClr-NoPres	Remarks	Sample # (lab only)
D240-GS-080618	G	SS	0-6"	8/6/18	1450	3	X	X		X			-01
D260-GS-080618	G	SS	0-6"	8/6/18	1530	3	X	X		X			02
D420-GS-080618	G	SS	0-6"	8/6/18	1655	3	X	X		X			03
D420-GS-080618-1	G	SS	0-6"	8/6/18	1700	3	X	X		X			04
D150-GS-080718	G	SS	0-6"	8/7/18	0730	3	X	X		X			05
D220-GS-080718	G	SS	0-6"	8/7/18	0755	3	X	X		X			06
~~BGWS01-GS~~ BG-WS01-GS-080718	G	SS	0-6"	8/7/18	0850	3	X	X		X			07
D200-GS-080718	G	SS	0-6"	8/7/18	1230	3	X	X		X			08
D200-SC-080718-A	G	SS	~~2-5~~	8/7/18	1640	~~1~~	~~X~~	~~X~~		~~X~~	X	TOC only	09
D260-SC-080718-A	G	SS	~~2-5~~ 3.5	8/7/18	1725	~~1~~	~~X~~	~~X~~		~~X~~	X	TOC only	10

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier __ _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
1.5 sulfite

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
Jennifer Ulrich	8/13/18	1200			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 1.0 °C	Bottles Received: 54
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 8/14/18	Time: 5:45

If preservation required by Login: Date/Time

Hold:

Condition: (NCF) / OK

NWTPH-Dx / PAH / TOC

Jacobs - BNSF Region 1

2020 SW 4th Ave, Ste 300
Portland, OR 97201

Billing Information:
Carrie Andrews
2020 SW 4th Ave, Ste 300
Portland, OR 97201

Pres Chk

Report to: Jennifer Ulrich

Email To: carrie.andrews@ch2m.com; jennifer.ulrich@ch2m.com

Project Description: BNSF-Wishram Railyard

City/State Collected: Wishram, WA

Phone: 503-348-9500
Fax:

Client Project #

Lab Project # BNSF1JACOBS-WISHRAM

Collected by (print): Jennifer Ulrich

Site/Facility ID #

P.O. #

Collected by (signature): Jennifer Ulrich

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	NWTPHDX w/SGT 4ozClr-NoPres	NWTPHDX w/out SGT 4ozClr-NoPres	PAHSIMLVID 40mlAmb-NoPres-WT	SV8270PAHSIMD, TS 4ozClr-NoPres	TOC 4ozClr-NoPres	Remarks	Sample # (lab only)
G260-SC-080718-A-1	G	SS	~~0-3.5~~ C1	8/7/18	1730	~~1~~ 2	~~X~~	~~X~~		~~X~~	X	TOC only	-01
G260-SC-080718-B	G	SS	~~3.5~~ 4	8/7/18	1710	~~1~~ 2	~~X~~	~~X~~		~~X~~	X	TOC only	02
G260-GS-080718	G	SS	0.5	8/7/18	1800	3	X	X		X	~~X~~		13
G200-GS-080718	G	~~GW~~ SS	0.5	8/7/18	1850	3	X	X	~~X~~	X			14
G200-SC-080718-A	G	SS	3.5	8/7/18	1840	~~1~~ 2	~~X~~		~~X~~	~~X~~	~~X~~ X	~~TOC only~~	15
F400B-SC-080818-A	G	SS	1	8/8/18	1155	1					X	TOC only	16
F400B-SC-080818-B	G	SS	5	8/8/18	1200	1					X	TOC only	17
F360-SC-080818-A	G	SS	~~1~~	8/8/18	1310	1					X	↓	18
F360-SC-080818-B	G	SS	4	8/8/18	1315	1					X	↓	19
~~K120-GS-080818~~	G	SS	0.5	8/8/18	1640	~~3~~ 2	X	X		X	~~X~~		20

Chain of Custody Page 2 of 3

ESC LAB SCIENCES
a subsidiary of

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L1017281

Table #

Acctnum: BNSF1JACOBS
Template: T137632
Prelogin: P659706
TSR: 134 - Mark W. Beasley
PB: 6-27-18

Shipped Via: FedEx Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier __ _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
L-5 MM AP

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR
Jennifer Ulrich	8/13/18	1200		1
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 1.0 °C Bottles Received: 54
				If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 8/14/18 Time: 8145
				Hold: Condition: NCF OK

TestAmerica (ESC)

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

NWTPH-Dx / PAH / TOC

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: CH2M	Client Contact: Carrie Andrews	Date: 8/13/18	Chain of Custody Number: 37668
Address: 2020 4th Ave Ste. 300	Telephone Number (Area Code)/Fax Number: 503 348 9500	Lab Number	Page 3 of 3
City: Portland, State: OR, Zip Code: 97201	Sampler: J. Ulrich; Lab Contact: Kristine Ellen		
Project Name and Location (State): BNSF - Wishram	Billing Contact: Carrie Andrews		
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	NWTPH-Dx W/SGT	W/OUT SGT NWTPH-Dx	SV8270 PAH LVI	TOC Only	SV8270 PAH SIM	Special Instructions/Conditions of Receipt (L1017281)
K120 ~~J260~~-SC-080818-A	8/8/18	1655			X											1		TOC ONLY -21
J260-GS-080818	8/8/18	1740			X								1	1	1			22
J260-SC-080818-A	8/8/18	1745			X								~~[illegible]~~			1		TOC ONLY 23
I400-GS-080918	8/9/18	1000			X								1	1	1			24
I400-SC-080918-A	8/9/18	1010			X											1		TOC ONLY 25
I400-SC-080918-B	8/9/18	1015			X											1		TOC ONLY 26
EB-01-080718	8/7/18	1600		X													2	27
TB-01-080618	8/6/18	0900		X													1	

Cooler: ☒ Yes ☐ No Cooler Temp: ______

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other ______

QC Requirements (Specify)

1. Relinquished By Sign/Print: Jennifer Ulrich / Jennifer Ulrich	Date: 8/13/18	Time: 1200	1. Received By Sign/Print: [signature] 8G Kevin Turner	Date: 8/14/18	Time: 845
2. Relinquished By Sign/Print	Date	Time	2. Received By Sign/Print	Date	Time
3. Relinquished By Sign/Print	Date	Time	3. Received By Sign/Print	Date	Time

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

1.0°C L5 MR4HR COSI

TAL-8274-580 (0210) (NCF)

Jeremy W. Watkins

Pace Analytical®
National Center for Testing & Innovation

Login #: L1017281	Client: BNSF1JACOBS	Date: 8/14/18	Evaluated by: Jeremy

Non-Conformance (check applicable items)

	Sample Integrity		Chain of Custody Clarification		
	Parameter(s) past holding time	x	Login Clarification Needed		**If Broken Container:**
	Improper temperature		Chain of custody is incomplete		Insufficient packing material around container
	Improper container type		Please specify Metals requested.		Insufficient packing material inside cooler
	Improper preservation		Please specify TCLP requested.		Improper handling by carrier (FedEx / UPS / Courie
	Insufficient sample volume.		Received additional samples not listed on coc.		Sample was frozen
	Sample is biphasic.		Sample ids on containers do not match ids on coc		Container lid not intact
	Vials received with headspace.		Trip Blank not received.		**If no Chain of Custody:**
	Broken container		Client did not "X" analysis.		Received by:
	Broken container:		Chain of Custody is missing		Date/Time:
	Sufficient sample remains				Temp./Cont. Rec./pH:
					Carrier:
					Tracking#

Login Comments: Received a 40ml-HCL-BLK, client is requesting PAHSIMLVI. Please advise.

Client informed by:		Call		Email		Voice Mail		Date: 8/14/18	Time: 1440
TSR Initials: MB	Client Contact: Jennifer Ulrich								

Login Instructions:

Place trip blank on hold

Treatability Report for

BNSF Wishram

ASL Report #: T1092
Project ID: 921884.OTC

Attn: Dusty.Berggren@Jacobs.com
CC: carrie.andrews@jacobs.com

Authorized and Released By:

Applied Research Scientist II
Ester Gordon
541.243.0981
January 15, 2019

TestAmerica ASL
1100 NE Circle Boulevard, Suite 310
Corvallis, OR 97330
1-541-243-0980
www.testamericainc.com

TestAmerica ASL Treatability Report #: T1092

Sample Receipt Comments

Two 2 inch diameter core samples were received at TestAmerica ASL on August 14, 2018. Per client specifications, the two sample names were changed from "G200-MC-081018" and "G260-MC-081018" as indicated on the Chain of Custody, to G200-MC-080918 and G260-MC-080918.

Sample G200-MC-080918 (T1092-01) consisted of 1.5 to 3.8 feet below sediment surface (bss) and sample G260-MC-080918 (T1092-02) was 1.5 to 3.3 bss. The samples were shipped on dry ice and arrived as ASL at -43 °C. They were stored at -10°C until testing began.

Sample Cross-Reference

Sample Name [Client ID]	**ASL Sample ID** [SDG]	**Samples Analyzed** [Lab ID]
G200-MC-080918	T1092-01	G200-C
		G200-D
		G200-E
		G200-F
		G200-G
		G200-J
		G200-K
		G200-L
		G200-M
		G200-N
		G200-O
G260-MC-080918	T1092-02	G260-B
		G260-C
		G260-D
		G260-E
		G260-F
		G260-G
		G260-H
		G260-J
		G260-K

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CASE NARRATIVE
SPECIAL ANALYTICS

Lab Name: TestAmerica ASL ASL SDG: T1092
Project Name: *BNSF Wishram* PO Number: 131004734

Method(s):

Analyses: Soil Core Cutting and NAPL Photography
Water Drive at Three Flow Settings (CH2M/Jacobs Proprietary Method)
Dean Stark Analysis of Pore Fluid Saturation (API RP40 (1998) Section 4.3, *modified*)
Grain Density (API RP40 (1998) Section 5.3.2.1, *modified*)
Grain Size (ASTM D422)

Overview: The two frozen core samples received at the lab were cut into segments 2 inches in length. These core segments (pucks) were capped on both ends and stored at -10 °C until testing began.

The core segments were first allowed to warm to room temperature. They were then photographed under white and UV lighting, and the physical parameters (length, width, mass) were measured. The core segments were then re-frozen and shipped on dry ice to Dakota labs for TarGOST scanning (results not included in TestAmerica Report). Based on photography and TarGOST results, two segments from each core were selected by the Jacobs project team for water drive analysis, and four other notably contaminated pucks were selected from each core for Dean Stark extraction only.

Two of the selected pucks from each core were subjected to water drive testing, passing one pore volume of fluid through the puck for each of three flow rates. During application of flow, pressure at the base of the puck was measured utilizing a pressure transducer connected to a data logger that recorded in volts. Voltage was then converted to pressure (pounds per square inch, PSI) using the instrument-specified conversion factor. The average voltage recorded over the last five minutes of each run that exhibited a consistent pressure trend was reported as the Steady Run Volt Output (steady state voltage). Note that some runs exhibited a gentle slope in the voltage output over the duration of each run and did not reach a true steady state; those with steep slopes or inconsistent trends were flagged in the Water Drive Summaries.

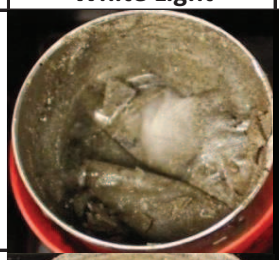
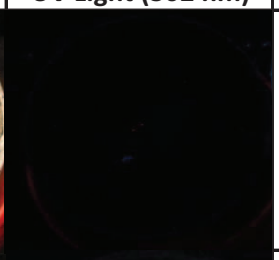
Post water drive (PWD), the eluate was observed under white and UV light to determine NAPL mobility (by presence/absence only). A representative subsample of the soil was then removed from the core sleeve and extracted by the Dean Stark method for determination of pore fluid saturations. Residual solids from the Dean Stark analysis were first air-dried until visibly dry, and then baked at 105 °C for at least 12 hours. These clean, dry solids were then used to measure the average grain density of the sample. After grain density was measured, dried soil samples were combined to create enough mass for grain size analysis (see Grain Size Case Narrative); soil combinations were guided by the Jacobs project team and included some as-received air dried samples that did not undergo extraction for pore fluid saturation.

Four of the selected pucks from each core were allowed to warm to room temperature and extracted by the Dean Stark method for determination of pore fluid saturations. Grain density was also measured on the baked clean, dry solids of these samples post Dean Stark (PDS). After grain density was measured, dried soil samples were combined to create enough mass for grain size analysis (see Grain Size Case Narrative); soil combinations were guided by the Jacobs project team and included some as-received air dried samples that did not undergo extraction for pore fluid saturation.

Core Photo Log
BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

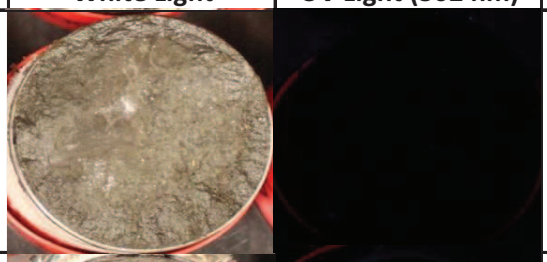
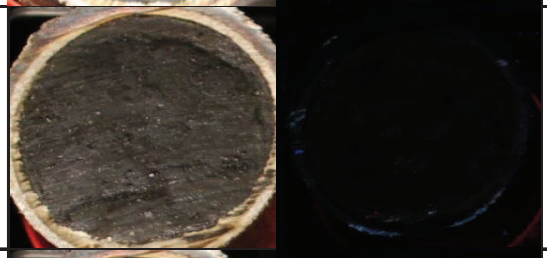
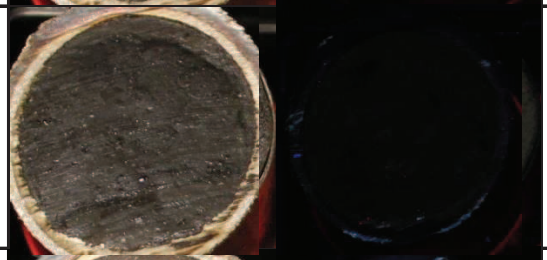
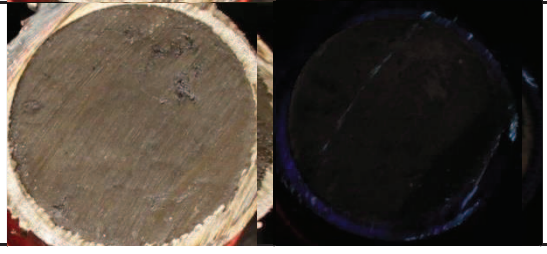
Sample ID: G200-MC-080918

LAB ID (SDG ID)		Top		Approximate Depth of Core Segment (feet below sediment surface, bss)	
		White Light	UV Light (302 nm)	Top	Bottom
G200-B T1092-01B	Pre-Mobility			1.50	1.67
G200-C T1092-01C	Pre-Mobility			1.67	1.83
G200-D T1092-01D	Pre-Mobility			1.83	2.00
G200-E T1092-01E	Pre-Mobility			2.00	2.17
G200-F T1092-01F	Pre-Mobility			2.17	2.33
G200-G T1092-01G	Pre-Mobility			2.33	2.50

Core Photo Log
BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

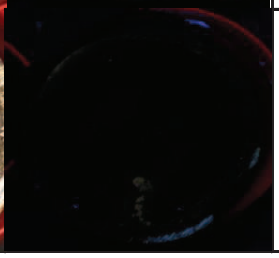
Sample ID: G200-MC-080918

LAB ID (SDG ID)		Top		Approximate Depth of Core Segment (feet below sediment surface, bss)	
		White Light	UV Light (302 nm)	Top	Bottom
G200-H T1092-01H	Pre-Mobility			2.50	2.67
G200-I T1092-01I	Pre-Mobility			2.67	2.83
G200-J T1092-01J	Pre-Mobility			2.83	3.00
G200-K T1092-01K	Pre-Mobility			3.00	3.17
G200-L T1092-01L	Pre-Mobility			3.17	3.33
G200-M T1092-01M	Pre-Mobility			3.33	3.50

Core Photo Log
BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

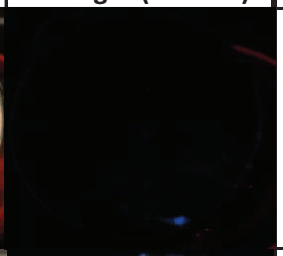
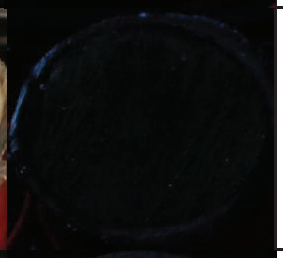
Sample ID: G200-MC-080918

LAB ID (SDG ID)		Top		Approximate Depth of Core Segment (feet below sediment surface, bss)	
		White Light	UV Light (302 nm)	Top	Bottom
G200-N T1092-01N	Pre-Mobility			3.50	3.67
G200-O T1092-01O	Pre-Mobility			3.67	3.83

Core Photo Log
BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

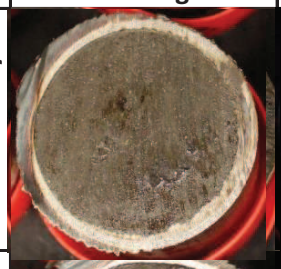
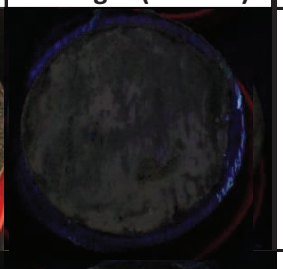
Sample ID: G260-MC-080918

LAB ID (SDG ID)		Top		Approximate Depth of Core Segment (feet below sediment surface, bss)	
		White Light	UV Light (302 nm)	Top	Bottom
G260-A T1092-02A	Pre-Mobility			1.50	1.67
G260-B T1092-02B	Pre-Mobility			1.67	1.83
G260-C T1092-02C	Pre-Mobility			1.83	2.00
G260-D T1092-02D	Pre-Mobility			2.00	2.17
G260-E T1092-02E	Pre-Mobility			2.17	2.33
G260-F T1092-02F	Pre-Mobility			2.33	2.50

Core Photo Log
BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample ID: G260-MC-080918

LAB ID (SDG ID)		Top		Approximate Depth of Core Segment (feet below sediment surface, bss)	
		White Light	UV Light (302 nm)	Top	Bottom
G260-G T1092-02G	Pre-Mobility			2.50	2.67
G260-H T1092-02H	Pre-Mobility			2.67	2.83
G260-I T1092-02I	Pre-Mobility			2.83	3.00
G260-J T1092-02J	Pre-Mobility			3.00	3.17
G260-K T1092-02K	Pre-Mobility			3.17	3.33

TestAmerica ASL

Core Measurements

BNSF Wishram Yard

Sample ID	Sample Depth Range (ft bss)	Core Height (mm)	Inner Diameter (mm)	Mass with Sleeve (g)	Sleeve Mass (g)	Total Bulk Volume, V_B (cm^3)	Analyses Performed			
							Water Drive Mobility	Dean-Stark Extraction	Grain Density	Grain Size Distribution
G200-J	2.83 - 3.00	48.2	42.8	153.0	53.67	69.3		x	PDS	PDS
G200-K	3.00 - 3.17	49.8	41.8	158.6	54.62	68.4	x	PWD	PDS	PDS
G200-L	3.17 - 3.33	45.2	42.6	154.1	50.34	64.3		x	PDS	PDS
G200-M	3.33 - 3.50	47.8	42.3	162.5	53.01	67.1	x	PWD	PDS	PDS
G200-N	3.50 - 3.67	50.2	42.1	186.9	55.85	69.9		x	PDS	PDS
G200-O	3.67 - 3.83	37.5	42.7	120.7	47.24	53.7		x	PDS	PDS
G260-C	1.83-2.00	48.5	42.6	167.0	52.75	69.2		x	PDS	PDS
G260-D	2.00-2.17	51.8	42.2	157.0	56.81	72.6	x	PWD	PDS	PDS
G260-E	2.17-2.33	48.5	41.8	161.2	53.20	66.5		x	PDS	PDS
G260-F	2.33-2.50	46.4	42.6	148.0	51.10	66.2		x	PDS	PDS
G260-G	2.50-2.67	49.0	42.7	162.2	54.50	70.2	x	PWD	PDS	PDS
G260-H	2.67-2.83	45.5	41.8	165.0	51.78	62.3		x	PDS	PDS

Notes:

PWD = Post Water Drive

PDS = Post Dean Stark

bss = below sediment surface

Water Drive for Three Flow Settings

Benchsheet

BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample and Setup Information

Sample ID:	**G200-K**	Analyst:	EG
Lab ID:	T1092-01K	Date/Time:	10/17/2018 10:08
Mass of Sample w/ Sleeve (g):	158.56	Water Drive ID:	Orion M365 (Original) #1
Sample Height (mm):	49.81	Number of Syringes:	1
Sample Diameter (mm):	41.82	Syringe size (mL):	60

Water Drive Test	Run 1	Run 2	Run 3
Flow Target Rate (mL/min):	**0.400**	**0.800**	**4.000**
Coarse Dial Setting:	1	1	1
Percentage Setting:	0.5%	1.0%	5.0%
Theoretical Flow Rate (mL/min):	0.387	0.774	3.870
Target Effluent Volume (mL):	50.0	50.0	50.0
Initial Syringe Volume (mL):	60	60	60
Start Date/Time:	10/17/2018 10:08	10/17/2018 12:50	10/17/2018 14:22
Stop Date/Time:	10/17/2018 11:47	10/17/2018 13:53	10/17/2018 14:45
Final Syringe Volume (mL):	10	10	10
Flow Rate Check (mL/min):	0.505	0.794	2.174

Pressure	Run 1	Run 2	Run 3
Transducer (High or Low):	High	High	High
Voltage Multiplier (psi/V):	3	3	3
Steady Run Volt Output (V):	0.08	0.12	0.38 †
Applied Pressure (psi):	0.25	0.36	1.15 †

Observations	Run 1	Run 2	Run 3
Volume Accumulated on Top (mL):	46	50	52
Clear/Color?	clear yellow tint	clear yellow tint	clear slight yellow tint
Sheen?	no	no	no
Blebs w/ approx. vol (mL)?	no	no	no
Odor?	slight odor	slight odor	med. odor
Fluoresce Under UV light?	yes	yes	yes

† Run did not achieve flat steady state, but gradually increased over time.

Post-Water Drive

Mass of Sample w/ Sleeve (g):	160.98

Notes: Eluate examined under 302 nm UV light Post-Water Drive.

Water Drive Raw Data Summary
BNSF Wishram Yard

Sample Name: G200-K
Lab ID: T1092-01K
Test Start: 10/17/2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Run Time [Hours]	Pressure [PSI]
0.00	0.48
0.03	0.45
0.07	0.21
0.10	0.21
0.14	0.21
0.17	0.21
0.21	0.21
0.26	0.21
0.29	0.21
0.33	0.21
0.36	0.21
0.39	0.21
0.43	0.24
0.46	0.21
0.50	0.21
0.53	0.24
0.57	0.24
0.60	0.21
0.64	0.24
0.67	0.24
0.71	0.21
0.74	0.24
0.78	0.24
0.81	0.24
0.85	0.24
0.88	0.24
0.92	0.21
0.95	0.24
0.99	0.21
1.02	0.24
1.06	0.24
1.09	0.24
1.13	0.24
1.16	0.24
1.19	0.24
1.23	0.24
1.26	0.24
1.30	0.24
1.33	0.24
1.37	0.24
1.40	0.24
1.44	0.24
1.47	0.24
1.51	0.24
1.54	0.27
1.58	0.24

Run Time [Hours]	Pressure [PSI]
1.61	0.24
1.64	0.24
1.66	0.24
*1.66 **	0.30
1.68	0.15
1.71	0.15
1.75	0.12
1.78	0.15
1.82	0.10
1.85	0.10
1.89	0.10
1.92	0.12
1.96	0.10
2.72	0.27
2.76	0.30
2.79	0.27
2.83	0.33
2.86	0.30
2.89	0.30
2.93	0.30
2.96	0.33
3.00	0.30
3.03	0.30
3.07	0.33
3.10	0.33
3.14	0.33
3.17	0.30
3.21	0.33
3.24	0.36
3.28	0.33
3.31	0.30
3.34	0.33
3.38	0.33
3.41	0.33
3.45	0.36
3.48	0.33
3.52	0.36
3.55	0.33
3.59	0.36
3.62	0.36
3.66	0.36
3.69	0.36
3.73	0.36
3.75	0.36
*4.23 **	0.86
4.25	1.09

Run Time [Hours]	Pressure [PSI]
4.28	1.12
4.32	1.15
4.35	1.18
4.39	0.12
4.42	0.15
4.46	0.12
4.49	0.12
4.55	1.06
4.58	1.24
4.62	1.27
4.63	0.18

**Flow rate change*

NOTE: Data collection software may not have been paused for full interim between Runs at differing flow rates. Thus, total Run Time of the raw data may exceed total time of flow recorded on the Water Drive Summary Benchsheet.

Water Drive for Three Flow Settings

Benchsheet

BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample and Setup Information

Sample ID:	**G200-M**	Analyst:	EG
Lab ID:	T1092-01M	Date/Time:	10/18/2018 10:58
Mass of Sample w/ Sleeve (g):	162.47	Water Drive ID:	Orion M365 (Original) #1
Sample Height (mm):	47.79	Number of Syringes:	1
Sample Diameter (mm):	42.27	Syringe size (mL):	60

Water Drive Test	Run 1	Run 2	Run 3
Flow Target Rate (mL/min):	**0.400**	**0.800**	**4.000**
Coarse Dial Setting:	1	1	1
Percentage Setting:	0.5%	1.0%	5.0%
Theoretical Flow Rate (mL/min):	0.387	0.774	3.870
Target Effluent Volume (mL):	50.0	50.0	50.0
Initial Syringe Volume (mL):	60	60	60
Start Date/Time:	10/18/2018 10:58	10/18/2018 13:06	10/18/2018 14:16
Stop Date/Time:	10/18/2018 12:58	10/18/2018 14:10	10/18/2018 14:29
Final Syringe Volume (mL):	10	10.0	10.0
Flow Rate Check (mL/min):	0.417	0.781	3.846

Pressure	Run 1	Run 2	Run 3
Transducer (High or Low):	High	High	High
Voltage Multiplier (psi/V):	3	3	3
Steady Run Volt Output (V):	0.30	0.66	1.78 †
Applied Pressure (psi):	0.90	1.98	5.34 †

Observations	Run 1	Run 2	Run 3
Volume Accumulated on Top (mL):	49	50	50
Clear/Color?	yellow tint	slight yellow tint	slight yellow tint
Sheen?	no	no	no
Blebs w/ approx. vol (mL)?	no	no	no
Odor?	yes	yes	yes
Fluoresce Under UV light?	yes	yes	yes

† Run did not achieve flat steady state, but gradually decreased over time.

Post-Water Drive

Mass of Sample w/ Sleeve (g):	163.97

Notes: Eluate examined under 302 nm UV light Post-Water Drive.

Water Drive Raw Data Summary
BNSF Wishram Yard

Sample Name: G200-M
Lab ID: T1092-01M
Test Start: 10/18/2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Run Time [Hours]	Pressure [PSI]
0.01	1.82
0.03	1.15
0.07	0.95
0.10	0.92
0.14	0.92
0.17	0.95
0.21	0.95
0.24	1.00
0.28	0.97
0.31	0.97
0.35	1.00
0.38	1.00
0.42	1.03
0.45	1.03
0.49	1.03
0.52	1.03
0.56	1.03
0.59	1.03
0.62	1.03
0.66	1.03
0.69	1.03
0.73	1.03
0.76	1.03
0.80	1.06
0.83	1.06
0.87	1.03
0.90	1.06
0.94	0.95
0.97	0.92
1.01	0.92
1.04	0.89
1.08	0.89
1.11	0.89
1.14	0.89
1.18	0.89
1.21	0.92
1.25	0.86
1.28	0.89
1.32	0.89
1.35	0.89
1.39	0.92
1.42	0.92
1.46	0.92
1.49	0.92
1.53	0.92

Run Time [Hours]	Pressure [PSI]
1.56	0.92
1.60	0.89
1.63	0.89
1.65	0.95
1.67	0.92
1.70	0.92
1.74	0.92
1.77	0.95
1.81	0.92
1.84	0.95
1.88	0.92
1.91	0.95
1.94	0.92
1.98	0.95
2.01	0.39
*2.14 **	0.15
2.15	0.56
2.19	1.59
2.22	1.71
2.26	1.79
2.29	1.85
2.32	1.85
2.36	1.88
2.39	1.97
2.43	1.97
2.46	2.00
2.50	2.06
2.53	2.06
2.57	2.06
2.60	2.00
2.64	2.00
2.67	2.00
2.71	2.06
2.74	2.06
2.78	2.06
2.81	2.06
2.85	2.00
2.88	2.00
2.92	1.97
2.93	1.97
*3.03 **	2.00
3.06	2.00
3.09	1.97
3.12	1.94
3.16	1.97

Run Time [Hours]	Pressure [PSI]
3.19	1.97
3.23	0.21
3.26	0.12
3.30	0.10
3.33	6.01
3.37	5.63
3.40	5.55
3.44	5.37
3.47	5.31
3.49	5.34
3.51	5.31
3.52	5.28

**Flow rate change*

NOTE: Data collection software may not have been paused for full interim between Runs at differing flow rates. Thus, total Run Time of the raw data may exceed total time of flow recorded on the Water Drive Summary Benchsheet.

Water Drive for Three Flow Settings

Benchsheet

BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample and Setup Information

Sample ID:	**G260-D**	Analyst:	EG
Lab ID:	T1092-02D	Date/Time:	10/19/2018 12:49
Mass of Sample w/ Sleeve (g):	157.00	Water Drive ID:	#2
Sample Height (mm):	51.81	Number of Syringes:	1
Sample Diameter (mm):	42.24	Syringe size (mL):	60

Water Drive Test	Run 1	Run 2	Run 3
Flow Target Rate (mL/min):	**0.400**	**0.800**	**4.000**
Coarse Dial Setting:	1	1	1
Percentage Setting:	0.5%	1.0%	5.0%
Theoretical Flow Rate (mL/min):	0.387	0.774	3.870
Target Effluent Volume (mL):	50.0	50.0	50.0
Initial Syringe Volume (mL):	60	60	60
Start Date/Time:	10/19/2018 12:53	10/19/2018 14:57	10/19/2018 16:12
Stop Date/Time:	10/19/2018 14:50	10/19/2018 16:04	10/19/2018 16:25
Final Syringe Volume (mL):	10	10	10
Flow Rate Check (mL/min):	0.427	0.746	3.846

Pressure	Run 1	Run 2	Run 3
Transducer (High or Low):	High	High	High
Voltage Multiplier (psi/V):	3	3	3
Steady Run Volt Output (V):	0.08	0.09	0.28
Applied Pressure (psi):	0.23	0.28	0.85

Observations	Run 1	Run 2	Run 3
Volume Accumulated on Top (mL):	46	50	50
Clear/Color?	yellow tint	slight yellow tint	slight yellow tint
Sheen?	no	no	no
Blebs w/ approx. vol (mL)?	no	no	no
Odor?	yes	yes	yes
Fluoresce Under UV light?	yes	yes	yes

Post-Water Drive

Mass of Sample w/ Sleeve (g):	157.19

Notes: Eluate examined under 302 nm UV light Post-Water Drive.

Water Drive Raw Data Summary
BNSF Wishram Yard

Sample Name: G260-D
Lab ID: T1092-02D
Test Start: 10/19/2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Run Time [Hours]	Pressure [PSI]
0.00	0.12
0.03	0.12
0.07	0.12
0.10	0.12
0.13	0.15
0.17	0.12
0.20	0.15
0.23	0.15
0.27	0.15
0.30	0.15
0.33	0.15
0.37	0.15
0.40	0.15
0.43	0.18
0.47	0.15
0.50	0.18
0.53	0.18
0.57	0.18
0.60	0.15
0.63	0.18
0.67	0.18
0.70	0.18
0.73	0.15
0.77	0.15
0.80	0.15
0.83	0.18
0.87	0.18
0.90	0.15
0.93	0.15
0.97	0.15
1.00	0.18
1.03	0.36
1.07	0.21
1.10	0.21
1.13	0.21
1.17	0.21
1.20	0.21
1.23	0.21
1.27	0.21
1.30	0.21
1.33	0.21
1.37	0.21
1.40	0.21
1.43	0.21
1.47	0.24

Run Time [Hours]	Pressure [PSI]
1.50	0.24
1.53	0.21
1.57	0.21
1.60	0.21
1.63	0.21
1.67	0.21
1.70	0.24
1.73	0.21
1.77	0.21
1.80	0.24
1.83	0.21
1.87	0.21
1.90	0.24
1.93	0.21
1.95	0.18
*2.06 **	0.12
2.07	0.04
2.10	0.21
2.13	0.24
2.17	0.24
2.20	0.24
2.23	0.27
2.27	0.24
2.30	0.27
2.33	0.27
2.37	0.24
2.40	0.27
2.43	0.27
2.47	0.27
2.50	0.24
2.53	0.27
2.57	0.27
2.60	0.27
2.63	0.27
2.67	0.27
2.70	0.27
2.73	0.30
2.77	0.27
2.80	0.30
2.83	0.27
2.87	0.27
2.90	0.27
2.93	0.30
2.97	0.33
3.00	0.30

Run Time [Hours]	Pressure [PSI]
3.03	0.30
3.07	0.30
3.10	0.30
3.13	0.30
3.15	0.18
*3.31 **	0.10
3.33	0.83
3.37	0.83
3.40	0.83
3.43	0.83
3.47	0.83
3.50	0.83
3.53	0.86

**Flow rate change*

NOTE: Data collection software may not have been paused for full interim between Runs at differing flow rates. Thus, total Run Time of the raw data may exceed total time of flow recorded on the Water Drive Summary Benchsheet.

Water Drive for Three Flow Settings

Benchsheet

BNSF Wishram Yard

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sample and Setup Information

Sample ID:	**G260-G**	Analyst:	EG
Lab ID:	T1092-02G	Date/Time:	10/22/2018 13:32
Mass of Sample w/ Sleeve (g):	162.22	Water Drive ID:	Pump #1
Sample Height (mm):	48.95	Number of Syringes:	1
Sample Diameter (mm):	42.72	Syringe size (mL):	60

Water Drive Test	Run 1	Run 2	Run 3
Flow Target Rate (mL/min):	**0.400**	**0.800**	**4.000**
Coarse Dial Setting:	1	1	1
Percentage Setting:	0.5%	1.0%	5.0%
Theoretical Flow Rate (mL/min):	0.387	0.774	3.870
Target Effluent Volume (mL):	50.0	50.0	50.0
Initial Syringe Volume (mL):	60	60	60
Start Date/Time:	10/22/2018 13:32	10/22/2018 15:39	10/22/2018 16:48
Stop Date/Time:	10/22/2018 15:34	10/22/2018 16:42	10/22/2018 17:02
Final Syringe Volume (mL):	10	10.0	4
Flow Rate Check (mL/min):	0.410	0.794	4.000

Pressure	Run 1	Run 2	Run 3
Transducer (High or Low):	High	High	High
Voltage Multiplier (psi/V):	3	3	3
Steady Run Volt Output (V):	0.10	0.15	0.53
Applied Pressure (psi):	0.31	0.44	1.60

Observations	Run 1	Run 2	Run 3
Volume Accumulated on Top (mL):	48	50	56
Clear/Color?	slightly opaque/yellow tint	clear/yellow tint	clear/ slight yellow tint
Sheen?	no	no	no
Blebs w/ approx. vol (mL)?	no	no	no
Odor?	yes	yes	yes
Fluoresce Under UV light?	yes	yes	yes

Post-Water Drive

Mass of Sample w/ Sleeve (g):	151.12

Notes: Eluate examined under 302 nm UV light Post-Water Drive.
Some solids retained on the filter post water drive.

Water Drive Raw Data Summary
BNSF Wishram Yard

Sample Name: G260-G
Lab ID: T1092-02G
Test Start: 10/22/2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Run Time [Hours]	Pressure [PSI]
0.01	0.24
0.03	0.27
0.07	0.24
0.10	0.33
0.13	0.27
0.17	0.27
0.20	0.27
0.23	0.27
0.27	0.27
0.30	0.27
0.33	0.27
0.37	0.27
0.40	0.27
0.43	0.30
0.47	0.30
0.50	0.30
0.53	0.27
0.57	0.27
0.60	0.27
0.63	0.30
0.67	0.30
0.70	0.30
0.73	0.27
0.77	0.27
0.80	0.27
0.83	0.30
0.87	0.30
0.90	0.30
0.93	0.30
0.97	0.27
1.00	0.30
1.03	0.30
1.07	0.30
1.10	0.30
1.13	0.27
1.17	0.33
1.20	0.30
1.23	0.30
1.27	0.33
1.30	0.27
1.33	0.30
1.37	0.30
1.40	0.30
1.43	0.33
1.47	0.30

Run Time [Hours]	Pressure [PSI]
1.50	0.27
1.53	0.33
1.57	0.30
1.60	0.30
1.63	0.30
1.67	0.33
1.70	0.33
1.73	0.30
1.77	0.33
1.80	0.33
1.83	0.30
1.87	0.33
1.90	0.33
1.93	0.33
1.95	0.30
1.97	0.30
2.00	0.30
2.03	0.33
2.04	0.15
*2.04 **	0.15
2.06	0.10
2.07	0.10
2.10	0.10
2.13	0.30
2.17	0.39
2.20	0.42
2.23	0.39
2.27	0.39
2.30	0.45
2.33	0.42
2.37	0.42
2.40	0.42
2.43	0.45
2.47	0.42
2.50	0.42
2.53	0.42
2.57	0.42
2.60	0.42
2.63	0.42
2.67	0.45
2.70	0.45
2.73	0.42
2.77	0.42
2.80	0.45
2.83	0.45

Run Time [Hours]	Pressure [PSI]
2.87	0.42
2.90	0.45
*2.90 **	0.45
2.93	0.45
2.97	0.45
3.00	0.45
3.03	0.42
3.07	0.45
3.10	0.45
3.13	0.45
3.15	0.45
3.17	0.45
3.20	0.12
3.23	0.12
3.27	0.10
3.30	1.65
3.31	1.62
3.33	1.59
3.37	1.62
3.40	1.65
3.43	1.65
3.47	1.68
3.50	1.65
3.51	0.42

**Flow rate change*

NOTE: Data collection software may not have been paused for full interim between Runs at differing flow rates. Thus, total Run Time of the raw data may exceed total time of flow recorded on the Water Drive Summary Benchsheet.

TestAmerica ASL

Dean Stark Extraction and Grain Density Summary

BNSF Wishram Yard

T1092-01

Sample ID	Sample Depth Range (ft bgs)	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Wet Sample Mass (g)	Media Mass			Grain Density (g/cm^3)
					Solids (g)	Water (g)	NAPL (g)	
G200-J	2.83 - 3.00	1.43	0.87	54.17	33.03	15.5 *	5.64	2.23
G200-K, PWD	3.00 - 3.17	1.52	0.89	54.86	32.29	14.7	6.92	1.75
G200-L	3.17 - 3.33	1.61	1.07	54.07	35.73	11.7	6.60	2.18
G200-M, PWD	3.33 - 3.50	1.63	1.16	67.30	47.66	14.4	5.22	2.06
G200-N	3.50 - 3.67	1.87	1.52	57.83	46.83	9.70	1.30	2.21
G200-O	3.67 - 3.83	1.37	1.00	43.86	31.95	12.9	-0.96	2.01

Notes:

* Water mass estimated volumetrically as opposed to gravimetrically like all the others.

PWD = Post Water Drive

TestAmerica ASL

Dean Stark Extraction and Grain Density Summary

BNSF Wishram Yard

T1092-02

Sample ID	Sample Depth Range (ft bgs)	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Wet Sample Mass (g)	Media Mass			Grain Density (g/cm^3)
					Solids (g)	Water (g)	NAPL (g)	
G260-C	1.83-2.00	1.65	1.26	58.1	44.15	14.5	-0.56	1.96
G260-D, PWD	2.00-2.17	1.38	0.86	68.0	42.45	16.1	9.42	1.92
G260-E	2.17-2.33	1.62	1.09	57.6	38.70	15.9	3.05	2.17
G260-F	2.33-2.50	1.46	1.07	58.8	43.09	9.28	6.44	1.99
G260-G, PWD	2.50-2.67	1.54	1.03	61.7	41.59	17.0	3.15	2.04
G260-H	2.67-2.83	1.82	1.31	65.2	47.09	17.7	0.47	2.00

Notes:

PWD = Post Water Drive

CASE NARRATIVE
SPECIAL ANALYTICS

Lab Name: TestAmerica ASL ASL SDG: T1092
Project Name: *BNSF Wishram* PO Number: 131004734

Method(s):

Analyses: Grain Size (ASTM D422)

Overview: The distribution of particle sizes larger than 75 µm is determined by sieving, while the distribution of particle sizes smaller than 75 µm is determined by a sedimentation process using a hydrometer.

Exceptions: Solid samples from core segments used for mobility and/or pore fluid saturation analysis were oven-baked at 105°C instead of the method-specified air drying. The solids mass of each individual sample segment was insufficient for measurement of grain size distribution, as ASTM 422 specifies a sample mass of 300-500 grams dry. To increase the amount of soil mass for testing, several adjacent segments with similar properties were combined according to the instruction of the Jacobs project team. These combinations are summarized in the table below with the total amount of dry solids mass used in the grain size distribution analysis. Each combined sample had sufficient analysis for the hydrometer portion of the test, but due to the limited mass, was below method specifications for the sieve analysis (grain size > 75 µm). Accordingly, results of the sieve analysis may not represent the greater soil profile as accurately as a sample size within the recommended mass range.

GRAIN SIZE Sample Combinations

Lab ID	SDG ID	Sample Mass [g]	Sample Notes *	Total Sample Mass † [g]
WISH-1	G200-C	92.64	As-Received, Air Dried	
	G200-D	102.82	As-Received, Air Dried	
	G200-E	89.66	As-Received, Air Dried	
	G200-F	92.14	As-Received, Air Dried	
	G200-G	83.53	As-Received, Air Dried	460.79
WISH-3	G200-J	32.91	Post DS Baked	
	G200-K	32.33	Post DS Baked	
	G200-L	35.65	Post DS Baked	100.89 †
WISH-4	G200-M	47.65	Post DS Baked	
	G200-N	46.87	Post DS Baked	
	G200-N	54.23	As-Received, Air Dried ‡	
	G200-O	32.02	Post DS Baked	180.77 †
WISH-5	G260-B	86.57	As-Received, Air Dried	
	G260-C	43.93	Post DS Baked	
	G260-C	40.98	As-Received, Air Dried ‡	171.48 †
WISH-6	G260-D	42.39	Post DS Baked	
	G260-E	37.80	Post DS Baked	80.19 †
WISH-7	G260-F	42.43	Post DS Baked	
	G260-G	41.80	Post DS Baked	
	G260-H	46.43	Post DS Baked	130.66 †
WISH-8	G260-J	68.31	As-Received, Air Dried	
	G260-K	48.27	As-Received, Air Dried	116.58 †

* All Air-Dried samples were dried on small trays in a fume hood until visibly dry.

‡ This portion of the soil sample did not undergo extraction by Dean Stark.

† Total Sample Mass was less than method recommended minimum for determination of grain sizes >75 µm. All hydrometer analyses (determination of grain sizes <75 µm) were conducted with enough sample mass per the method.

DS = Dean Stark extraction for pore fluid saturation

TestAmerica ASL

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

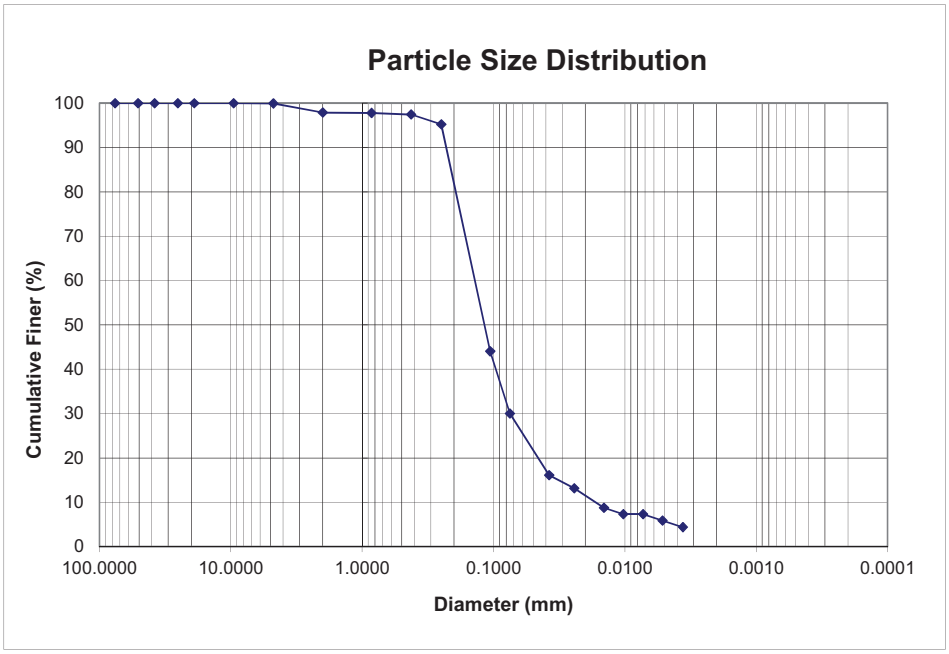
Particle Size Distribution (ASTM D422) - Report

Analyst:	PC	Lab ID:	WISH-1
Date:	1/5/2019	Client ID:	G200-C - G200-G

Soil Description	Sieve No	Weight %		
Gravel	4	0.1		
Coarse Sand	10	2.1		
Medium Sand	40	0.4		
Fine Sand	200	67.4		
Silt/Clay	<200	30.0	Sample Mass (g):	459.86

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.25	0.05	0.05	99.95
	10	2.000	9.50	2.07	2.12	97.88
	20	0.850	0.55	0.12	2.24	97.76
	40	0.425	1.48	0.32	2.56	97.44
	60	0.250	10.21	2.22	4.78	95.22
	140	0.106	235.29	51.17	55.95	44.05
	200	0.075	64.56	14.04	69.99	30.01

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.038		25.18	95.17	16.10
	5	0.024		0.88	96.05	13.17
	15	0.014		1.32	97.36	8.78
	30	0.010		0.44	97.80	7.32
	60	0.007		0.00	97.80	7.32
	120	0.005		0.44	98.24	5.85
	250	0.004		0.44	98.68	4.39



TestAmerica ASL

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

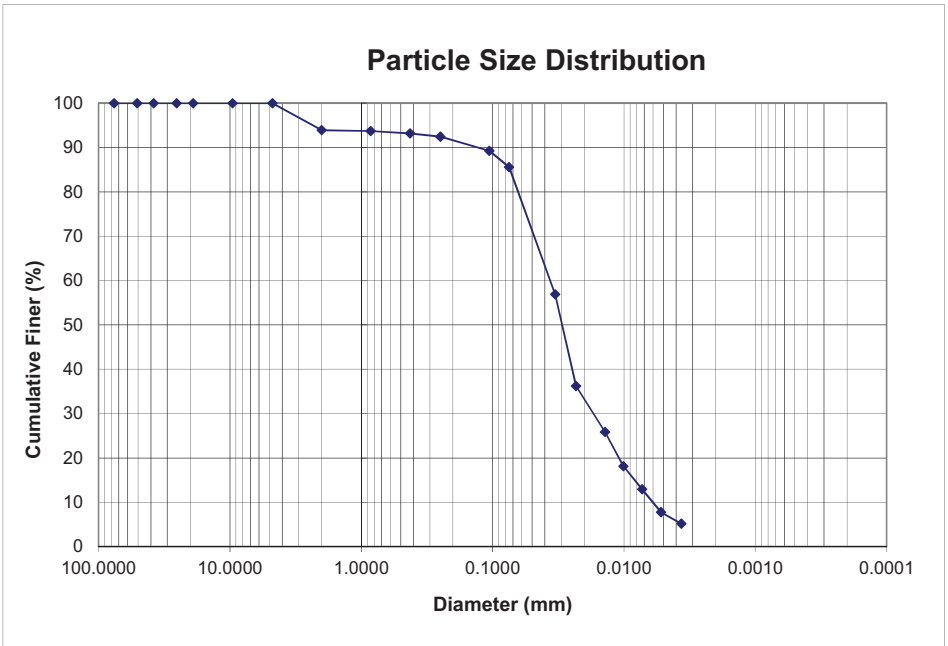
Particle Size Distribution (ASTM D422) - Report

Analyst:	PC	Lab ID:	WISH-3
Date:	1/5/2019	Client ID:	G200-J - G200-L

Soil Description	Sieve No	Weight %		
Gravel	4	0.0		
Coarse Sand	10	6.1		
Medium Sand	40	0.8		
Fine Sand	200	7.6		
Silt/Clay	<200	85.6	Sample Mass (g):	101.25

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.00	0.00	0.00	100.00
	10	2.000	6.16	6.08	6.08	93.92
	20	0.850	0.20	0.20	6.29	93.71
	40	0.425	0.57	0.56	6.85	93.15
	60	0.250	0.76	0.75	7.59	92.41
	140	0.106	3.22	3.18	10.77	89.23
	200	0.075	3.73	3.68	14.45	85.55

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.033		36.89	51.34	56.88
	5	0.023		17.70	69.03	36.20
	15	0.014		8.85	77.88	25.86
	30	0.010		6.64	84.52	18.10
	60	0.007		4.42	88.94	12.93
	120	0.005		4.42	93.36	7.76
	250	0.004		2.21	95.58	5.17



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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

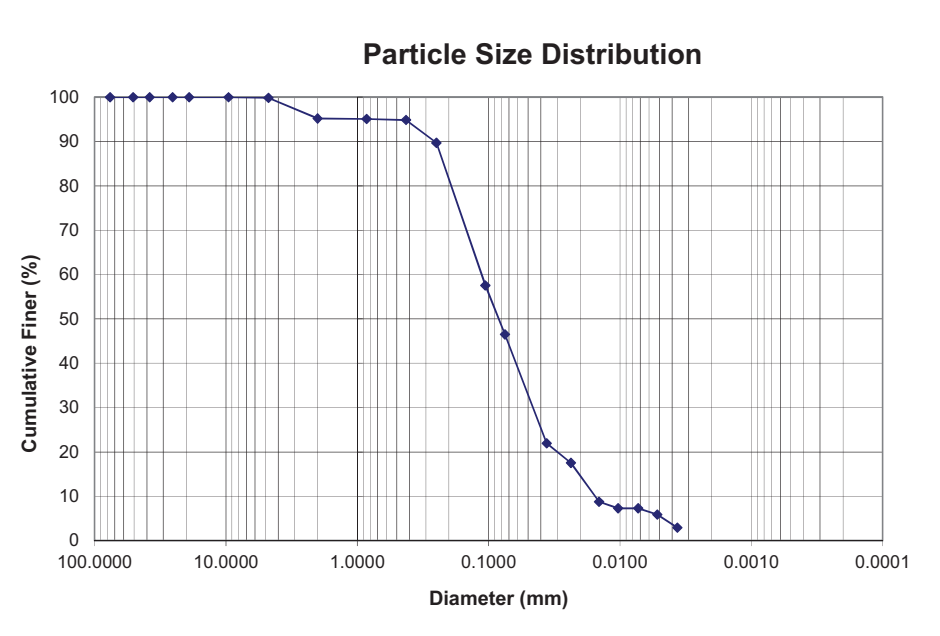
Particle Size Distribution (ASTM D422) - Report

Analyst:	PC	Lab ID:	WISH-4
Date:	1/5/2019	Client ID:	G200-M - G200O

Soil Description	Sieve No	Weight %		
Gravel	4	0.2		
Coarse Sand	10	4.6		
Medium Sand	40	0.3		
Fine Sand	200	48.4		
Silt/Clay	<200	46.5	Sample Mass (g):	180.38

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.35	0.19	0.19	99.81
	10	2.000	8.33	4.62	4.81	95.19
	20	0.850	0.21	0.12	4.93	95.07
	40	0.425	0.40	0.22	5.15	94.85
	60	0.250	9.31	5.16	10.31	89.69
	140	0.106	58.00	32.15	42.46	57.54
	200	0.075	19.97	11.07	53.53	46.47

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.036		36.28	89.82	21.92
	5	0.024		2.04	91.85	17.53
	15	0.014		4.07	95.93	8.77
	30	0.010		0.68	96.61	7.31
	60	0.007		0.00	96.61	7.31
	120	0.005		0.68	97.28	5.84
	250	0.004		1.36	98.64	2.92



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THE LEADER IN ENVIRONMENTAL TESTING

Particle Size Distribution (ASTM D422) - Report

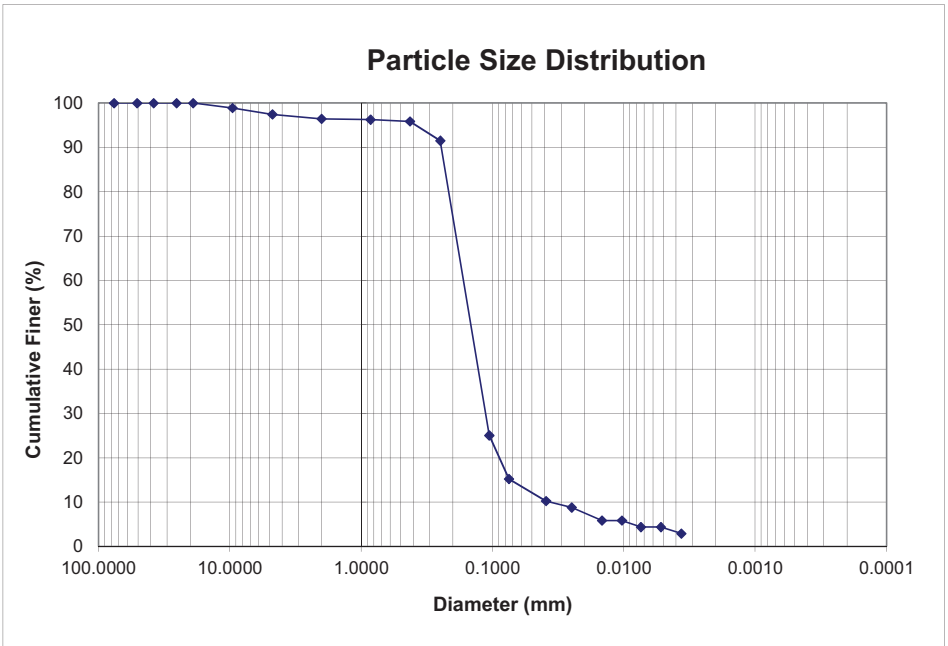
Analyst:	PC	Lab ID:	WISH-5
Date:	1/5/2019	Client ID:	G260-B, G260-C

Soil Description	Sieve No	Weight %
Gravel	4	2.6
Coarse Sand	10	1.0
Medium Sand	40	0.6
Fine Sand	200	80.6
Silt/Clay	<200	15.2

Sample Mass (g):	171.14

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	1.91	1.12	1.12	98.88
	4	4.750	4.43	2.59	2.59	97.41
	10	2.000	1.67	0.98	3.56	96.44
	20	0.850	0.27	0.16	3.72	96.28
	40	0.425	0.73	0.43	4.15	95.85
	60	0.250	7.45	4.35	8.50	91.50
	140	0.106	113.70	66.44	74.94	25.06
	200	0.075	16.82	9.83	84.77	15.23

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.039		13.67	98.44	10.27
	5	0.025		0.22	98.66	8.80
	15	0.015		0.45	99.11	5.87
	30	0.010		0.00	99.11	5.87
	60	0.007		0.22	99.33	4.40
	120	0.005		0.00	99.33	4.40
	250	0.004		0.22	99.55	2.93



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THE LEADER IN ENVIRONMENTAL TESTING

Particle Size Distribution (ASTM D422) - Report

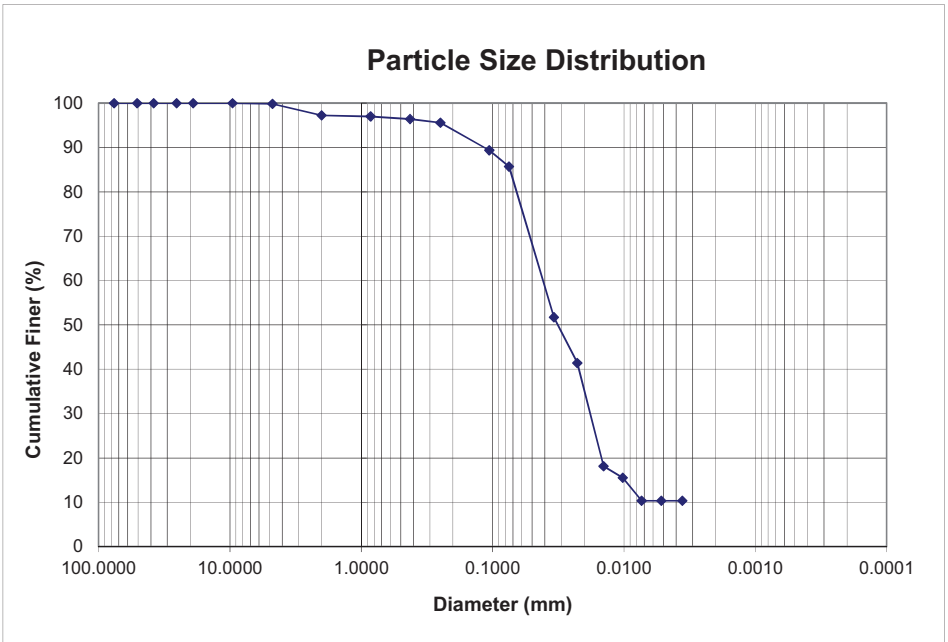
Analyst:	PC	Lab ID:	WISH-6
Date:	1/5/2019	Client ID:	G260-D, G260-E

Soil Description	Sieve No	Weight %
Gravel	4	0.2
Coarse Sand	10	2.6
Medium Sand	40	0.8
Fine Sand	200	10.7
Silt/Clay	<200	85.7

Sample Mass (g):	79.55

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.14	0.18	0.18	99.82
	10	2.000	2.06	2.59	2.77	97.23
	20	0.850	0.19	0.24	3.00	97.00
	40	0.425	0.49	0.61	3.61	96.39
	60	0.250	0.66	0.83	4.45	95.55
	140	0.106	4.93	6.20	10.65	89.35
	200	0.075	2.92	3.67	14.32	85.68

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.034		41.38	55.70	51.70
	5	0.023		8.86	64.56	41.36
	15	0.014		19.93	84.50	18.10
	30	0.010		2.21	86.71	15.51
	60	0.007		4.43	91.14	10.34
	120	0.005		0.00	91.14	10.34
	250	0.004		0.00	91.14	10.34



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THE LEADER IN ENVIRONMENTAL TESTING

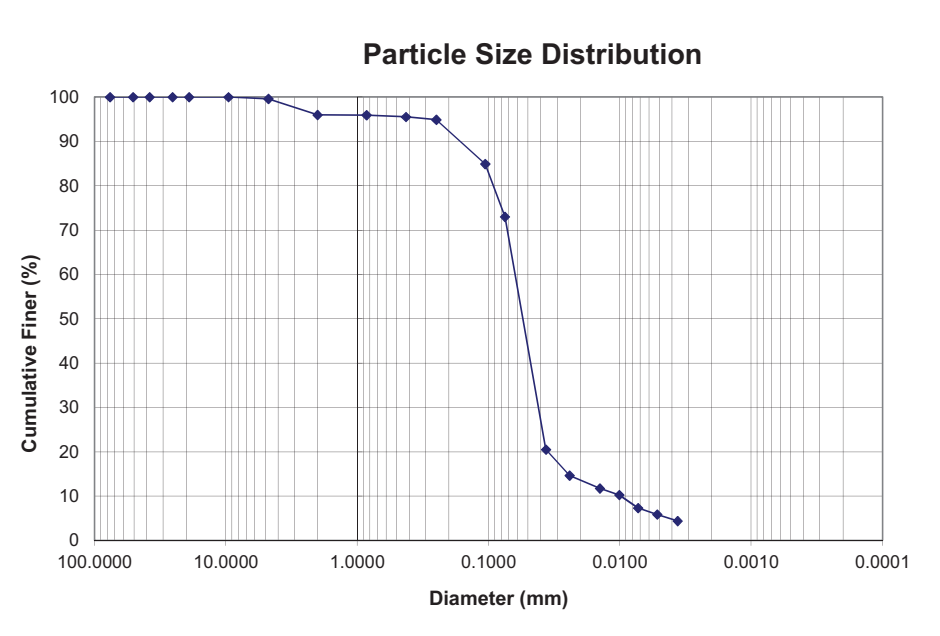
Particle Size Distribution (ASTM D422) - Report

Analyst:	PC	Lab ID:	WISH-7
Date:	1/5/2019	Client ID:	G260-F - G260-H

Soil Description	Sieve No	Weight %		
Gravel	4	0.4		
Coarse Sand	10	3.6		
Medium Sand	40	0.4		
Fine Sand	200	22.5		
Silt/Clay	<200	73.0	**Sample Mass (g):**	**130.27**

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.56	0.43	0.43	99.57
	10	2.000	4.70	3.61	4.04	95.96
	20	0.850	0.10	0.07	4.11	95.89
	40	0.425	0.49	0.37	4.49	95.51
	60	0.250	0.85	0.65	5.14	94.86
	140	0.106	13.02	9.99	15.13	84.87
	200	0.075	15.48	11.88	27.01	72.99

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.037		58.01	85.02	20.53
	5	0.024		4.28	89.30	14.66
	15	0.014		2.14	91.44	11.73
	30	0.010		1.07	92.51	10.26
	60	0.007		2.14	94.65	7.33
	120	0.005		1.07	95.72	5.86
	250	0.004		1.07	96.79	4.40



TestAmerica ASL

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

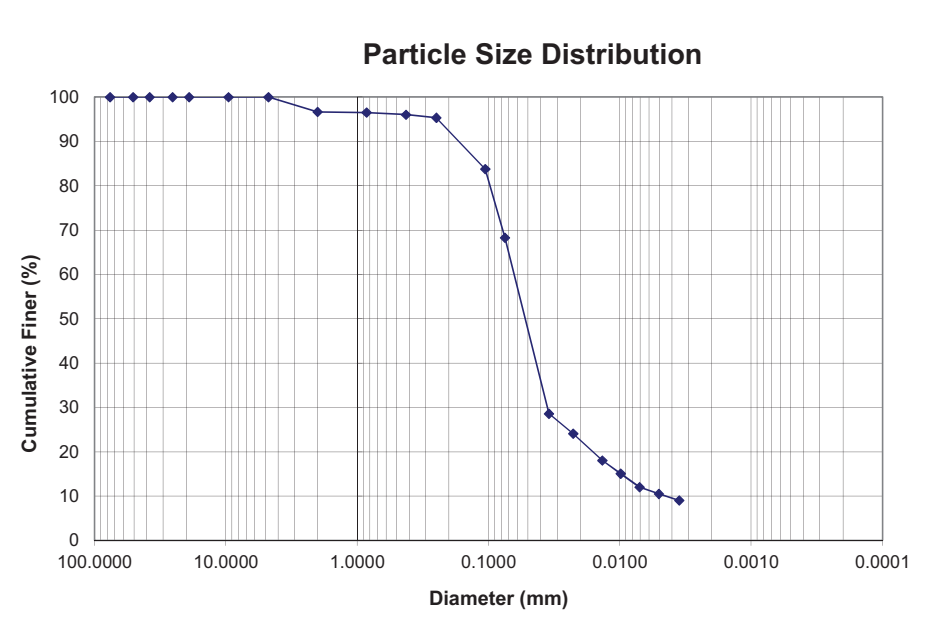
Particle Size Distribution (ASTM D422) - Report

Analyst:	PC	Lab ID:	WISH-8
Date:	1/5/2019	Client ID:	G260-I - G260-K

Soil Description	Sieve No	Weight %		
Gravel	4	0.0		
Coarse Sand	10	3.4		
Medium Sand	40	0.6		
Fine Sand	200	27.8		
Silt/Clay	<200	68.3	Sample Mass (g):	116.17

	Sieve #	Diameter (mm)	Weight Retained (g)	Weight Retained %	Cumulative Retained %	Cumulative Finer %
Sieve Analysis	3"	76.20	0.00	0.00	0.00	100.00
	2"	50.80	0.00	0.00	0.00	100.00
	1.5"	38.10	0.00	0.00	0.00	100.00
	1"	25.40	0.00	0.00	0.00	100.00
	3/4"	19.05	0.00	0.00	0.00	100.00
	3/8"	9.525	0.00	0.00	0.00	100.00
	4	4.750	0.00	0.00	0.00	100.00
	10	2.000	3.91	3.37	3.37	96.63
	20	0.850	0.17	0.15	3.51	96.49
	40	0.425	0.53	0.46	3.97	96.03
	60	0.250	0.84	0.72	4.69	95.31
	140	0.106	13.41	11.55	16.24	83.76
	200	0.075	18.01	15.51	31.74	68.26

	Hydrometer Time	Diameter (mm)		Weight Retained %	Cumulative Retained %	Cumulative Finer %
Hydrometer Analysis	2	0.035		48.73	80.48	28.60
	5	0.023		3.08	83.56	24.09
	15	0.014		4.11	87.67	18.06
	30	0.010		2.06	89.72	15.05
	60	0.007		2.06	91.78	12.04
	120	0.005		1.03	92.81	10.54
	250	0.004		1.03	93.83	9.03



TEST AMERICA Chain of Custody Record [CVO]

LAB#: T1092

Client: CH2M

Project #: 693282

Project Name: BNSF-WISHRAM

Project location: WISHRAM, WA

Sampler: J. Ulrich

Report to: Carrie Andrews

Phone: 503 348 9500

email: carrie.andrews@jacobs.com

SAMPLE ID	DATE TAKEN	TIME TAKEN	MATRIX	PRESERV / Collection Method	No. of Containers	Anaylis NAPL Mobility
G200-MC-081018	8/10/18	1330	SS	Dry ice / Grab	1	X
G260-MC-081018	8/10/18	1550	SS	Dry ice	1	X

Relinquished By: Jennifer Ulrich DATE/TIME: 8/13/18 1200

Received By: [signature] TAA82 DATE/TIME: 8/14/18 0945

Received on Ice: Yes ☒ No ☐

Temperature: Dry -43 °C

Appendix D
NAPL Mobility Testing Results

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Pore Fluid Saturations

BNSF Wishram Yard

			Media Volumes							Pore Volume Saturation		
Sample ID	Sample Depth Range (ft bgs)	NAPL Density * (g/cm^3)	Bulk Sample (cm^3)	Solids (cm^3)	Water (cm^3)	NAPL (cm^3)	Air (cm^3)	Pore Volume, P_V (cm^3)	Porosity (%V_B)	Water (% P_V)	NAPL (% P_V)	Air (% P_V)
G200-J	2.83 - 3.00	0.96	37.80	14.8	15.5	5.9	1.6	21.4	57%	73%	27%	8%
G200-K, PWD	3.00 - 3.17	0.96	36.11	18.5	14.7	7.2	-4.3	21.9	61%	67%	33%	-20%
G200-L	3.17 - 3.33	0.96	33.53	16.4	11.7	6.9	-1.4	18.6	55%	63%	37%	-8%
G200-M, PWD	3.33 - 3.50	0.96	36.19	23.2	14.4	5.4	-6.8	19.8	55%	73%	27%	-34%
G200-N	3.50 - 3.67	0.96	30.85	21.1	9.7	1.4	-1.3	11.1	36%	88%	12%	-12%
G200-O	3.67 - 3.83	0.96	32.10	15.9	12.9	-1.0	4.3	11.9	37%	108%	-8%	36%

Notes:

*No location-specific NAPL density measured. Assumed density of 0.96 g/cm^3 per previous upland study.

Pore Volume is estimated as the sum of the water and NAPL phases as these were saturated samples.

PWD = Post Water Drive

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Pore Fluid Saturations

BNSF Wishram Yard

			Media Volumes							Pore Volume Saturation		
Sample ID	Sample Depth Range (ft bgs)	NAPL Density* (g/cm^3)	Bulk Sample (cm^3)	Solids (cm^3)	Water (cm^3)	NAPL (cm^3)	Air (cm^3)	Pore Volume, P_V (cm^3)	Porosity ($\%V_B$)	Water ($\%\ P_V$)	NAPL ($\%\ P_V$)	Air ($\%\ P_V$)
G260-C	1.83 - 2.00	0.96	35.17	22.6	14.5	-0.6	-1.3	13.9	39%	104%	-4%	-9%
G260-D, PWD	2.00 - 2.17	0.96	49.25	22.2	16.1	9.8	1.2	25.9	53%	62%	38%	5%
G260-E	2.17 - 2.33	0.96	35.49	17.8	15.9	3.2	-1.3	19.0	54%	83%	17%	-7%
G260-F	2.33 - 2.50	0.96	40.15	21.7	9.3	6.7	2.5	16.0	40%	58%	42%	16%
G260-G, PWD	2.50 - 2.67	0.96	41.24	20.4	17.0	3.3	0.6	20.2	49%	84%	16%	3%
G260-H	2.67 - 2.83	0.96	35.90	23.5	17.7	0.5	-5.8	18.2	51%	97%	3%	-32%

Notes:

*No location-specific NAPL density measured. Assumed density of 0.96 g/cm^3 per previous upland study.

Pore Volume is estimated as the sum of the water and NAPL phases as these were saturated samples.

PWD = Post Water Drive

Appendix E
Data Validation

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Memorandum

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Dallas, Texas 75201
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Subject **Data Validation Summary**

Project Name BNSF-Wishram Railyard

Attention Carrie Andrews/PDX
Gretchen Gee/PDX

From Tiffany Hill

Date January 22, 2019

1. Introduction

The following data validation report discusses the data validation process and findings for STAT Analysis Corporation in Chicago, IL for Sample Delivery Group (SDG) 18080529. Based on the deliverable the validation performed is in line with a level 2 validation.

Samples were analyzed using the following analytical methods:

- COD by E410.4 (Note: lab is not accredited for solid matrices, utilizing a modified method due to the matrix.)

The samples included in this SDG are listed in the table below.

Table 1. Sample IDs

Sample ID	Lab ID	Matrix
D240-GS-080618	18080529-001A	Soil
D260-GS-080618	18080529-002A	Soil
D420-GS-080618	18080529-003A	Soil
D150-GS-080718	18080529-004A	Soil
D220-GS-080718	18080529-005A	Soil
BG-US01-080718	18080529-006A	Soil
D200-GS-080718	18080529-007A	Soil
D200-SC-080718-A	18080529-008A	Soil
G260-SC-080718-A	18080529-009A	Soil
G260-SC-080718-A-1	18080529-010A	Soil
G260-SC-080718-B	18080529-011A	Soil

Table 1. Sample IDs

Sample ID	Lab ID	Matrix
G260-GS-080718	18080529-012A	Soil
G200-GS-080718	18080529-013A	Soil
G200-SC-080718	18080529-014A	Soil
F400B-SC-080818-A	18080529-015A	Soil
F400B-SC-080818-B	18080529-016A	Soil
F360-SC-080818-A	18080529-017A	Soil
F360-SC-080818-B	18080529-018A	Soil
K120-GS-080818	18080529-019A	Soil
K120-SC-080818-A	18080529-020A	Soil
J260-GS-080818	18080529-021A	Soil
J260-SC-080818-A	18080529-022A	Soil
I400-GS-080918	18080529-023A	Soil
I400-SC-080918-A	18080529-024A	Soil
I400-SC-080918-B	18080529-025A	Soil

2. Data Evaluation

Data was evaluated with guidance found in the following guidance documents: National Functional Guidelines for Inorganic Superfund Methods Data Review (January 2017) as applicable:

- Data Completeness
- Technical Holding Times

3. Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the sections below. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte, the validator has chosen the qualifier that best indicates possible bias in the results and qualified these data accordingly.

3.1 Data Completeness

The SDGs were received complete and intact.

3.2 Technical Holding Times

According to the chain of custody records, sampling was performed on 8/6/18-8/9/18. Samples were received at the laboratory on 8/14/18. All sample preparation analysis was performed within holding time requirements.

4. Conclusion

These data can be used in the project decision-making process as qualified by the data quality evaluation process.

Qualification Flags

Exclude	More appropriate data exist for this analyte.
R	Data were rejected for use.
UL	Analyte not detected, quantitation limit is potentially biased low.
UJ	Analyte not detected, estimated quantitation limit.
U	Analyte not detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
L	Analyte present, estimated value potentially biased low.
K	Analyte present, estimated value potentially biased high.
N	Analyte identification presumptive; no second column analysis performed or GC/MS tentative identification.
J	Analyte present, estimated value.
NJ	Analysis indicates the presence of an analyte that was "tentatively identified" and the associated value represents its approximate concentration.
None	Placeholder for calculating quality control issues that do not require flagging.
=	Analyte was detected at a concentration greater than the quantitation limit.

Qualifier Code Reference

Value	Description
%SOL	High Moisture content
2C	Second Column – Poor Dual Column Reproducibility
2S	Second Source – Bad reproducibility between tandem detectors
BD	Blank Spike/Blank Spike Duplicate(LCS/LCSD) Precision
BRL	Below Reporting Limit
BSH	Blank Spike/LCS – High Recovery
BSL	Blank Spike/LCS – Low Recovery
CC	Continuing Calibration
CCH	Continuing Calibration Verification – High Recovery
CCL	Continuing Calibration Verification – Low Recovery
DL	Redundant Result – due to Dilution
EBL	Equipment Blank Contamination

Value	Description
EMPC	Estimated Possible Maximum Concentration
ESH	Extraction Standard - High Recovery
ESL	Extraction Standard - Low Recovery
FBL	Field Blank Contamination
FD	Field Duplicate
HT	Holding Time
ICB	Initial Calibration – Bad Linearity or Curve Function
ICH	Initial Calibration – High Relative Response Factors
ICL	Initial Calibration – Low Relative Response Factors
ISH	Internal Standard – High Recovery
ISL	Internal Standard – Low Recovery
LD	Lab Duplicate Reproducibility
LR	Concentration Exceeds Linear Range
MBL	Method Blank Contamination
MDP	Matrix Spike/Matrix Spike Duplicate Precision
MI	Matrix interference obscuring the raw data
MSH	Matrix Spike and/or Matrix Spike Duplicate – High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate – Low Recovery
OT	Other
PD	Pesticide Degradation
RE	Redundant Result - due to Reanalysis or Re-extraction
SD	Serial Dilution Reproducibility
SSH	Spiked Surrogate – High Recovery
SSL	Spiked Surrogate – Low Recovery
TBL	Trip Blank Contamination
TN	Tune

Attachment 1
Analytical Results

STAT Analysis Corporation
2242 West Harrison St., Suite 200, Chicago, IL 60612-3766
Tel: (312) 733-0551 Fax: (312) 733-2386 STATinfo@STATAnalysis.com
Accreditations:IEPA ELAP 100445;ORELAP IL300001;AIHA-LAP, LLC 101160;NVLAP LabCode 101202-0

Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-001 **Collection Date:** 8/6/2018 2:50:00 PM
Client Sample ID: D240-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	ND	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-002 **Collection Date:** 8/6/2018 3:30:00 PM
Client Sample ID: D260-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-003 **Collection Date:** 8/6/2018 4:55:00 PM
Client Sample ID: D420-GS-080618 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-004 **Collection Date:** 8/7/2018 7:30:00 AM
Client Sample ID: D150-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-005 **Collection Date:** 8/7/2018 7:55:00 AM
Client Sample ID: D220-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-006 **Collection Date:** 8/7/2018 8:50:00 AM
Client Sample ID: BG-US01-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-007 **Collection Date:** 8/7/2018 12:30:00 PM
Client Sample ID: D200-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-008 **Collection Date:** 8/7/2018 4:40:00 PM
Client Sample ID: D200-SC-080718-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	350	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-009 **Collection Date:** 8/7/2018 5:25:00 PM
Client Sample ID: G260-SC-080718-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-010 **Collection Date:** 8/7/2018 5:30:00 PM
Client Sample ID: G260-SC-080718-A-1 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-011 **Collection Date:** 8/7/2018 5:10:00 PM
Client Sample ID: G260-SC-080718-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-012 **Collection Date:** 8/7/2018 6:00:00 PM
Client Sample ID: G260-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-013 **Collection Date:** 8/7/2018 6:50:00 PM
Client Sample ID: G200-GS-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-014 **Collection Date:** 8/7/2018 6:40:00 PM
Client Sample ID: G200-SC-080718 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-015 **Collection Date:** 8/8/2018 11:55:00 AM
Client Sample ID: F400B-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-016 **Collection Date:** 8/8/2018 12:00:00 PM
Client Sample ID: F400B-SC-080818-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-017 **Collection Date:** 8/8/2018 1:10:00 PM
Client Sample ID: F360-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	480	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-018 **Collection Date:** 8/8/2018 1:15:00 PM
Client Sample ID: F360-SC-080818-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-019 **Collection Date:** 8/8/2018 4:40:00 PM
Client Sample ID: K120-GS-080818 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-020 **Collection Date:** 8/8/2018 4:55:00 PM
Client Sample ID: K120-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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Date Reported: September 05, 2018
Date Printed: September 05, 2018

ANALYTICAL RESULTS

Client: CH2M Hill
Project: 693282, BNSF-Wishram, Wishram, WA **Work Order:** 18080529 Revision 0

Lab ID: 18080529-021 **Collection Date:** 8/8/2018 5:40:00 PM
Client Sample ID: J260-GS-080818 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-022 **Collection Date:** 8/8/2018 5:45:00 PM
Client Sample ID: J260-SC-080818-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/19/2018**		Analyst: **MD**
Chemical Oxygen Demand	2200	2000	*	mg/Kg	1	8/19/2018

Lab ID: 18080529-023 **Collection Date:** 8/9/2018 10:00:00 AM
Client Sample ID: I400-GS-080918 **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	ND	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-024 **Collection Date:** 8/9/2018 10:10:00 AM
Client Sample ID: I400-SC-080918-A **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	220	200	*	mg/Kg	1	8/21/2018

Lab ID: 18080529-025 **Collection Date:** 8/9/2018 10:15:00 AM
Client Sample ID: I400-SC-080918-B **Matrix:** Soil

Analyses	Result	RL	Qualifier	Units	DF	Date Analyzed
Chemical Oxygen Demand	**E410.4**			Prep Date: **8/21/2018**		Analyst: **MD**
Chemical Oxygen Demand	250	200	*	mg/Kg	1	8/21/2018

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
HT - Sample received past holding time
* - Non-accredited parameter
RL - Reporting / Quantitation Limit for the analysis
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H - Holding time exceeded

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VPH/EPH Validation Summary

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Memorandum

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Subject **Wishram VPH/EPH Validation**

Project Name Wishram Nearshore Initial Investigation

From Tiffany Hill

Date October 9, 2018

Project No 693282

1. Introduction

The following data validation report discusses the data validation process and findings for Test America in Tacoma, WA for Sample Delivery Group (SDG) J79568-1.

Samples were analyzed using the following analytical methods:

- NWTPH-VPH
- NWTPH-EPH
- Percent Solids, Percent Moisture

The samples included in this SDG are listed in the table below.

Table 1. Sample IDs

Sample ID	Lab ID	Matrix
D240-GS-080618	580-79568-1	Soil
D260-GS-080618	580-79568-2	Soil
D420-GS-080618	580-79568-3	Soil
D420-GS-080618-1	580-79568-4	Soil
D220-GS-080718	580-79568-5	Soil
BG-US01-GS-080718	580-79568-6	Soil
D200-GS-080718	580-79568-7	Soil
G260-GS-080718	580-79568-8	Soil
G200-GS-080718	580-79568-9	Soil
K120-GS-080818	580-79568-10	Soil
J260-GS-080818	580-79568-11	Soil
I400-GS-080918	580-79568-12	Soil
TB-01-080618	580-79568-13	QC

2. Data Evaluation

Data was evaluated in accordance with the analytical methods and with the criteria found in the following guidance documents: National Functional Guidelines for Superfund Organic Methods Data Review (September 2017) as applicable:

- Data Completeness
- Technical Holding Times
- Blanks
- Laboratory Control Samples
- Surrogate Recoveries

2.1 Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the sections below. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte, the validator has chosen the qualifier that best indicates possible bias in the results and qualified these data accordingly.

2.2 Data Completeness

The SDGs were received complete and intact.

2.3 Technical Holding Times

Per the chain of custody records, sampling was performed on 8/6/18-8/9/18. Samples were received at the laboratory on 8/14/18. All sample preparation analysis was initially performed within holding time requirements. An LCS failed to meet acceptance criteria for all samples for C10-C12 Aliphatics. Samples were re-extracted outside of holding time beyond use. Initial results were used for reporting.

2.4 Blanks

A few compounds were detected in the associated trip blank as listed below. Affected data are summarized in the tables below. Impacted samples were flagged U-TBL.

Table 2. Trip Blank Detections

Sample ID	Analyte	Reported Concentration (mg/kg)
TB-01-080618	C10-C12 Aliphatics	2.4 J
TB-01-080618	C10-C12 Aromatics	4.2 J

Table 3. Sample Results Impacted by Equipment Blank Detections

Sample	Analyte	Concentration (mg/kg)	Original Qualifier	Final Qualifier
D240-GS-080618	C10-C12 Aromatics	13	J	U-TBL
D260-GS-080618	C10-C12 Aromatics	8.1	J	U-TBL
D420-GS-080618	C10-C12 Aliphatics	5.8	J	U-TBL
	C10-C12 Aromatics	8.9	J	U-TBL
D420-GS-080618-1	C10-C12 Aromatics	9.4	J	U-TBL

Table 3. Sample Results Impacted by Equipment Blank Detections

Sample	Analyte	Concentration (mg/kg)	Original Qualifier	Final Qualifier
D220-GS-080718	C10-C12 Aromatics	11	J	U-TBL
BG-US01-080718	C10-C12 Aromatics	7.0	J	U-TBL
D200-GS-080718	C10-C12 Aromatics	5.1	J	U-TBL
G260-GS-080718	C10-C12 Aromatics	5.3	J	U-TBL
G200-GS-080718	C10-C12 Aromatics	5.2	J	U-TBL
K120-GS-080818	C10-C12 Aromatics	6.4	J	U-TBL
J260-GS-080818	C10-C12 Aromatics	5.3	J	U-TBL
I400-GS-080918	C10-C12 Aromatics	4.5	J	U-TBL

2.5 Laboratory Control Spike

In all NWTPH-EPH samples the associated LCS failed to meet criteria for C10-C12 Aliphatics. All samples are qualified UJ-BSL.

2.6 Surrogate Spike

Samples D240-GS-080618, D260-GS-080618, D420-GS-080618-1, D220-GS-080718, and BG-US01-080718 were UJ/J-SSL qualified due to the failure of associated surrogates for NWTPH-EPH analysis.

2.7 Other

All other analytes for NWTPH-VPH were qualified as estimated UJ/J-OT due to noted elevated baseline described in the laboratory case narrative. Such narration suggests that the results are potentially biased high or reported with reporting limits biased high. Data is available for use at an estimated level.

2.8 Conclusion

These data can be used in the project decision-making process as qualified by the data quality evaluation process.

Qualification Flags

Exclude	More appropriate data exist for this analyte.
R	Data were rejected for use.
UL	Analyte not detected, quantitation limit is potentially biased low.
UJ	Analyte not detected, estimated quantitation limit.
U	Analyte not detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
L	Analyte present, estimated value potentially biased low.

K	Analyte present, estimated value potentially biased high.
N	Analyte identification presumptive; no second column analysis performed or GC/MS tentative identification.
J	Analyte present, estimated value.
NJ	Analysis indicates the presence of an analyte that was "tentatively identified" and the associated value represents its approximate concentration.
None	Placeholder for calculating quality control issues that do not require flagging.
=	Analyte was detected at a concentration greater than the quantitation limit.

Qualifier Code Reference

Value	Description
%SOL	High Moisture content
2C	Second Column – Poor Dual Column Reproducibility
2S	Second Source – Bad reproducibility between tandem detectors
BD	Blank Spike/Blank Spike Duplicate(LCS/LCSD) Precision
BRL	Below Reporting Limit
BSH	Blank Spike/LCS – High Recovery
BSL	Blank Spike/LCS – Low Recovery
CC	Continuing Calibration
CCH	Continuing Calibration Verification – High Recovery
CCL	Continuing Calibration Verification – Low Recovery
DL	Redundant Result – due to Dilution
EBL	Equipment Blank Contamination
EMPC	Estimated Possible Maximum Concentration
ESH	Extraction Standard - High Recovery
ESL	Extraction Standard - Low Recovery
FBL	Field Blank Contamination
FD	Field Duplicate
HT	Holding Time
ICB	Initial Calibration – Bad Linearity or Curve Function
ICH	Initial Calibration – High Relative Response Factors
ICL	Initial Calibration – Low Relative Response Factors
ISH	Internal Standard – High Recovery
ISL	Internal Standard – Low Recovery
LD	Lab Duplicate Reproducibility

Value	Description
LR	Concentration Exceeds Linear Range
MBL	Method Blank Contamination
MDP	Matrix Spike/Matrix Spike Duplicate Precision
MI	Matrix interference obscuring the raw data
MSH	Matrix Spike and/or Matrix Spike Duplicate – High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate – Low Recovery
OT	Other
PD	Pesticide Degradation
RE	Redundant Result - due to Reanalysis or Re-extraction
SD	Serial Dilution Reproducibility
SSH	Spiked Surrogate – High Recovery
SSL	Spiked Surrogate – Low Recovery
TBL	Trip Blank Contamination
TN	Tune

TPH/PAH Data Validation Summary

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Subject	**Data Validation Summary**
Project Name	BNSF – Wishram Railyard
Attention	Carrie Andrews/PDX Gretchen Gee/PDX
From	Tiffany Hill/CVO
Date	August 27, 2018
Project No	693282

1. Introduction

The following data validation report discusses the data validation process and findings for Pace Analytical in Mount Juliet, TN for Sample Delivery Group (SDG) L107281.

Samples were analyzed using the following analytical methods:

- SW8270-SIM, PAHs
- NWTPH-Dx, DRO and RRO with and without silica gel treatment
- USDA LOI, TOC
- SM2540G, Total Solids

The samples included in this SDG are listed in the table below.

Table 1. Sample IDs

Sample ID	Lab ID	Matrix
D240-GS-080618	L1017281-01	Soil
D240-GS-080618	L1017281-02	Soil
D420-GS-080618	L1017281-03	Soil
D420-GS-080618-1	L1017281-04	Soil
D150-GS-080718	L1017281-05	Soil
D220-GS-080718	L1017281-06	Soil
BG-USO1-GS-080718	L1017281-07	Soil
D200-GS-080718	L1017281-08	Soil
D200-SC-080718A	L1017281-09	Soil
G260-SC-080718-A	L1017281-10	Soil

Table 1. Sample IDs

Sample ID	Lab ID	Matrix
G260-SC-080718-A-1	L1017281-11	Soil
G260-SC-080718-B	L1017281-12	Soil
G260-GS-080718	L1017281-13	Soil
G200-GS-080718	L1017281-14	Soil
G200-SC-080718-A	L1017281-15	Soil
F400B-SC-080818-A	L1017281-16	Soil
F400B-SC-080818-B	L1017281-17	Soil
F360-SC-080818-A	L1017281-18	Soil
F360-SC-080818-B	L1017281-19	Soil
K120-GS-080818	L1017281-20	Soil
K120-SC-080818-A	L1017281-21	Soil
J260-GS-080818	L1017281-22	Soil
J260-SC-080818-A	L1017281-23	Soil
I400-GS-080918	L1017281-24	Soil
I400-SC-080918-A	L1017281-25	Soil
I400-SC-080918-B	L1017281-26	Soil
EB-01-080718	L1017281-27	Aqueous

2. Data Evaluation

Data was evaluated in accordance with the analytical methods and with the criteria found in the following guidance documents: National Functional Guidelines for Superfund Organic Methods Data Review (September 2017) as applicable:

- Data Completeness
- Technical Holding Times
- Blanks
- Laboratory Control Samples
- Surrogate Recoveries

3. Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the sections below. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte, the validator has chosen the qualifier that best indicates possible bias in the results and qualified these data accordingly.

3.1 Data Completeness

The SDGs were received complete and intact.

3.2 Technical Holding Times

According to the chain of custody records, sampling was performed on 8/6/18-8/9/18. Samples were received at the laboratory on 8/14/18. All sample preparation analysis was performed within holding time requirements.

3.3 Blanks

Several compounds were detected in the associated equipment blank as listed below. Affected data are summarized in the tables below. The equipment blank, EB-01-080718 had a detection of benzo(b)fluoranthene in its associated method blank. The result in the sample was U-MBL qualified.

Table 2. Equipment Blank Detections

Sample ID	Analyte	Reported Concentration (µg/L)
EB-01-080718	Fluoranthene	0.0519
EB-01-080718	Fluorene	0.0211 J
EB-01-080718	Naphthalene	0.329
EB-01-080718	Phenanthrene	0.0791
EB-01-080718	Pyrene	0.0293 J
EB-01-080718	1-methylnaphthalene	0.0293 J
EB-01-080718	2-methylnaphthalene	0.0445 J

Table 3. Sample Results Impacted by Equipment Blank Detections

Sample	Analyte	Concentration (mg/kg)	Original Qualifier	Final Qualifier
D240-GS-080618	Naphthalene	0.00428	J	U-EBL
	2-Methylnaphthalene	0.003	J	U-EBL
D260-GS-080618	Fluoranthene	0.00398	J	U-EBL
	Phenanthrene	0.00149	J	U-EBL
	Pyrene	0.00531	J	U-EBL
D420-GS-080618-1	Pyrene	0.000937	J	U-EBL
D150-GS-080718	Fluoranthene	0.00268	J	U-EBL
	Phenanthrene	0.00103	J	U-EBL
	Pyrene	0.00437	J	U-EBL
D220-GS-080718	Fluoranthene	0.00135	J	U-EBL
	Pyrene	0.00257	J	U-EBL
D200-GS-080718	Fluoranthene	0.00726	J	U-EBL
	Fluorene	0.00161	J	U-EBL
	Naphthalene	0.00579	J	U-EBL

Table 3. Sample Results Impacted by Equipment Blank Detections

Sample	Analyte	Concentration (mg/kg)	Original Qualifier	Final Qualifier
G200-GS-080718	Fluoranthene	0.00272	J	U-EBL
	Pyrene	0.00369	J	U-EBL
K120-GS-080818	Pyrene	0.00104	J	U-EBL
J260-GS-080818	Naphthalene	0.0605	J	U-EBL
EB-01-080718	Benzo(b)fluoranthene	0.00261	BJ	U-MBL

4. Conclusion

These data can be used in the project decision-making process as qualified by the data quality evaluation process.

Please do not hesitate to contact us about this validation report.

Sincerely,

Tiffany Hill

Qualification Flags

Exclude	More appropriate data exist for this analyte.
R	Data were rejected for use.
UL	Analyte not detected, quantitation limit is potentially biased low.
UJ	Analyte not detected, estimated quantitation limit.
U	Analyte not detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
L	Analyte present, estimated value potentially biased low.
K	Analyte present, estimated value potentially biased high.
N	Analyte identification presumptive; no second column analysis performed or GC/MS tentative identification.
J	Analyte present, estimated value.
NJ	Analysis indicates the presence of an analyte that was "tentatively identified" and the associated value represents its approximate concentration.
None	Placeholder for calculating quality control issues that do not require flagging.
=	Analyte was detected at a concentration greater than the quantitation limit.

Qualifier Code Reference

Value	Description
%SOL	High Moisture content
2C	Second Column – Poor Dual Column Reproducibility
2S	Second Source – Bad reproducibility between tandem detectors
BD	Blank Spike/Blank Spike Duplicate(LCS/LCSD) Precision
BRL	Below Reporting Limit
BSH	Blank Spike/LCS – High Recovery
BSL	Blank Spike/LCS – Low Recovery
CC	Continuing Calibration
CCH	Continuing Calibration Verification – High Recovery
CCL	Continuing Calibration Verification – Low Recovery
DL	Redundant Result – due to Dilution
EBL	Equipment Blank Contamination
EMPC	Estimated Possible Maximum Concentration
ESH	Extraction Standard - High Recovery
ESL	Extraction Standard - Low Recovery
FBL	Field Blank Contamination
FD	Field Duplicate
HT	Holding Time
ICB	Initial Calibration – Bad Linearity or Curve Function

Value	Description
ICH	Initial Calibration – High Relative Response Factors
ICL	Initial Calibration – Low Relative Response Factors
ISH	Internal Standard – High Recovery
ISL	Internal Standard – Low Recovery
LD	Lab Duplicate Reproducibility
LR	Concentration Exceeds Linear Range
MBL	Method Blank Contamination
MDP	Matrix Spike/Matrix Spike Duplicate Precision
MI	Matrix interference obscuring the raw data
MSH	Matrix Spike and/or Matrix Spike Duplicate – High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate – Low Recovery
OT	Other
PD	Pesticide Degradation
RE	Redundant Result - due to Reanalysis or Re-extraction
SD	Serial Dilution Reproducibility
SSH	Spiked Surrogate – High Recovery
SSL	Spiked Surrogate – Low Recovery
TBL	Trip Blank Contamination
TN	Tune

Appendix F
Calculated Estimates of Ebullition Potential

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Memorandum

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Subject	**Gas Ebullition Potential in Sediment Samples at the Wishram Rail Yard**
Project Name	BNSF Wishram Initial Investigation
Attention	Carrie Andrews
From	Raja Kaliappan
Date	December 2018

1. Introduction

Gas ebullition potential in sediment samples collected from the nearshore areas associated with the BNSF Railroad Company (BNSF) Wishram rail yard (site) was evaluated using a literature gas ebullition model (Viana et al., 2012). The model provides an estimate of the expected gas ebullition rate using sediment temperature, total organic carbon (TOC), and chemical oxygen demand (COD) as input parameters. The empirical model was developed from field observations of ebullition fluxes over a period of 1 year in Bubbly Creek (south fork of the Chicago River) and is as follows:

$$GF_m = 7.39 + 12.3\,T - 186\,S_{labile}$$

Where, GF_m is the molar gas flux in millimoles per square meter per day (mmol/m^2/d), T is the sediment temperature in degrees Celsius, and S_{labile} is the labile fraction of the organic carbon that readily contributes to gas generation, which is estimated as the ratio of sediment COD to TOC values in milligrams per kilogram (mg/kg).

Sediment COD and TOC data were collected from eight sediment coring locations from depths ranging from 1.0 to 5.5 feet below sediment surface (bss) (Figure F-1). The sample depths were chosen to represent the primary gas production zone, which is generally considered as the top 5 feet of soft sediment. Ponar grab samples were collected from five locations (D150, D220, D240, D260, and D420) in addition to the eight sediment core locations and analyzed for COD and TOC. As the grab samples were only analyzed for sediment COD and average TOC concentration from the 1-foot sample collected at F360 and F400 were used for grab samples in estimating gas ebullition rates. The average of the sediment temperature measurements at G200 and G260 were used in the model. Estimated ebullition rates in mmol/m^2/d were converted to liters per square meter per day (L/m^2/d). The model results and trends in sediment data are discussed in the following sections.

2. Sediment Characteristics

TOC concentrations ranged between 3,380 and 107,000 mg/kg with a median value of 4,563 mg/kg. The higher TOC concentrations (ranging from 37,100 mg/kg to 91,000 mg/kg) were observed farther from shore at F360, G200, G260, and J260 at depths ranging from 2.5 to 4 feet bss (Figures F-3 and F-4). These high TOC samples were collocated with occurrence of organic debris, roots, and free phase nonaqueous phase liquid (NAPL) identified in the sediment core logs. The high TOC samples were also

collocated with the maximum observed COD concentration of 2,200 mg/kg (Table F-1), suggesting that these samples were potentially influenced by NAPL present in the sample. In contrast, the COD/TOC ratio, which is an indicator of the ease of biodegradability of the organic carbon, was observed to decrease with depth and was higher in samples from 0.5 to 2.5 feet bss with values ranging from 0.05 to 0.08 (Figure F-5). This is consistent with observations at other sites as fresh organic matter is more labile than the more recalcitrant organic matter found at depth.

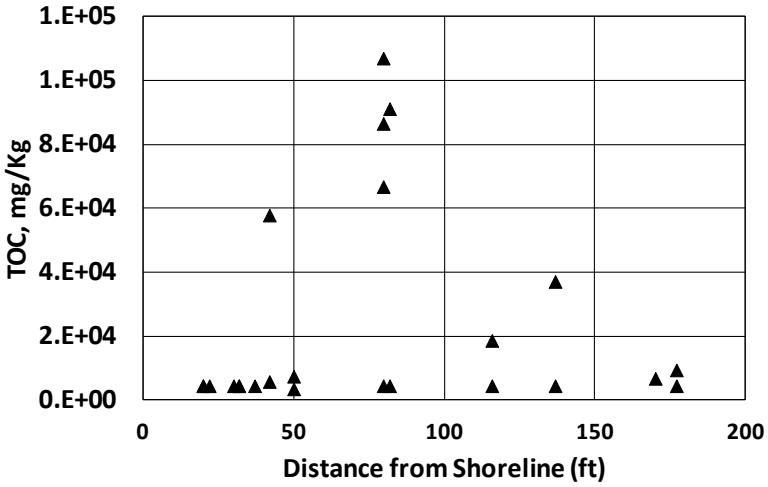


Figure F-3. Variation in TOC Concentration as a Function of Distance from the Shoreline

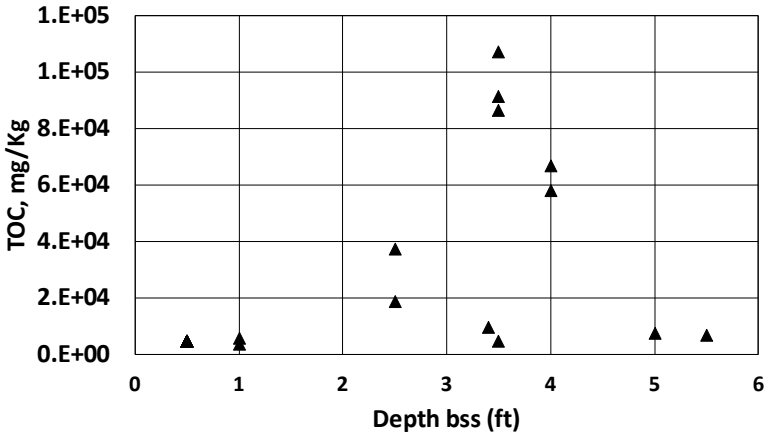


Figure F-4. Variation in TOC Concentration as a Function of Sample Depth

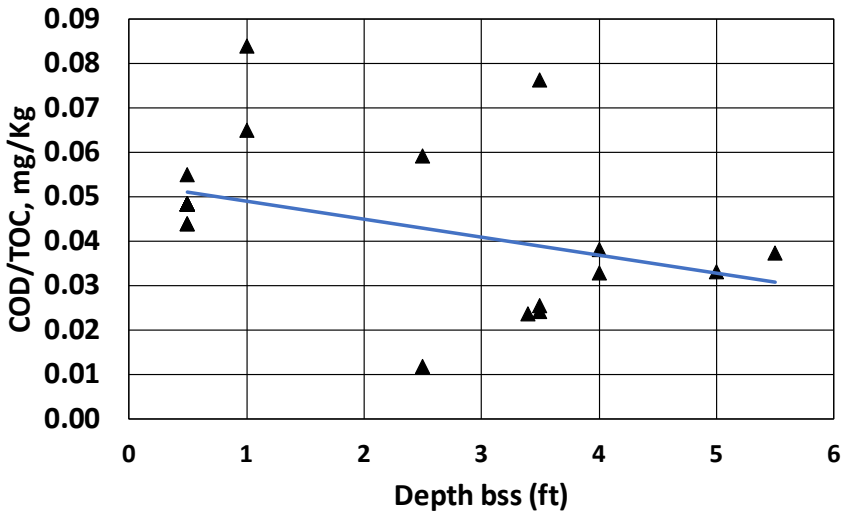


Figure F-5. Decrease in COD/TOC Ratio with Increasing Sample Depth

3. Gas Ebullition Rates

The estimated gas ebullition rates ranged between 6.5 and 6.8 L/m^2/d with little spatial variability as shown in Figures F-6 and F-7. The estimated rates were primarily influenced by the high sediment temperature at the time of sampling and is consistent with field measurements reported in the literature. Predicted ebullition rates were in the range of field measured fluxes observed in Bubbly Creek (Chicago River) that ranged between 1.4 and 9.1 L/m^2/d with a mean value of 5.5 L/m^2/d (Rockne et al., 2010). The predicted rates are indicative of high gas production in the sediments associated with the railroad property, resulting from the high TOC content observed in deeper sediment (4 to 9 percent at depths of 2.5 to 4.0 feet bss) and more labile carbon substrate observed at shallow depths. This is further validated by field observations of ebullition during the recent sampling event conducted by Jacobs Engineering Group Inc. (Jacobs) in August 2018. The NAPL occurrence depth coincides with the ebullition active zone of 0 to 5 feet bss (Viana et al., 2012; Costello and Talsma, 2003), suggesting that gas ebullition could be responsible for the mobilization of free phase NAPL and contribute to NAPL transport to the water column.

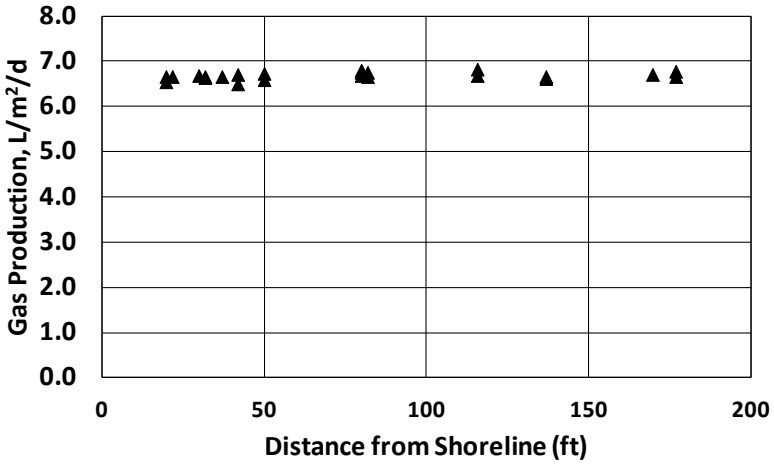


Figure F-6. Variation in Predicted Gas Ebullition Rates as a Function of Distance from the Shoreline

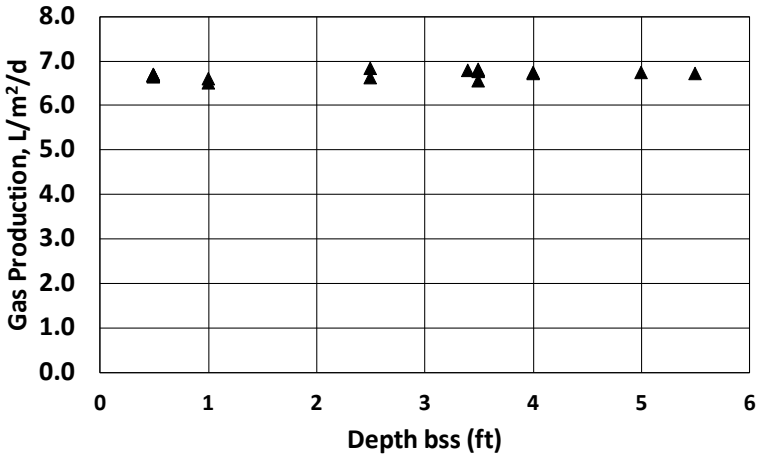


Figure F-7. Variation in Predicted Gas Ebullition Rates as a Function of Sample Depth

4. References

Costello, Michael, and D. Talsma. 2003. "Remedial design modeling at a superfund sediment site." *Proceedings of the Second International Conference on Remediation of Contaminated Sediments, Venice, Italy.*

Rockne, K, P Viana, and K. Yin. 2010. *Sediment Ebullition and Flux Studies at Bubbly Creek, Chicago, IL.* Final. United State Army Corps of Engineers Chicago District.

Viana, P.Z., K. Yin, and K.J. Rockne. 2012. “Field Measurements and Modeling of Ebullition Facilitated Flux of Heavy Metals and Polycyclic Aromatic Hydrocarbons from Sediments to the Water Column.” *Environmental Science and Technology*, Vol. 46, pp. 12046-1205

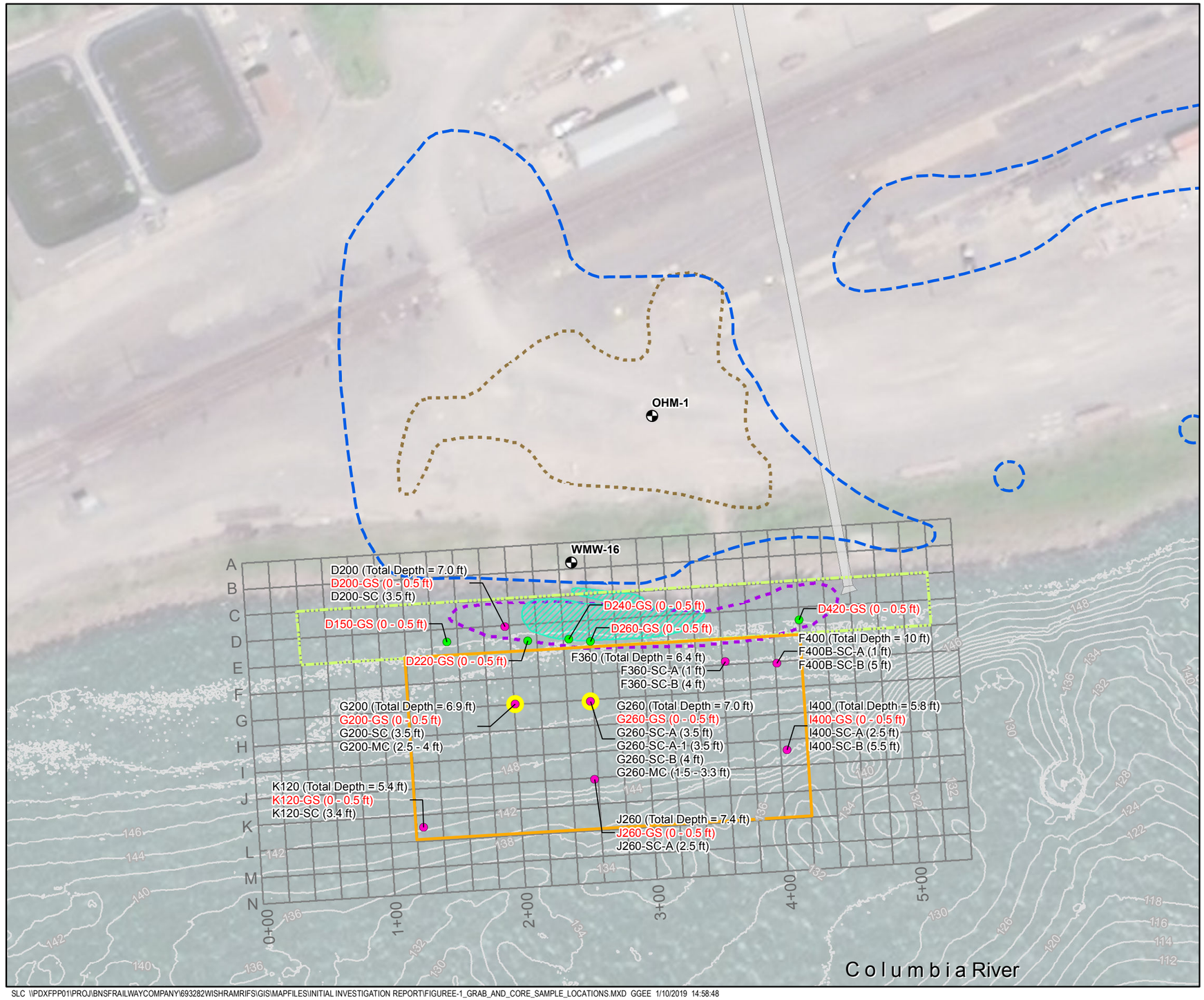
Table F-1. Input Parameters and Estimated Gas Ebullition Rates

Parameter	Units	D150-GS-080718	D200-GS-080718	D200-SC-080718A	D220-GS-080718	D240-GS-080618	D260-GS-080618	D420-GS-080618	D420-GS-080618-1	F360-SC-080818-A	F360-SC-080818-B	F400B-SC-080818-A	F400B-SC-080818-B	G200-GS-080718	G200-SC-080718-A	G260-GS-080718	G260-SC-080718-A	G260-SC-080718-A-1	G260-SC-080718-B	I400-GS-080918	I400-SC-080918-A	I400-SC-080918-B	J260-GS-080818	J260-SC-080818-A	K120-GS-080818	K120-SC-080818-A	Maximum	Minimum	Average	Median
Sample Depth		0.5	0.5	3.5	0.5	0.5	0.5	0.5		1	4	1	5	0.5	3.5	0.5	3.5	3.5	4	0.5	2.5	5.5	0.5	2.5	0.5	3.4	6	1	2	1
Distance from Shoreline	feet	37.0	20.0	20.0	32.0	30.0	32.0	22.0		42.0	42.0	50.0	50.0	82.0	82.0	80.0	80.0	80.0	80.0	116.0	116.0	170.0	137.0	137.0	177.0	177.0				
TOC	mg/kg	4,545	4,545	4,580	4,545	4,545	4,545	4,545		5,710	57,700	3,380	7,510	4,545	91,000	4,545	86,400	107,000	66,700	4,545	18,600	6,700	4,545	37,100	4,545	9,320	107,000	3,380	22,987	4,563
TOC	%	0.5	0.5	0.5	0.5	0.5		0.5	0.0	0.6	5.8	0.3	0.8	0.5	9.1	0.5	8.6	10.7	6.7	0.5	1.9	0.7	0.5	3.7	0.5	0.9	10.7	0.0	2.3	0.5
COD	mg/kg	220	220	350	250	200	220	220		480	2,200	220	250	220	2,200	220	2,200	2,200	2,200	200	220	250	220	2,200	220	220	2,200	200	733	220
COD/TOC Ratio		0.05	0.05	0.08	0.06	0.04	0.05	0.05		0.08	0.04	0.07	0.03	0.05	0.02	0.05	0.03	0.02	0.03	0.04	0.01	0.04	0.05	0.06	0.05	0.02	0.08	0.01	0.04	0
Temperature	°C	22.70	22.70	22.70	22.70	22.70	22.70	22.70		22.70	22.70	22.70	22.70	22.66	22.66	22.74	22.74	22.74	22.74	22.70	22.70	22.70	22.70	22.70	22.70	22.70	23	23	23	23
Gas Production	mmol/m^2/d	277.6	277.6	272.4	276.4	278.4	277.6	277.6		271.0	279.5	274.5	280.4	277.1	281.6	278.1	282.4	283.3	281.0	278.4	284.4	279.7	277.6	275.6	277.6	282.2	284	271	278	278
Gas Production[b]	L/m^2/d	6.7	6.7	6.5	6.6	6.7	6.7	6.7		6.5	6.7	6.6	6.7	6.7	6.8	6.7	6.8	6.8	6.7	6.7	6.8	6.7	6.7	6.6	6.7	6.8	6.8	6.5	6.7	6.7

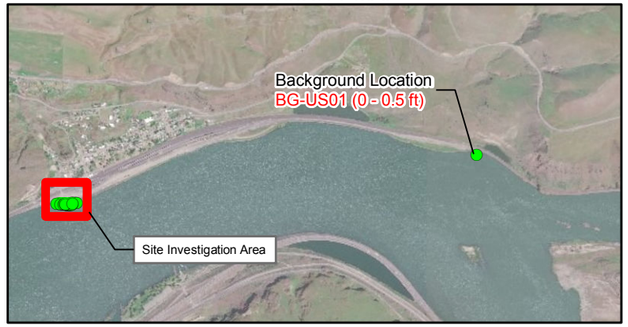
[a] Average TOC results from the 1- foot sample collected at F360 and F400 were used as input TOC for all grab sample locations.

[b] Gas flux in L/m^2/d was calculated from the model output (mmol/m^2/d) assuming a molar gas volume of 22.4 L/mole at standard temperature and pressure.

Notes:
°C = degree(s) Celsius
COD = chemical oxygen demand
L/m^2/d = liter(s) per square meter per day
L/mole = liter(s) per mole
mg/kg = milligram(s) per kilogram
mmol/m^2/d = millimole(s) per square meter per day
TOC = total organic carbon



VICINITY MAP



LEGEND

- Surface Sediment Grab Sample Location
- Lithology Core Sample Location
- Mobility Core Sample Location
- Existing Monitoring Well
- Sampling Grid (20 ft x 20 ft)
- Initial Study
- Expanded Study
- Bathymetric Contour (ft NAVD88, 2 ft Contour Interval)
- Approximate Lateral Extent of Dissolved-Phase Diesel- and/or Oil-Range Organics Above the MTCA Method A Groundwater Cleanup Level (CUL) (500 µg/L)
- Approximate Lateral Extent of Oil
- Area of Intermittent NAPL Sheening
- Small-extent NAPL Sheens Observed (Ecology, 2017)
- Stormwater Underdrain (Portion Removed from Service Circa 1960)

Sample ID Notes:

G260 (Total Depth = 7.0 ft)	Total penetration depth of core.
G260-GS (0 - 0.5 ft)	Red Text = Sample selected for petroleum-related contaminants of concern
G260-SC-A (3.5 ft)	
G260-SC-A-1 (3.5 ft)	"-1" = Duplicate sample
G260-SC-B (4 ft)	
G260-MC (1.5 - 3.3 ft)	"-MC" = Mobility sample

Notes:

NAPL = nonaqueous phase liquid	ft = feet
µg/L = microgram(s) per liter	NAVD88 = North American Vertical Datum 1988
MTCA = Model Toxics Control Act	

N

0 40 80 160
Feet

1:956 1 inch = 79.65 feet

Figure F-1. August Surface Sediment Grab Sample and Core Sample Locations
BNSF Wishram Railyard
Wishram, Washington

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SLC \\PDXFPP01\PROJ\BNSFRAILWAYCOMPANY\693282WISHRAMRIFS\GIS\MAPFILES\INITIAL INVESTIGATION REPORT\FIGUREE-1_GRAB_AND_CORE_SAMPLE_LOCATIONS.MXD GGEE 1/10/2019 14:58:48

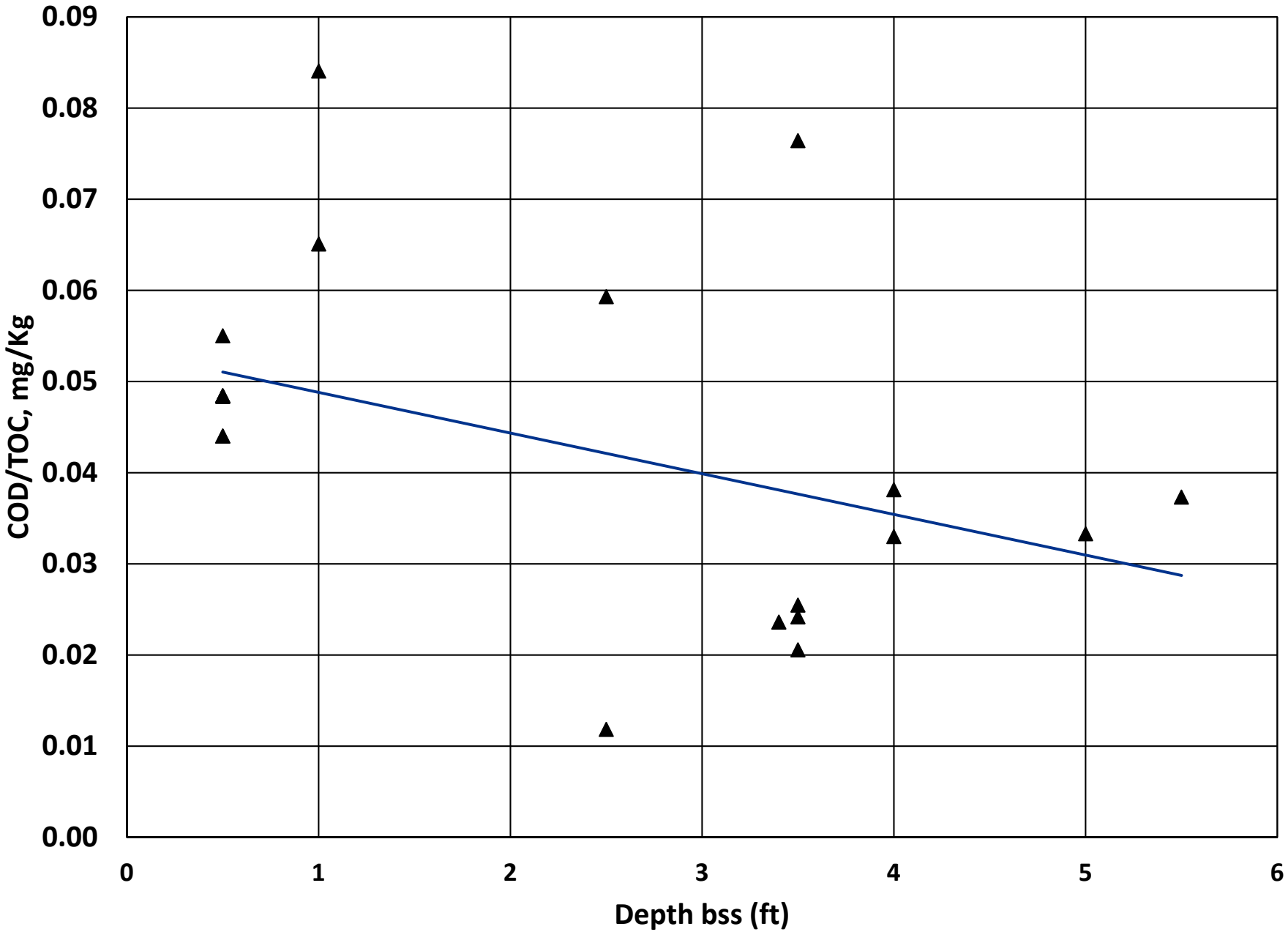

Figure F-2. Total Organic Carbon and Chemical Oxygen Demand Evaluation
BNSF Wishram Railyard
Wishram, Washington