Appendix A
Pre-Design Investigation Data Summary Report

March 2023
Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation Data Summary Report

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ABBREVIATIONS

µS/cm	microsiemens per centimeter
ASTM	ASTM International
bgs	below ground surface
BMP	Black Mud Pond
CDID	Consolidated Diking Improvement District
ConeTec	ConeTec Investigations Ltd
CPT	cone penetrometer testing
CRCP	*Cultural Resources Coordination Plan*
DSR	*Pre-Design Investigation Data Summary Report*
Ecology	Washington State Department of Ecology
Final EDR	*Final Engineering Design Report, Version 2*
Former Reynolds Plant	former Reynolds Metals Reduction Plant
HPT	hydraulic profile tool
mV	millivolt
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
PDI	pre-design investigation
PDI2	pre-design investigation 2
PDI3	pre-design investigation 3
PDI Work Plan	*Pre-Design Investigation Work Plan*
ppm	parts per million
PRB	permeable reactive barrier
PVC	polyvinyl chloride
SAP	*Sampling and Analysis Plan*
SOP	standard operating procedure
SPT	standard penetration test
SU	site unit
Su	undrained shear strength
USACE	U.S. Army Corps of Engineers
YJD	Yellow Jacket Drilling

1 Introduction

This *Pre-Design Investigation Data Summary Report* (DSR) summarizes the field investigations conducted as part of the pre-design investigation (PDI) at the former Reynolds Metals Reduction Plant (Former Reynolds Plant) in Longview, Washington. The PDI was conducted in February and April 2020 and February 2022. This DSR is an appendix to the *Final Engineering Design Report, Version 2* (Final EDR), prepared in accordance with the cleanup action as specified in the *Cleanup Action Plan* (Ecology 2018a) pursuant to Consent Decree No. 18-2-01312-08 (Ecology 2018b).

1.1 Site Description

The site is located at 4029 Industrial Way near Longview, Washington, in unincorporated Cowlitz County. The property includes about 460 acres and is currently operated as a multimodal bulk materials handling facility. The site is approximately 10 feet above mean sea level and bounded by the Columbia River to the south; Consolidated Diking Improvement District (CDID) drainage ditches to the north, west, and east; Industrial Way along the northern boundary; and private property to the east.

1.2 Purpose

The purpose of this appendix is to document the geotechnical and groundwater fluoride screening sampling techniques used and the results of the PDI. This appendix supports the Final EDR by characterizing the geotechnical conditions of site units (SUs) in order to perform engineering evaluations for cleanup action design and to screen fluoride concentrations in groundwater along the extent of the conceptual permeable reactive barrier (PRB) to determine design alignments.

2 PDI Data Collection Summary

The PDI conducted at the site included an array of geotechnical and groundwater fluoride screening sampling techniques to characterize the geotechnical properties present at the following SUs: SU1, SU2, SU6, SU7, SU8, and SU10, and to screen fluoride concentrations in groundwater along the extent of the conceptual PRB. This work was conducted per the *Pre-Design Investigation Work Plan* (PDI Work Plan; Anchor QEA 2019a) and associated addenda (Anchor QEA 2020a, 2020b, 2022) approved by the Washington State Department of Ecology (Ecology). The PDI Work Plan was approved on March 15, 2019; however, field work could not commence until the U.S. Army Corps of Engineers (USACE) provided authorization to work in the levee. The USACE authorization and CDID-issued levee encroachment permit were received on January 7, 2020. The PDI Work Plan Addendum (Anchor QEA 2020a) was submitted to Ecology on February 4, 2020, and work commenced on February 10, 2020. A second PDI mobilization occurred in April following Ecology's approval of the Pre-Design Investigation 2 (PDI2) Work Plan Addendum (Anchor QEA 2020b) on April 13, 2020.

An additional Pre-Design Investigation 3 (PDI3) Work Plan Addendum (Anchor QEA 2022) was submitted to Ecology on February 15, 2022. This addendum authorized the performance of two additional geotechnical borings performed to support foundation design of two stormwater structures proposed within the vicinity of SU7, a pump station on a gravel pad to the west of Berth Road and a 48-inch manhole to the east of Berth Road. Additional geotechnical sampling techniques were conducted to characterize the geotechnical properties present in the proposed vicinity of the pump station and manhole. Mobilization for PDI3 occurred on February 22 and 23, 2022, following Ecology's approval of the PDI3 Work Plan Addendum (Anchor QEA 2022) on February 16, 2022.

To reduce the potential for adverse effects on cultural resources, the *Cultural Resources Coordination Plan* (CRCP; AECOM 2019) was followed during the PDI. The CRCP provides procedures to be followed in the event of an unanticipated human remains or archaeological discovery, with or without a monitor being present, in compliance with federal and state laws protecting these resources. Archaeological monitoring, overseen by a professional archaeologist, occurred for exploration activities where soil was removed, including direct push soil core collection and sonic borings. The following sections summarize the PDI findings.

2.1 Direct Push Fluoride Screening Sampling

Eight direct push probes (PDI-PRB-DP-01 through PDI-PRB-DP-08) were advanced adjacent to the western side of the Closed Black Mud Pond (BMP) Facility to screen fluoride concentrations in groundwater (Figure A1). The direct push probes were advanced by Holocene Drilling, Inc., under supervision of Anchor QEA staff between February 10 and 14, 2020.

Discrete groundwater samples for fluoride field screening were collected using procedures outlined in the *Pre-Design Investigation Sampling and Analysis Plan* (SAP; Anchor QEA 2019b). Temporary well screens were installed using a direct push drilling rig at 5-foot intervals starting at ground surface down to 30 feet below ground surface (bgs) or refusal. For each 5-foot interval, the screen was advanced to the target sampling depth using the closed-tip method described in the Fluoride Field Screening Using Direct Push Drilling standard operating procedure (SOP) included as Attachment A1. Once the target sampling depth was reached, the screen was exposed to the aquifer, and if enough water entered the temporary well, a sample was collected for fluoride field screening and water quality parameters.

A follow-up direct push field investigation (PDI2) was conducted on April 15 and April 16, 2020, per the Ecology-approved PDI2 Work Plan Addendum (Anchor QEA 2020b), to further screen two locations around PDI-PRB-DP-03, which had levels of fluoride higher than anticipated. A hydraulic profile tool (HPT) measured the pressure required to inject a flow of water into the soil as the probe was advanced into the subsurface. This injection pressure log is an excellent indicator of formation permeability. In addition to measurement of injection pressure, the HPT also measured hydrostatic pressure under the zero-flow condition. This allowed for the development of an absolute piezometric pressure profile for the log and prediction of the position of the water table. The piezometric profile was used to calculate the corrected HPT pressure. These data along with the flow rate were used to calculate an estimate of hydraulic conductivity (K) in the saturated formation.

Borings PDI2-PRB-DP-09 and PDI2-PRB-DP-10 (Figure A1) were advanced using a Geoprobe 77-series drill rig equipped with the HPT. Ten borings were installed for groundwater sample collection, five were installed immediately surrounding PDI2-PRB-DP-09, and five were installed immediately surrounding PDI2-PRB-DP-10. A separate boring was installed for each groundwater sample depth interval determined as a high hydraulic conductivity area by the HPT during the advancement of PDI2-PRB-DP-09 and PDI2-PRB-DP-10 (Table A1). Four-foot stainless steel temporary well screens with 0.005-inch slot size were installed using the direct push drill rig. When the location of higher hydraulic conductivity was reached, the well screen was opened to the aquifer and sampling proceeded as discussed in the fluoride screening SOP (Attachment A1). The direct push boring installations were performed by Cascade Environmental under the supervision of Anchor QEA staff. Field forms are included in Attachment A2.

2.1.1 Fluoride Field Screening Process and Results

During the February and April 2020 investigations, polyethylene tubing was inserted to the midpoint or base of the screen, and a peristaltic pump was used to collect a groundwater grab sample through a 0.45-micron filter for fluoride field screening. A filtered 10-milliliter aliquot of sample was mixed with 10 milliliters of a total ionic strength adjustment buffer (TISAB IV, Ricca Chemical Company), and the fluoride concentration was measured with a fluoride ion-selective electrode in accordance with

the fluoride screening SOP (Attachment A1). Ion-selective electrode readings were taken in millivolts and converted to milligrams per liter using a standard curve. The standard curve was generated daily using a series of standards in an appropriate range for the measured concentrations. Water quality parameters (pH, specific conductivity, and temperature) were collected with a YSI ProPlus multiparameter unit equipped with a flow-through cell.

Fluoride screening results, water quality parameters, and groundwater sample intervals for both the February and April 2020 sampling events are presented in Table A1.

Table A1
Summary of Fluoride Concentrations in Groundwater

Boring ID	Depth Interval (feet)	Date	Fluoride (ppm)	pH (Standard Unit)	Specific Conductance (µS/cm)	Temperature (°C)
PDI-PRB-DP-01	0–5	2/10/2020	4.36	6.15	317	10.3
	5–10	2/10/2020	18	6.9	834	11.7
	10–15	2/10/2020	13.6	7.17	759	12.0
	15–20	2/10/2020	3.45	6.83	6,359	12.0
	20–25	2/10/2020	--	--	--	--
	25–30	2/11/2020	1.44	6.84	1,731	10.0
PDI-PRB-DP-02	0–5	2/11/2020	--	--	--	--
	5–10	2/11/2020	38.8	7.86	496	11.7
	10–15	2/11/2020	1.01	--	--	--
	15–20	2/11/2020	0.591	--	--	--
	20–25	2/11/2020	0.848	--	--	--
	25–30	2/11/2020	0.535	--	--	--
PDI-PRB-DP-03	0–5	2/11/2020	--	--	--	--
	5–10	2/11/2020	442	--	--	--
	10–15	2/11/2020	85.8	9.49	2,454	12.0
	15–20	2/11/2020	160	--	--	--
	20–25	2/12/2020	1.79	6.48	2,529	11.6
	25–30	2/12/2020	1.35	--	--	--
PDI-PRB-DP-04	0–5	2/13/2020	--	--	--	--
	5–10	2/13/2020	4.57	7	412	10.4
	10–15	2/13/2020	13	9.58	1,805	10.8
	15–20	2/14/2020	137	--	--	--
	20–25	2/14/2020	174	9.74	13,591	10.2
	25–30	2/14/2020	125	--	--	--

Boring ID	Depth Interval (feet)	Date	Fluoride (ppm)	pH (Standard Unit)	Specific Conductance (µS/cm)	Temperature (°C)
PDI-PRB-DP-05	0–5	2/13/2020	--	--	--	--
	5–10	2/13/2020	1.01	7.06	719	9.5
	10–15	2/13/2020	1.09	7.02	1,986	9.4
	15–20	2/13/2020	0.553	6.61	4,048	10.4
	20–25	2/13/2020	0.362	6.39	1,976	11.4
	25–30	2/13/2020	0.385	6.66	3,105	8.1
PDI-PRB-DP-06	0–5	2/12/2020	--	--	--	--
	5–10	2/12/2020	583	10.4	26,129	12.1
	10–15	2/12/2020	513	--	--	--
	15–20	2/12/2020	30.1	--	--	--
	20–25	2/12/2020	68.4	--	--	--
	25–30	2/12/2020	5.74	--	--	--
PDI-PRB-DP-07	0–5	2/12/2020	--	--	--	--
	5–10	2/12/2020	0.218	6.76	218	11.1
	10–15	2/12/2020	0.278	6.38	240	11.6
	15–20	2/12/2020	0.389	6.4	573	11.9
	20–25	2/12/2020	0.522	--	--	--
	25–30	2/12/2020	0.286	6.51	1,157	12.2
PDI-PRB-DP-08	0–5	2/12/2020	--	--	--	--
	5–10	2/12/2020	147	9.83	9,099	10.5
	10–15	2/12/2020	22	--	--	--
	15–20	2/12/2020	0.960	6.5	1,366	11.0
	20–25	2/12/2020	0.683	6.34	963	9.6
	25–30	2/13/2020	0.624	6.41	959	9.6
PDI2-PRB-DP-09	8–9	4/16/2020	16.8	7.98	848	18.9
	14–15	4/16/2020	40.1	9.96	11,689	17.9
	19–20	4/16/2020	209	9.66	19,630	19.5
	24–25	4/16/2020	0.513	6.75	1,106	18.6
	29–30	4/16/2020	1.25	7.86	1,109	NA

Boring ID	Depth Interval (feet)	Date	Fluoride (ppm)	pH (Standard Unit)	Specific Conductance (µS/cm)	Temperature (°C)
PDI2-PRB-DP-10	13–14	4/15/2020	68.4	9.13	12,143	17.4
	16–17	4/15/2020	111	9.64	19,919	17.2
	19–20	4/16/2020	18.4	6.87	4,748	11.9
	23–24	4/16/2020	1.08	6.23	2,390	11.9
	27–29	4/16/2020	0.751	7.52	1,170	NA

Notes:
A stainless-steel screen with a 0.004-inch slot size was used at PDI-PRB-DP-01 and PDI-PRB-DP-02 (1 to 10 feet) but switched to a PVC screen with a 0.01-inch slot size to reduce heaving in the core at PDI-PRB-DP-02 (10 to 30 feet) and remaining boring locations. Stainless-steel temporary well screens with a 0.005-inch slot size were used for PDI2-PRB-DP-09 and PDI2-PRB-DP-10.
--: Not enough water was collected to take both fluoride reading and pH, specific conductance, and temperature readings. At least 250 milliliters is required to fill the YSI flow cell, and these intervals did not have enough water for the YSI flow cell and the fluoride sample. See SOP deviation form in Attachment A1.

2.1.2 Soil Cores

Separate soil borings were advanced at PDI-PRB-DP-04, PDI-PRB-DP-05, and PDI-PRB-DP-08 for lithology and collection of samples for grain size analysis. Soil cores were collected in 5-foot intervals using the closed-tip method described in Section 3.7.1 of the SAP (Anchor QEA 2019b) with a 2.25-inch outside diameter core barrel sampler equipped with a 1.5-inch diameter polyvinyl chloride (PVC) liner. Upon advancing the closed tip to the top of the target 5-foot sampling interval, the inner rods were removed, and the core barrel was advanced into the undisturbed formation to collect a soil core. The core barrel was removed from the borehole, and the PVC liner was removed from the core barrel, capped, and taken to the Anchor QEA geochemistry laboratory in Portland, Oregon, for logging and sample collection for grain size analysis.

A geologic boring log was created for each soil sampling boring. Each 5-foot soil core interval was photographed in 1-foot intervals and described by an Anchor QEA staff geologist in accordance with ASTM D2488 – 17e1: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM 2017a). A professional archaeologist from AECOM also observed the soil core for items of archaeological significance. Soil descriptions included percent recovery, Unified Soil Classification System soil type, moisture content, grain size, grading, density/consistency, odor, presence of anthropogenic material, and color. Soil descriptions and sample information were recorded on a boring log form. Copies of soil boring logs are included in Attachment A3. The coarsest and finest soil observed in each soil boring was sampled, and grain size analysis performed and used in horizontal hydraulic conductivity estimates for PRB design.

2.2 Sonic Borings

The primary goal of the geotechnical coring program was to collect samples for laboratory testing of soil geotechnical properties, including index properties, consolidation, and shear strength properties. Geotechnical coring and sample collection were conducted as outlined in the PDI Work Plan and PDI Work Plan Addendum (Anchor QEA 2019a, 2020a). The geotechnical investigation occurred between February 10 and 25, 2020, and was implemented by Anchor QEA with drilling conducted by Yellow Jacket Drilling (YJD). Throughout the investigation, YJD used a Terramac track-mounted sonic oscillator drill rig manufactured by Terra Sonic, and a Terramac track-mounted support rig to conduct 6-inch diameter roto-sonic core borings to a depth ranging from 41.5 to 62 feet bgs. The investigation included a total of 21 sonic core borings. These borings included one at SU10 to 41.5 feet bgs, seven borings at SU2 ranging from 41.5 to 52 feet bgs, nine borings at SU6 ranging from 50 to 57 feet bgs, and four borings at S07 ranging from 42 to 62 feet bgs. The locations of these borings can be found in Figure A2, and a summary of the boring depths, coordinates, and elevations are provided in Table A2. Field forms are included in Attachment A2.

Table A2
Summary of Boring Depths, Coordinates, and Elevations

Station ID	Test Date	Coordinates[1] (NAD83, feet)		Ground Surface Elevation[2] (NAVD88, feet)	Total Depth of Sonic Core (feet)	Water Depth at Time of Boring (feet)	Water Table Elevation at Time of Boring (NAVD88, feet)
		Easting (X)	Northing (Y)				
SU02B1	2/12/2020	1003154.00	304876.00	21.0	46.0	7.0	14.0
SU02B2	2/11 and 2/12/2020	1003680.96	304694.12	25.7	42.5	--	--
SU02B3	2/10 and 2/11/2020	1004597.00	304405.00	23.6	41.5	15.0	8.6
SU02B4	2/14/2020	1004480.00	304778.00	15.9	42.0	--	--
SU02B5	2/14/2020	1004272.00	305051.00	15.0	42.0	0.0	15.0
SU02B6	2/13/2020	1003508.00	305061.00	13.4	42.0	5.0	8.4
SU02B7	2/13/2020	1003611.00	304908.00	22.3	42.0	--	--
SU06B1	2/24/2020	1008367.00	302427.00	22.8	50.0	--	--
SU06B2	2/22/2020	1008605.00	302704.00	22.4	51.5	--	--
SU06B3	2/21/2020	1008845.00	302961.00	22.0	57.0	10.0	12.0
SU06B4	2/20 and 2/21/2020	1009068.00	302858.00	22.0	52.0	10.0	12.0
SU06B5	2/24/2020	1008717.00	302321.00	24.7	52.0	10.0	14.7
SU06B6	2/21/2020	1008781.39	302606.85	24.4	57.0	10.0	14.4
SU06B7	2/20/2020	1009142.00	302640.00	22.7	56.0	10.0	12.7
SU06B8	2/22/2020	1008676.00	302473.83	24.3	53.5	0.0	24.3

Station ID	Test Date	Coordinates[1] (NAD83, feet)		Ground Surface Elevation[2] (NAVD88, feet)	Total Depth of Sonic Core (feet)	Water Depth at Time of Boring (feet)	Water Table Elevation at Time of Boring (NAVD88, feet)
		Easting (X)	Northing (Y)				
SU06B9	2/19/2020	1008950.04	302747.27	22.3	57.0	10.0	12.3
SU07B1	2/17/2020	1009265.00	303449.00	11.3	52.0	0.0	11.3
SU07B2	2/18/2020	1009505.00	302938.00	11.7	42.0	0.0	11.7
SU07B3	2/18/2020	1009189.00	302980.00	11.5	42.0	0.0	11.5
SU07B4	2/17 and 2/18/2020	1009301.93	303178.19	11.5	62.0	0.0	11.5
SU10B1	2/19/2020	1007141.00	302942.00	31.7	42.5	20.0	11.7

Notes:

1. Horizontal datum is North American Datum of 1983, Washington State Plane, feet.
2. Vertical datum is North American Vertical Datum of 1988, feet.

--: not observed

Soil processing was completed at the time of drilling, and primarily included the following:

- Prior to sampling, color photographs were taken of the total sample length.
- Soil description along the entire length of the core in accordance with ASTM International (ASTM) procedures—ASTM D2488 – 17e1: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM 2017a) and ASTM D2487 - 17e1: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM 2017b)—were recorded, including soil type, moisture content, density/consistency of soil, and color.
- Field vane shear strength tests were performed with a TORVANE, using the following steps in accordance with ASTM Method D2573 / D2573M - 18: Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils (ASTM 2017c).
- Pocket penetrometer tests were performed in accordance with ASTM Method D2573 / D2573M - 18 (ASTM 2017c).
- Grab bag soil samples were collected in 1-gallon bags, labeled, stored, and then shipped to HWA Geosciences, Inc., for geotechnical laboratory testing.

2.2.1 Standard Penetration Tests

Standard penetration test (SPT) samples were collected at 5- to 20-foot depth intervals throughout the investigation. The testing intervals and specific blow counts per foot of material (N-value) are shown in the boring logs (Attachment A3). These SPTs indicated that the subsurface is generally considered very soft to soft, and/or very loose to loose to at least the depth of the individual sonic core borings located throughout the site. In addition, TORVANE testing for soil shear strength and penetrometer testing for compressive strength were also conducted.

2.2.2 Undisturbed Sampling

Shelby tube samples were collected throughout the investigation at predetermined depths, as well as at discrete sampling depths, which were suspected to contain fine-grained materials. Shelby tube samples were left in place for approximately 10 to 20 minutes to allow the soil inside the sampler to swell, thus improving overall sample recovery. The laboratory results pertaining to the samples collected by means of Shelby tube (e.g., unconfined compressions tests, bulk density, and consolidation tests) are included in Attachment A4.

2.3 Direct Push Borings

The primary goal of the geotechnical coring program was to collect samples for laboratory testing of soil geotechnical properties, including index properties. Geotechnical boring and sample collection were conducted as outlined in the PDI Work Plan and PDI3 Work Plan Addendum (Anchor QEA 2019a, 2022). The geotechnical investigation occurred on February 22 and 23, 2022, and was implemented by Anchor QEA with drilling conducted by Cascade Environmental. Throughout the investigation, Cascade Environmental used a Geoprobe track-mounted 3230DT drill rig manufactured by Geoprobe. The investigation included a total of two direct push borings to a depth ranging from 30.5 to 50 feet bgs. These borings were conducted approximately 70 feet southeast of Berth Road (50 feet bgs) and approximately 500 feet northwest of Berth Road (30.5 feet bgs). The locations of these borings can be found in Figure A2, and a summary of the boring depths, coordinates, and elevations are provided in Table A3. Field forms are included in Attachment A2.

Table A3
Summary of Boring Depths, Coordinates, and Elevations

Station ID	Test Date	Coordinates[1] (NAD83, feet)		Ground Surface Elevation[2] (NAVD88, feet)	Total Depth of Direct Push Boring (feet)
		Easting (X)	Northing (Y)		
PDI3-B01	2/22 and 2/23/2022	1008919.67	303086.55	8.7	50
PDI3-B02	2/23/2022	1008776.88	303191.03	8.8	30.5

Notes:

1. Horizontal datum is North American Datum of 1983, Washington State Plane South, feet.
2. Vertical datum is North American Vertical Datum of 1988, feet.

Soil processing was completed at the time of drilling and primarily included the following:

- Prior to sampling, color photographs were taken of the total sample length.
- Soil description along the entire length of the core in accordance with ASTM procedures—ASTM D2488 – 17e1: Standard Practice for Description and Identification of Soils

(Visual-Manual Procedure) (ASTM 2017a) and ASTM D2487 – 17e1: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM 2017b)—were recorded, including soil type, moisture content, density/consistency of soil, and color.

- Grab bag soil samples were collected in 1-gallon bags, labeled, stored, and then shipped to Materials Testing & Consulting, Inc., for geotechnical laboratory testing. The laboratory results are included in Attachment A4.

2.3.1 Standard Penetration Tests

SPT samples were collected at intervals ranging from continuous to 10-foot depth intervals throughout the investigation. The testing intervals and N-value are shown in the boring logs (Attachment A3). These SPTs indicated that the subsurface is generally considered very soft to soft and/or very loose to loose to at least the depth of the individual direct push borings located throughout the site.

2.4 In Situ Penetration Testing

In situ penetration testing was conducted using a CPT probe as outlined in the PDI Work Plan and the PDI Work Plan Addendum (Anchor QEA 2019a, 2020a). In situ penetration testing is used to determine subsurface lithology correlated to measured soil properties. CPT uses a cone-shaped probe that can be instrumented with various sensors to measure tip resistance, friction, porewater pressure, and other geotechnical and environmental parameters. The locations of the CPTs can be found in Figure A3, and a summary of the boring depths, coordinates, and elevations are provided in Table A4.

Table A4
Summary of CPT Depths, Coordinates, and Elevations

Station ID	Test Date	Actual Coordinates[1] (NAD83, feet)		Ground Surface Elevation[2] (NAVD88, feet)	Total Depth of Direct Push (feet)	Water Depth at Time of Test (feet)	Water Elevation at Time of Test (NAVD88, feet)
		Easting (X)	Northing (Y)				
PRB-PC-01	2/20/2020	1003060.29	306896.56	7.4	40.0	2.5	4.9
PRB-PC-02	2/20/2020	1003022.25	305342.11	13.8	40.0	7.0	6.8
SU02-PC-01	2/19/2020	1003686.65	304672.22	26.1	33.1	9.5	16.6
SU02-PC-01-B	2/19/2020	1003686.65	304672.22	26.1	40.0	9.5	16.6
SU02-PC-02	2/19/2020	1004243.25	304490.12	27.4	40.0	10.6	16.8
SU02-PC-03	2/20/2020	1004475.79	304756.12	16.2	40.1	3.9	12.3
SU02-PC-04	2/20/2020	1003859.67	305063.72	9.1	40.0	3.9	5.2

Station ID	Test Date	Actual Coordinates[1] (NAD83, feet)		Ground Surface Elevation[2] (NAVD88, feet)	Total Depth of Direct Push (feet)	Water Depth at Time of Test (feet)	Water Elevation at Time of Test (NAVD88, feet)
		Easting (X)	Northing (Y)				
SU02-PC-05	2/20/2020	1003599.93	304886.93	23.1	50.4	13.9	9.2
SU06-PC-01	2/21/2020	1008683.23	302491.14	24.3	60.0	3.6	20.7
SU06-PC-02	2/21/2020	1008745.23	302746.14	21.8	60.1	2.9	18.9
SU06-PC-03	2/21/2020	1008961.23	302759.14	22.1	60.1	3.7	18.4
SU06-PC-04	2/21/2020	1009300.23	302780.14	21.5	60.6	10.7	10.8
SU06-PC-05	2/22/2020	1008915.64	302471.47	25.0	60.2	6.7	18.3
SU06-PC-06	2/22/2020	1008521.17	302429.21	23.3	60.1	2.9	20.4
SU07-PC-01	2/22/2020	1008999.00	303149.00	10.5	40.3	0.7	9.8
SU07-PC-02	2/22/2020	1009460.22	303244.14	11.5	40.9	1.9	9.6
SU07-PC-03	2/22/2020	1009292.89	303150.43	11.5	50.0	1.1	10.4
SU10-PC-01	2/19/2020	1006899.24	303023.13	28.4	50.0	16.5	11.9
SU10-PC-02	2/19/2020	1007330.24	302795.13	30.8	50.0	15.9	14.9

Notes:

1. Horizontal datum is North American Datum of 1983, Washington State Plane, feet.
2. Vertical datum is North American Vertical Datum of 1988, feet.

Reliable equations and relationships have been developed to correlate collected data with geotechnical design parameters, such as material type, undrained shear strength (Su), and frictional strength, without physically collecting samples or performing laboratory tests (Robertson and Cabal 2015; Mayne 2014). The various correlations used for in situ data collected are detailed in the ConeTec report provided in Attachment A5. Su can be directly estimated from the tip resistance measured during advancement of the cone. Tip resistance and pore pressure measurements allow for a near-continuous relationship of Su versus depth. Preliminary Su data were calculated by ConeTec using a cone resistance factor of 15.0 for CPT data. Strength values derived from these data are only valid for materials that consist mainly of fine-grained particles that behave cohesively, as defined by Robertson's soil behavior type chart (Robertson 1990). Cohesionless materials (sand and gravel) rely on inter-particle friction to develop strength, and the method used to estimate Su considers net tip resistance but neglects sleeve friction.

Descriptions of the in situ penetration testing collection methods are provided in the following subsections, and results are provided in Attachment A5. Stations where in situ data were collected are displayed in Figure A2.

2.4.1 In Situ Penetration Testing

CPT was conducted in conjunction with the sonic core borings, at six different locations, to depths ranging from 40 to 60 feet bgs. CPT testing was conducted by ConeTec from February 19 to 22, 2020. CPT results can be found in Attachment A5.

2.4.2 Pore Pressure Dissipation Testing

Pore pressure dissipation testing accompanied each CPT. As a CPT cone is pushed into saturated sediment/soil, it creates a localized increase in pore pressure as porewater is pushed out of the way of the cone. The pore pressure dissipation test involves stopping the downward movement of the cone at specified depths, then disconnecting the CPT rods from the CPT rig and allowing porewater pressure to dissipate and stabilize. During the test, the changes in porewater pressure are measured against time. The rate of dissipation indicates the permeability or hydraulic conductivity of the sediment/soil. Results of this testing are presented in Attachment A5.

3 References

AECOM, 2019. *Cultural Resources Coordination Plan*. Reynolds Pre-Design Investigation: Former Reynolds Metals Reduction Plan Longview. January 9, 2019.

Anchor QEA, 2019a. *Pre-Design Investigation Work Plan*. Former Reynolds Metals Reduction Plant – Longview. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. March 2019.

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Anchor QEA, 2020b. Memorandum to: Garin Schrieve, PE, Washington State Department of Ecology. Regarding: Former Reynolds Metals Reduction Plant – Longview, Pre-Design Investigation Work Plan Addendum: Refinement of the Permeable Reactive Barrier Alignment. April 10, 2020.

Anchor QEA, 2022. Memorandum to: Garin Schrieve, PE, Washington State Department of Ecology. Regarding: Former Reynolds Metals Reduction Plant – Longview, Pre-Design Investigation Work Plan Addendum: Additional Geotechnical Borings. February 15, 2022.

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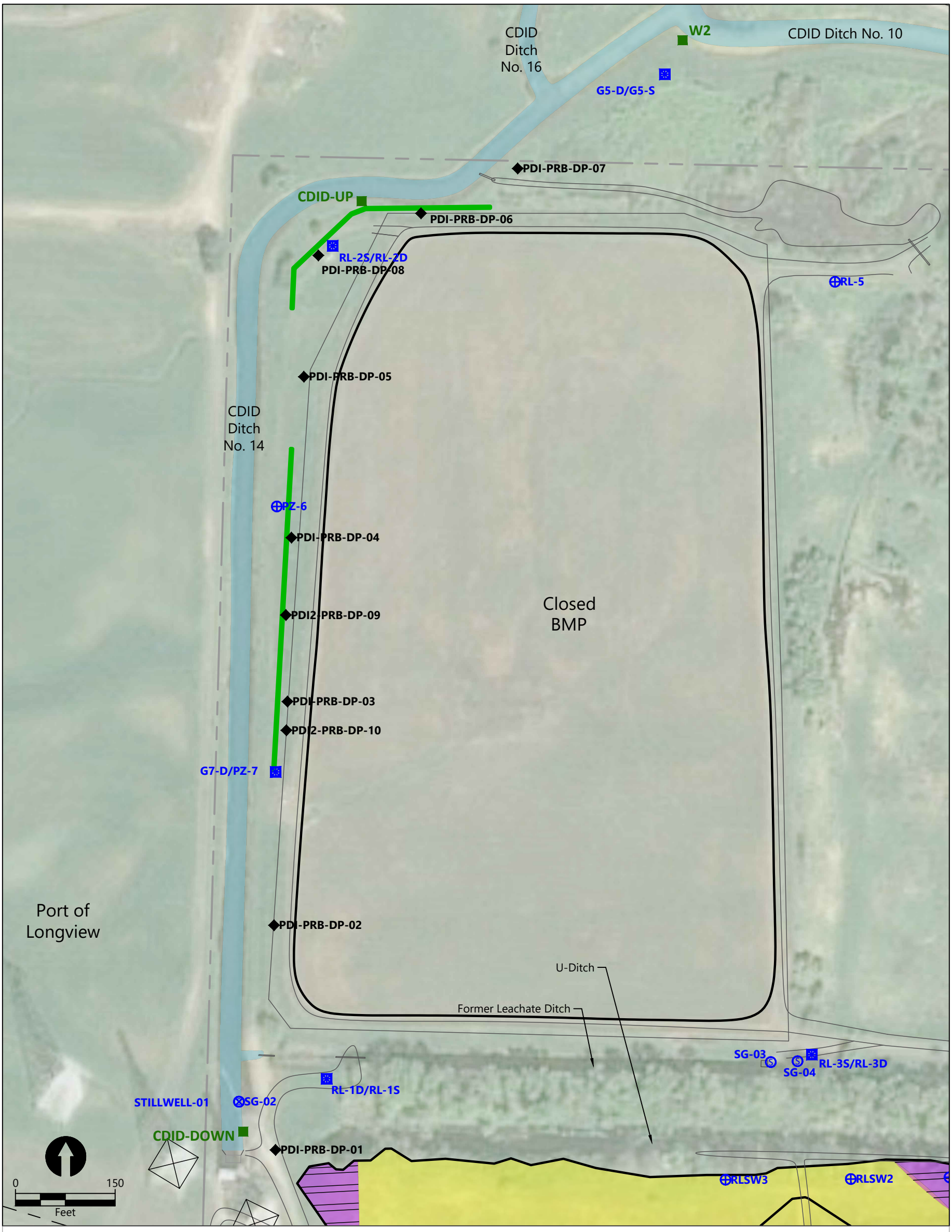
Mayne, P.W., 2014. "Interpretation of Geotechnical Parameters from Seismic Piezocone Tests." *Proceedings of the Third International Symposium on Cone Penetration Testing, Las Vegas, May 13–14, 2014*. P.K. Robertson and K.L. Cabal, editors. Atlanta: Georgia Institute of Technology; pp. 47–73.

Robertson P.K., and K.L. Cabal, 2015. *Guide to Cone Penetration Testing for Geotechnical Engineering*. Sixth edition. Signal Hill, California: Gregg Drilling and Testing.

Robertson, P.K., 1990. "Soil Classification Using the Cone Penetration Test." *Canadian Geotechnical Journal* 27(1):151–158.

Figures



SOURCE: Drawing prepared from ALTA Survey by Minister & Glaeser Surveying, Inc.. Aerial image from Bing Maps.
HORIZONTAL DATUM: Washington State Plane South, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88, Feet

LEGEND:

- Parcel Boundary
- CDID Ditch
- PDI Direct Push Probe
- Required Surface Water Monitoring Location for Closed BMP Facility

GROUNDWATER WELL LEGEND

- Groundwater Sampling Location
- Paired Shallow/Deeper Groundwater Sampling Location
- Temporary Stilling Well Instrumented for Tidal Study
- Permanent Staff Gauge

CLEANUP ACTION LEGEND:

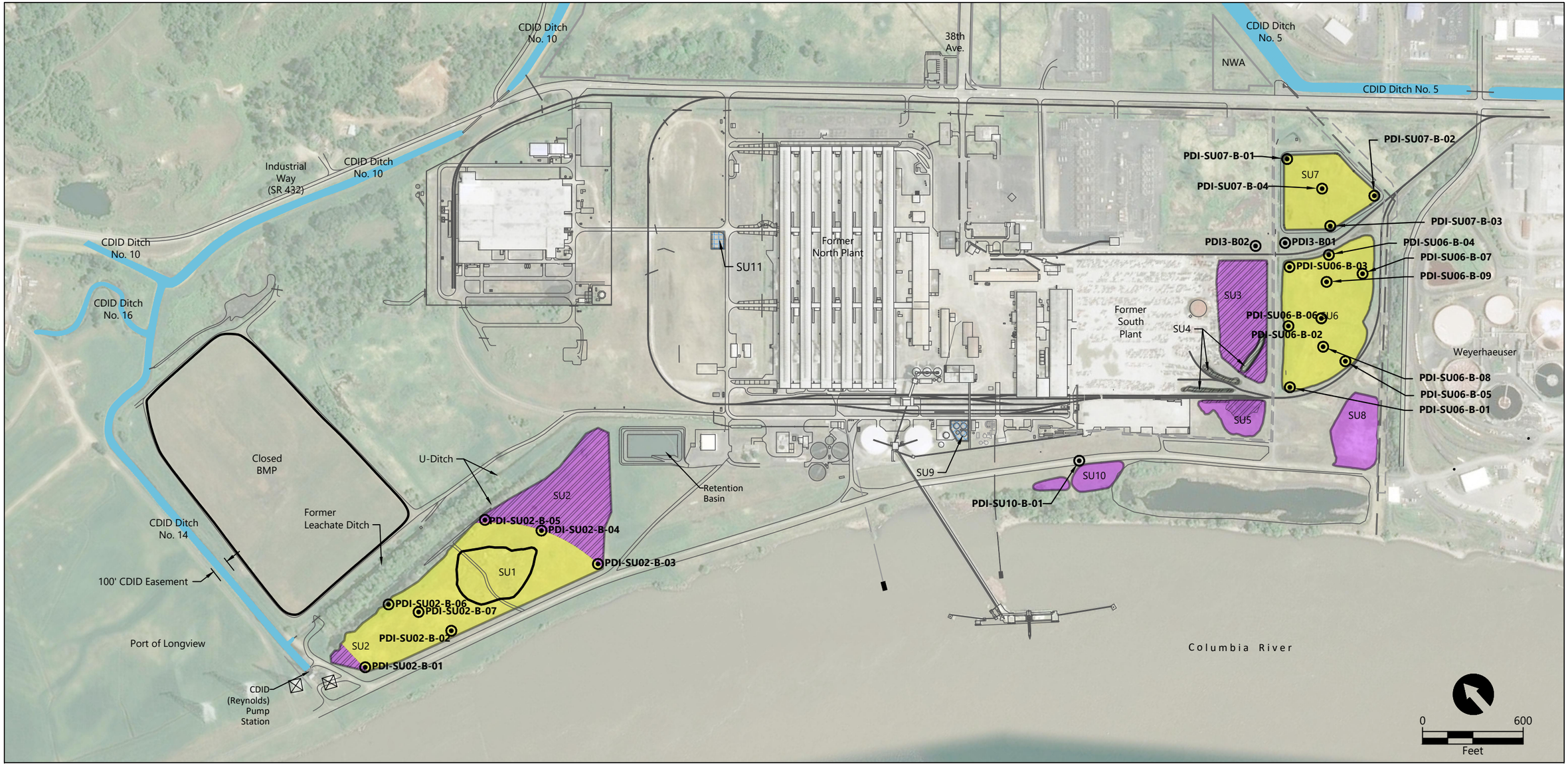
- Low Permeability Cap
- Excavate and Consolidate on Site
- Reactive Backfill
- Permeable Reactive Barrier

Publish Date: 2022/04/13 10:27 AM | User: chewett
Filepath: 0730-RP-066 (West Groundwater Lithology).dwg Figure A1

ANCHOR QEA

Figure A1
PDI Fluoride Screening Locations

PDI Data Summary Report
Former Reynolds Metals Reduction Plant – Longview



SOURCE: Drawing prepared from ALTA Survey (Minister & Glaeser Surveying, Inc.) conducted on November 11, 2010. Aerial image from Bing Maps.
HORIZONTAL DATUM: Washington State Plane South Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88, Feet

LEGEND:

- PDI Boring
- CDID Ditch

CLEANUP ACTION LEGEND:

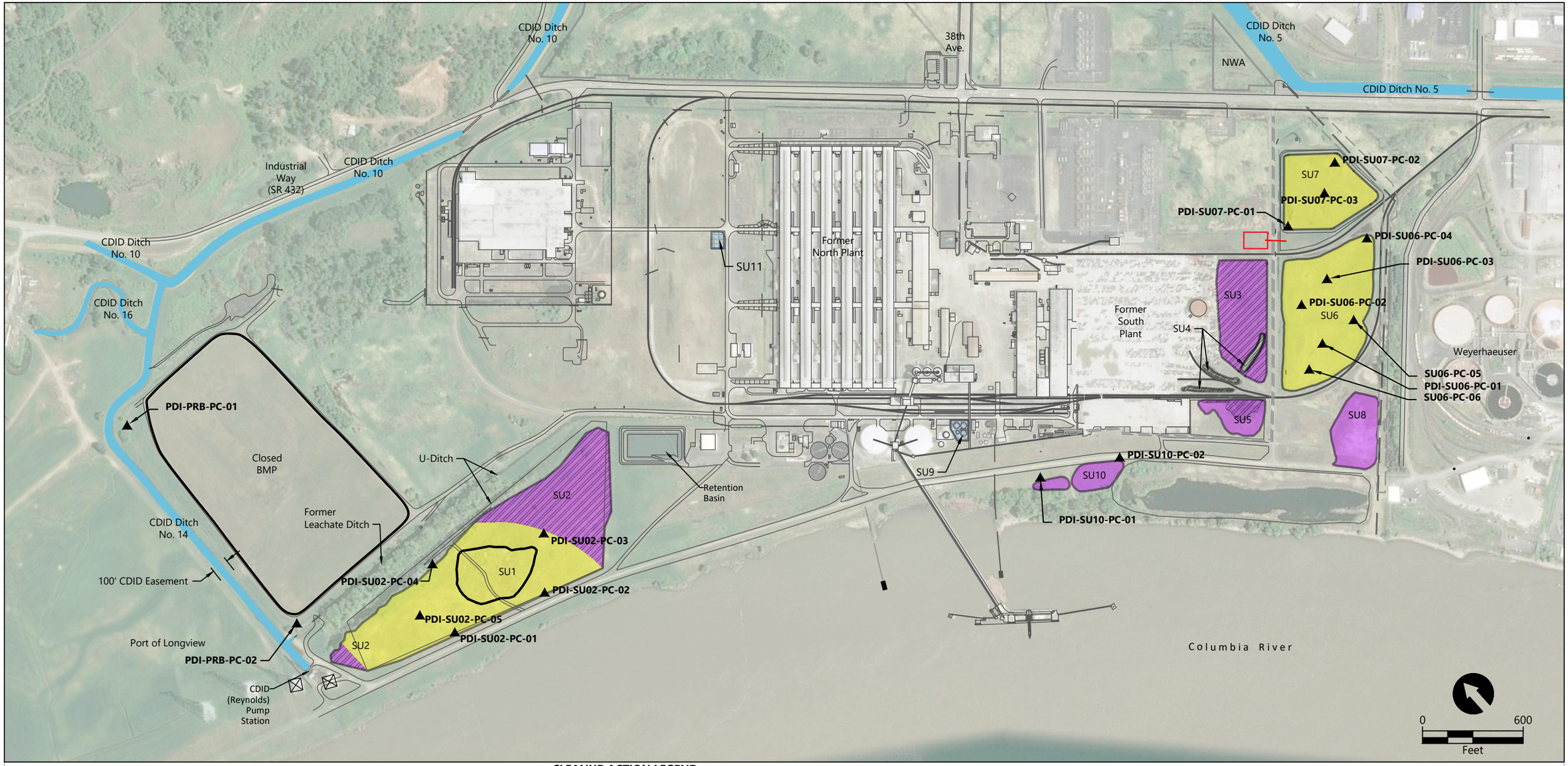
- Low Permeability Cap
- Excavate and Consolidate on Site
- Excavate and Dispose off Site
- Reactive Backfill

Publish Date: 2022/04/13 10:27 AM | User: chewett
Filepath: 0730-RP-001 (Samples_Compiled_Overall).dwg Figure A2

ANCHOR QEA

Figure A2
PDI Boring Locations

PDI Data Summary Report
Former Reynolds Metals Reduction Plant – Longview



SOURCE: Drawing prepared from ALTA Survey (Minister & Glaeser Surveying, Inc.) conducted on November 11, 2010. Aerial image from Bing Maps.
HORIZONTAL DATUM: Washington State Plane South Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88, Feet

LEGEND:

- PDI Cone Penetration Test
- CDID Ditch

CLEANUP ACTION LEGEND:

- Low Permeability Cap
- Excavate and Consolidate on Site
- Excavate and Dispose off Site
- Reactive Backfill

Publish Date: 2022/04/13 10:27 AM | User: chewett
Filepath: 0730-RP-001 (Samples_Compiled_Overall).dwg Figure A3

ANCHOR QEA

Figure A3
PDI CPT Locations

PDI Data Summary Report
Former Reynolds Metals Reduction Plant – Longview

Attachment A1
Standard Operating Procedures

Standard Operating Procedure
Former Reynolds Metals Reduction Plant – Longview – Cone Penetration Testing

1 Standard Operating Procedure Acknowledgement Form

Project Number: 190730-01.02 Project Name: Former Reynolds Metals Reduction Plant – Longview

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

2 Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection of cone penetration testing (CPT) data as part of the Pre-Design Investigation (PDI) for the Millennium Bulk Terminals – Longview, LLC (MBTL) Study Area. Anchor QEA, LLC, has contracted with a specialty CPT company to perform the CPT tests and provide technical support for analysis of in situ penetration data. The equipment, data collection, and data reduction are in accordance with Appendix A-3-1 and the current ASTM International D5778 standard.

Procedures for CPT data collection in this SOP are expected to be followed. Deviations from the procedures detailed in this SOP will be recorded in the Daily Log.

3 Health and Safety Warnings

Health and safety issues associated with this SOP, including physical, chemical, and biological hazards, are addressed in the *Health and Safety Plan* (HASP; Anchor QEA 2019a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the MBTL PDI field work.

4 Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the *Pre-Design Investigation Work Plan* (Anchor QEA 2019b), and the corresponding documents (i.e., *Pre-Design Investigation Sampling and Analysis Plan* [SAP; Anchor QEA 2019c], *Pre-Design Investigation Quality Assurance Project Plan* [QAPP; Anchor QEA 2019d], and HASP). Specialized training for field staff is not required for collection of CPT test data; the CPT company subcontracted to perform this work shall be qualified professionals who are experienced in performing the tasks required for CPT data collection.

5 Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions. Possible necessary equipment is as follows:

- Approved documents, including the SAP, QAPP, and HASP
- Appropriate personal protective equipment and clothing as defined in the HASP
- Test location coordinates
- CPT testing rig equipped with necessary differential global positioning system (DGPS) navigation (minimum overall accuracy of 2 meters) and communication equipment
- Standardized field log forms (field forms) and writing appurtenances
- Tape measure

6 Procedures

CPT testing will be performed using a CPT rig at locations described in the SAP.

CPT will be performed using the following procedures:

1. The CPT testing rig will be driven to the proposed location.
2. The location will be recorded on the appropriate forms by the location control personnel.
3. CPT will be performed to the designated depth and in general accordance with the current version of ASTM D5788 and in accordance with the subcontractor's SOPs.
4. The depth of the test will be measured and recorded.

7 Quality Assurance/Quality Control

Quality control procedures will consist of following standard instrument operation procedures and filling out field check forms. Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Lead to periodically check to ensure the procedures are in conformance with those stated in this SOP.

8 References

Anchor QEA (Anchor QEA, LLC), 2019a. *Health and Safety Plan*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2019.

Anchor QEA, 2019b. *Pre-Design Investigation Work Plan*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2019.

Anchor QEA, 2019c. *Pre-Design Investigation Sampling and Analysis Plan*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2019.

Anchor QEA, 2019d. *Pre-Design Investigation Quality Assurance Project Plan*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2019.

Appendix A-3-1
ConeTec Cone Penetration Test Information

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

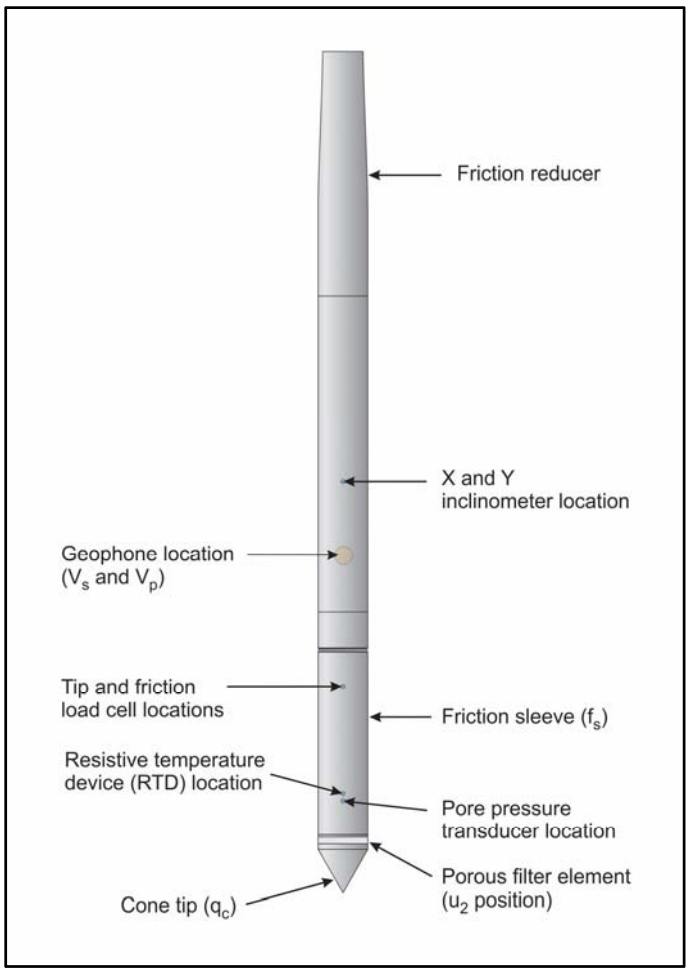


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

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Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

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Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

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Standard Operating Procedure
Former Reynolds Metals Reduction Plant – Longview – Soil Boring Collection and Processing

Standard Operating Procedure Acknowledgement Form

Project Number: 200730-01.02 Project Name: Former Reynolds Metals Reduction Plan - Longview

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

1 Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection and processing of soil boring data as part of the Pre-Design Investigation Sampling and Analysis FSAP for the Former Reynolds Metals Reduction Plant – Longview project. Samples from upland geotechnical borings will be collected for visual description and geotechnical testing.

Specific information regarding data collection and the list of parameters for soil analyses can be found in the *Pre-Design Investigation Field Sampling and Analysis Plan* (FSAP) and the *Pre-Design Investigation Quality Assurance Project Plan* (QAPP).

Procedures for soil sample collection in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Log.

2 Health and Safety Warnings

Health and safety issues associated with this SOP, including physical, chemical, and biological hazards, are addressed in the *Pre-Design Investigation Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA, LLC personnel as part of the Former Reynolds Metals Reduction Plant – Longview Soil project.

3 Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the *Pre-Design Investigation Work Plan*, and the corresponding documents (i.e., FSAP, QAPP, and HASP). All field personnel are required to take a 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response training course and annual refresher course, as well as participate in a medical monitoring program, prior to sample collection activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

4 Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents, including the FSAP, QAPP, and HASP
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment described in section 4 of the SOP – Field Documentation, Sample Handling Procedures, Decontamination Procedures, and Investigation-Derived Waste Management
- Standardized field log forms (field forms)

- Boring Log and Physical Description of Soil Key forms (see examples provided in Attachments 1 and 2, respectively)
- Pocket penetrometer
- Torvane
- Black ballpoint pen or Sharpie permanent marker (or equivalent)
- White board and pens
- Field laptop computer with Anchor QEA's Field Scribe and Microsoft Excel
- Vehicle capable of transporting drilling equipment, including the necessary navigational and communication equipment
- Direct-push (Geoprobe or similar) drill rig or sonic drill, probe rods, and core liner (supplied by subcontractor)
- Standard penetration testing (SPT) equipment (provided by the subcontractor)
- Differential global positioning system (DGPS) device
- Photoionization detector (PID)
- Distilled water
- Tape measure
- Electrical or duct tape
- Paper towels
- Digital camera

5 Procedures

The following descriptions of procedures will be followed for the data collection activities described in the FSAP.

5.1 Soil Boring

The following general activities and sampling procedures will be implemented for soil boring and geotechnical testing in the upland areas.

Prior to deployment, the following procedures will be used to decontaminate sample tubes:

1. Rinse and pre-clean Shelby tubes with potable water.
2. Wash and scrub the core barrel in a solution of phosphate-free soap (e.g., Alconox) and potable water.
3. Rinse with distilled water.
4. Seal both ends of each Shelby tube with a tube cap or aluminum foil.
5. If using thin plastic sleeves, store in a decontaminated container until use and decontaminate the core barrel casing before each use.

The caps will be removed immediately prior to placement onto the rods. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces.

Upland soil sample collection will be performed using the following procedures:

1. The drilling equipment will be maneuvered to the proposed sample location, and the location will be recorded using a DGPS-capable device.
2. Safety checks will be made at the beginning of the day, including arranging all winch cables and checking for kinks or burrs, checking the drill rig for fluid leaks, and checking that all "kill" switches are operational.
3. The stabilizers will be lowered, and the drill rig tower will be raised and secured with safety pins and bolts.
4. Before each use, the core barrel will be rinsed and a scrub brush will be used to remove any visible soil on the interior of the barrel.
5. Sonic flights will be advanced to the predetermined sampling depth. If initial sampling is to occur at the ground surface, do not advance casing until initial sample is obtained.
6. A decontaminated core barrel or 2.5-foot Shelby tube will be secured to the sampling rods.
7. The core barrel or Shelby tube will be driven to the appropriate termination depth. Samplers shall be advanced using one of the following methods:
    a. Soil collection using a core barrel:
        i. The core catcher will be inserted, if needed. The core barrel with drill shoe will be attached to the drill rod, and the cutting head will be attached to the core barrel and lowered.
        ii. The core barrel will be sonic-driven into the soil in 5- or 10-foot sections depending on the sonic drilling rig capacity.
        iii. The depth of core penetration will be measured and recorded.
        iv. The cutting bit and core catcher will be removed.
        v. The soil sample will carefully be extruded from the core barrel into the plastic sleeve.
    b. Undisturbed soil collection using a Shelby tube:
        i. The Shelby tube will be advanced 24 inches from the initial undisturbed sampling depth.
        ii. Vibration will be kept to a minimum when advancing undisturbed samples.
        iii. Allow the Shelby tube to sit for 5 minutes to allow the sample to settle before retrieving the sample.
        iv. The depth of sample penetration will be measured and recorded.
        v. Immediately upon retrieval of the Shelby tube, the bottom of the tube will be capped. The cap will be secured with duct or electrical tape.

vi. The Shelby tube sample will be evaluated at the top of the tube; the length of recovered soil will be recorded; and the top of the tube will be secured with a core cap and wrapped in duct tape. The tube will be labeled with the sample station number, depth interval, and an arrow pointing to the top of core. The Shelby tube will be stored upright to preserve core soil integrity and kept at 4°C, plus or minus 2°C, until shipment. Shelby tubes will be shipped upright with ample padding and protection to the contracted laboratory for processing and testing.

c. Acceptance criteria for soil intervals and Shelby tube samples are as follows:
   (i) The surface is intact.
   (ii) The tube appears intact without obstruction or blocking.
   (iii) Recovery is greater than 50% of drive length.

8. If sample acceptance criteria are not achieved, the sample is rejected unless modified acceptance criteria are approved by the Field Team Leader following consultation with the U.S. Environmental Protection Agency and/or multiple attempts have been made at the sampling location.

Anchor QEA personnel will record field conditions and drive notes on the Boring Logs (see Attachment 1). The logs will include the following information:

- The sample station identification
- Drilling method
- Geographic position of the actual coring location as determined by DGPS
- Date and time of collection of each soil core sample
- Names of field personnel collecting and handling the samples
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- Length of drive penetration and estimated recovery measurements
- Qualitative notation of apparent resistance of soil column to coring (how the core drove)

6 Soil Processing

1. Sample processing will be conducted at the drilling site after retrieval of the boring.
2. Sample processing consists of opening up the thin plastic sleeve to access the soil.
3. Disposable gloves will be discarded after processing at each station and replaced prior to handling instruments or work surfaces.
4. The sample will be split to expose the center of the two halves for visual observations.
5. Prior to sampling, color photographs will be taken of the total sample length.
6. A description of the sample will be recorded on the Boring Log (see example provided in Attachment 1) for the following parameters as appropriate:

a. Date and time of sample collection
b. Sample recovery (depth in feet of penetration compared to recovery)
c. Physical soil description along the entire length of the core in accordance with ASTM International (ASTM) procedures—ASTM D2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) and ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)—will be recorded including soil type, moisture content, density/consistency of soil, and color
d. Odors (e.g., hydrogen sulfide or petroleum)
e. Visual stratification, structure, and texture
f. Visual evidence of impacts (e.g., sheens) and potential nonaqueous phase liquid
g. Vegetation and debris
h. PID readings
i. Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
j. Presence of sheen
k. Any other distinguishing characteristics or features

7. If required, a field vane shear strength test will be performed with a Torvane, using the following steps in accordance with ASTM Method D2573 – Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils:
    a. Find a representative section of sample for testing within the target sampling.
    b. Set the Torvane to zero according to the manufacturer's instructions.
    c. Push the Torvane into the soil.
    d. Begin turning the vane at a rate of 1 degree per 6 minutes until failure is observed while maintaining a constant angle and pressure.
    e. Upon failure of the sample, record the peak value in the Boring Log (Attachment 1) without changing the position of the testing assembly. Also record any anomalies such as an unsmooth failure or presence of debris (e.g., anthropogenic material or debris, wood pieces, shells).
    f. Rotate the assembly five revolutions to create a residual condition of the failure mass.
    g. Reperform Steps b. through f. and record the results.
    h. Upon completion of the test, remove the sample within the Torvane and set to zero before conducting another test.
8. The pocket penetrometer test will be performed using the following steps in accordance with ASTM Method D2573 – Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils:
    a. Find a representative section of soil for testing within the target sampling interval of the Lexan tube or plastic sleeve.
    b. Set the pocket penetrometer to zero according to the manufacturer's instructions.

c. Hold the penetrometer at a right angle against the soil surface, then push the device into the soil until it reaches the indicator line.
d. Remove the penetrometer and record the result in the Boring Log (Attachment 1).
e. Remove the soil adhered to the penetrometer and set to zero before conducting another test.

7 Quality Assurance/Quality Control

Quality control procedures will consist of following standard instrument operation procedures for collecting soil. Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure the procedures are in conformance with those stated in this SOP.

8 List of Attachments

Attachment 1 – Boring Log
Attachment 2 – Physical Description of Soil Key

Attachments

PROJECT:	Log of Boring No.	
BORING LOCATION:	ELEVATION AND DATUM:	
DRILLING CONTRACTOR:	DATE STARTED:	DATE COMPLETED:
DRILLING METHOD:	TOTAL DEPTH:	MEASURING POINT:
DRILLING EQUIPMENT:	DEPTH TO FIRST WATER ATD:	DEPTH TO FREE WATER ATC:
SAMPLING METHOD:	LOGGED BY:	
BOREHOLE DIAMETER:	HAMMER TYPE/SYSTEM:	

DEPTH (feet)	SAMPLES		PID Reading (ppm)	DESCRIPTION	FIELD-ESTIMATED %						SAMPLE ID OTHER REMARKS
					Gravel		Sand				
	Recovery	Blows/ 6 inches			Coarse	Fine	Coarse	Medium	Fine	Fines	

Project No.	ANCHOR QEA	Page 1 of ___

PROJECT:

Log of Boring No.

DEPTH (feet)	SAMPLES		PID Reading (ppm)	DESCRIPTION	FIELD-ESTIMATED %						SAMPLE ID OTHER REMARKS
					Gravel		Sand				
	Recovery	Blows/ 6 inches			Coarse	Fine	Coarse	Medium	Fine	Fines	

Project No.

ANCHOR QEA

Page ___ of ___

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

Density SAND or GRAVEL	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

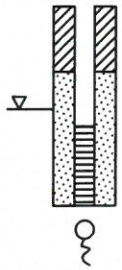
BORING SAMPLES

- Split Spoon
- Shelby Tube
- Cuttings
- Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- Grab (Jar)
- Bag
- Shelby Tube

Groundwater Observations



- Surface Seal
- Groundwater Level on Date (ATD) At Time of Drilling
- Observation Well Tip or Slotted Section
- Groundwater Seepage (Test Pits)

Test Symbols

GS	Grain Size
Comp	Composite
Chem	Chemistry
NS	No Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
TCD	Triaxial Consolidated Drained
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	In Situ Density Test

Jan 28, 2010 8:44am cdavidson K:\Standards\Geotech\FIG A-1.dwg AQ-A-Portrait

ANCHOR QEA

Figure #
Title of Drawing
Report Name
Client Name/Project Name

Standard Operating Procedure
Former Reynolds Metals Reduction Plant – Longview – Fluoride Field Screening Using Direct-Push Drilling

Standard Operating Procedure Acknowledgement Form

Project Number: 200730-01.02 Project Name: Former Reynolds Metals Reduction Plan - Longview

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

1 Introduction

Groundwater samples for fluoride screening may be collected with direct push drilling techniques with either a dual-tube or closed-tip method of borehole advancement.

The closed-tip method consists of advancing a 4-foot-long retractable screen into undisturbed formation to the desired sampling depth. The screen is secured within a small-diameter drive pipe with an expendable drive point. The drive pipe is advanced with drill rods to the desired sampling depth with the direct push rig. When the desired sample depth is reached, the screen is opened to the aquifer by pulling the drill rods up 4 feet. The expendable drive point remains lodged in the soil, allowing the screened interval to be exposed to the aquifer.

The dual-tube method consists of the simultaneous advancement of an outer casing and an inner 5-foot-long core barrel equipped with a disposable inner plastic liner into the subsurface in 5-foot increments. After advancing the assembly 5 feet, the core barrel is withdrawn from inside the outer casing, and the plastic liner containing the soil sample is removed from the core barrel. The plastic liner is cut lengthwise to expose the soil sample. The above procedure is repeated until the target depth of the boring is reached. The outer casing helps seal off upper geologic units and water bearing zones, keeps the borehole open, and allows for easy insertion and removal of sampling equipment.

Fluoride screening samples can be collected with the dual-tube method by installing a temporary polyvinyl chloride (PVC) well inside the outer casing and lifting the outer casing to expose the screened interval to the aquifer.

A drilling contractor licensed in the state of Washington will be responsible for advancing the soil borings to the required depth. An Anchor QEA, LLC geologist licensed in the state of Washington or working under the direct supervision of a Washington-licensed geologist will be responsible for supervision of drilling activities and collection of groundwater samples as necessary.

The following sections outline the necessary equipment and the general procedures for collection of direct push groundwater samples.

1.1 Minimum Equipment Checklist

- Standard personal protective equipment per project-specific health and safety plan (HASP)
- Decontamination equipment (distilled water, phosphate-free detergent [e.g., Liquinox], brushes, water sprayers, paper towels, drying racks, aluminum foil)
- GPS device
- Site map with proposed boring locations and coordinates

- Peristaltic pump or small-diameter Waterra tubing with check valve (depending on depth-to-water conditions)
- 12-volt battery (if using peristaltic pump)
- 0.45-micron in-line filters
- Water quality meter
- Flexible tubing (Masterflex or similar) 1/4-inch outside diameter polyethylene tubing (if using peristaltic pump)
- Depth-to-water indicator
- Sampling and analysis plan and HASP
- Table
- Plastic sheeting to cover table
- Sample bottles
- Sample labels
- Daily log forms
- Field screening data measurement form

1.2 Groundwater Sample Collection Procedures for Fluoride Field Screening

The following general activities and sampling procedures will be implemented for field screening for fluoride in groundwater:

1. Ensure the drilling contractor has positioned the drill rig on the proposed sampling location (within 3 meters) using a GPS navigation device.
2. Collect groundwater samples for fluoride field screening from temporary monitoring wells installed in 5-foot intervals in the borehole.
3. Upon reaching the field screening sample target depth, lift the drill rods (or the outer casing if using the dual casing method) 4 feet to expose the screen to the formation.
4. Use a depth-to-water indicator to determine the static depth to water and the depth to bottom of the temporary well from the top of the drill pipe. If after 5 minutes no water has collected in the temporary well, remove the screen from the borehole, advance the boring 5 feet, and install another screen in the borehole.
5. The type of pump used for purging will vary depending on the depth to water from the top of the drill rods. If the depth to water from the top of the drill rods is less than 27 feet, use a peristaltic pump. If the depth to water from the top of the well casing is greater than 27 feet, use a hand-actuated Waterra inertial pump with dedicated Waterra tubing and check-valve.
6. Install polyethylene tubing (if using a peristaltic pump) or Waterra tubing (if using an inertial pump) to the midpoint of the screened interval. Begin purging groundwater.

7. Immediately begin collecting the groundwater sample for fluoride field screening and groundwater quality parameters into a dedicated or decontaminated container. Filter the sample with a 0.45-micron filter.
8. Record groundwater field parameters (pH, conductivity, temperature,) with a YSI Professional Plus or similar instrument from the filtered groundwater sample and record on a Field Screening Data Measurement Form (Attachment 1).
9. Measure dissolved fluoride concentration in groundwater sample using a Synaptic Sensors fluoride ion selective electrode (ISE) for LabNavigators or similar, and record value on a Fluoride Field Screening Measurement Form. The ISE manual is attached to this SOP (Attachment 2).
10. After field screening is complete, remove and dispose of polyethylene tubing.
11. Advance the boring 5 feet to the next fluoride field screening interval.
12. Repeat steps 3 through 11 until the target depth of the boring is obtained or refusal occurs.
13. Between sample intervals, decontaminate all non-disposable materials used to collect field screening samples.

Attachment 1
Field Screening Data Measurement Form

Field Screening Data Measurement Form

Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation

Boring ID:_____

Date:_____

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes

Attachment 2
Fluoride Electrode Instruction Manual and Forston Labs LabNavigator 2 Reference Guide

Required Equipment

- Ion meter or pH/mV meter.
- Wash bottle with distilled or deionized water.
- Several clean beakers.
- 1 mL, 10 mL and 100 mL pipettes.
- 4-cycle semilogarithmic paper for calibration curves.
- Reference Electrode for mono-model. A Reference Electrode is **not** required with the Combination Model electrodes.

Required Solutions

- 1000 ppmF^- Standard (SD0FL2)
- Total Ionic Strength Adjuster with CDTA (AJ0FL1)
- Reference Fill Solution—For FastFil (refillable) combination and mono-electrodes (RF0FL1)

Electrode Preparation

1. Remove the protective cap covering the electrode tip. **Caution: Do not touch the sensing element with your fingers.**
2. **Mono** (Model 01)—the Reference Electrode must be prepared as described in the Reference Electrode Instruction Manual. Fill the Reference Electrode with Reference Fill Solution.
3. **FastFil (refillable) Combination** (Model 44)—the reference (outer) chamber must be filled with Reference Fill Solution and remain open during testing:
   a. Slide the sleeve of the electrode FastFil cap down to uncover the fill holes **(see fig. 1)**.
   b. Fill the reference chamber with the Reference Fill Solution provided.
   c. Shake the electrode downwards like a thermometer to remove any air bubbles trapped inside.
   d. The surface of the Reference Fill Solution in the reference chamber must be above the inner junction. This is approximately 3" from the electrode tip.
4. **PermaFil (non-refillable) Combination** (Model 43)—the reference chamber is gel filled and sealed. No Reference Fill Solution is required.
5. Rinse the electrode with DI water, blot dry. Do not rub dry.
6. Place the electrode in the electrode holder. Immerse the tip of the electrode in DI water and stir the water for 5 minutes. This will properly clean the electrode.

Checking Electrode Operation (Slope)

1. Connect electrode to the meter. (For Mono-model, also connect Reference Electrode to meter.)
2. Place 50 mL DI water into a 150 mL beaker. Add 50 mL TISAB to the DI water and stir thoroughly.
3. Set the function switch to the mV mode.
4. Rinse the electrode with DI water, blot dry and place in the solution prepared in step 2. (For Mono, also rinse and place Reference Electrode in the solution.)
5. Pipet 1 mL of 1000 ppm F~ Standard into the beaker. Stir thoroughly, then record the potential (E_1) in mV when a stable reading is displayed.
6. Pipette 10 mL of the same standard into the same beaker. Stir thoroughly. When a stable reading is displayed, record the potential (E_2) in mV.
7. The difference between the first and the second potential readings (E_1-E_2) is defined as the electrode slope. The normal range for the slope is 56±4 mV at 25°C.

Troubleshooting

If the electrode slope is not within the normal range, the following procedure may restore the electrode.

1. Polish the electrode sensing element with the furnished polishing strips. **Caution: Do not touch the sensing element with your fingers.**
2. Rinse and soak the electrode in standard solution for about 5 minutes before use.
3. Repeat "Checking Electrode Operation" procedure again. Note: All standard solutions should be prepared fresh. You must use TISAB.

Periodically check the Reference Fill Solution level in the reference chamber of the FastFil. The solution level must be higher than the inner junction. This step is unnecessary with the Mono and PermaFil models.

If the electrode slope is still outside the normal range after this procedure, please contact manufacturer's technical service department.

Reading a Sample with the Electrode

Various procedures may be used to determine the concentration of a sample. The most common is the Direct Calibration method, which is described below. Contact manufacturer's technical service department for details of other methods.

In Direct Calibration a series of standard solutions of differing concentrations are used to calibrate the electrode. Then each sample requires only a single meter reading, which is compared with the calibration readings to obtain the sample concentration. TISAB is added to all solutions to ensure the samples and the standards have the same ionic strength.

Setup:

1. Prepare the electrode as described in "Electrode Preparation" and "Checking Electrode Operation".
2. Connect the electrode to the meter.
3. Prepare two standard solutions that differ in concentration by a factor of ten (or follow meter manufacturers instructions) and bracket the expected sample concentration range. Use the concentration unit that is most appropriate. The standards should be at the same temperature as the sample.

Measurement:

If using a meter with direct concentration reading capability (see individual meter instruction manuals for more specific information):

1. Place 50 mL of the more dilute standard into a
1. 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
2. Rinse electrode with DI water, blot dry and place in the beaker. Wait for a stable reading, then adjust the meter to display the value of the standard. Refer to the meter's instruction manual for the meter adjustment procedure.
3. Measure 50 mL of the more concentrated standard into a second 150 mL beaker. Add 50 mL of TISAB and stir.
4. Rinse electrode with DI water, blot dry and place in the second beaker. Wait for a stable reading, then adjust the meter to display the value of the second standard.
5. Pipette 50 mL of sample into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
6. Rinse electrode with DI water, blot dry and place in the sample beaker. Wait for a stable reading and the sample concentration will be displayed on the meter.

If using a meter with millivolt reading only:

1. Turn the function switch to mV range.
2. Place 50 mL of the more dilute standard into a
1. 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
2. Rinse electrode with DI water, blot dry and place in the beaker. Wait for a stable reading, then record the mV value and the corresponding standard concentration.
3. Measure 50 mL of the more concentrated standard into a second 150 mL beaker. Add 50 mL of TISAB and stir.
4. Rinse electrode with DI water, blot dry and place in the second beaker. Wait for a stable reading, then record this mV value with the corresponding concentration.
5. Using the semilogarithmic graph paper, prepare a calibration curve by plotting the mV values on the linear axis and the standard concentrations on the logarithmic axis.
6. Pipette 50 mL of sample into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
7. Rinse electrode with DI water, blot dry and place in the sample beaker. Wait for a stable reading and record the mV reading.
8. Determine the sample concentration using the calibration curve prepared in Step 6 above.

Electrode Storage

Short Term (over night or the weekend):

Rinse the electrode throughly with DI water and place the tip in a solution of 50 mL of TISAB in 50 mL of DI water. For FastFil model slide the sleeve up to close refill holes.

Long Term:

Mono-electrode and **PermaFil** (gell filled)—rinse throughly with DI water and store dry. Replace the cap to protect the sensing element.

FastFil Combination—empty reference chamber of Reference Fill Solution. Flush reference chamber with DI water several times. Empty DI water from reference chamber and store the electrode-dry. Replace the cap to protect the -sensing element.

Follow procedures in "Electrode Preparation" and "Checking Electrode Operation" before using the electrode again.

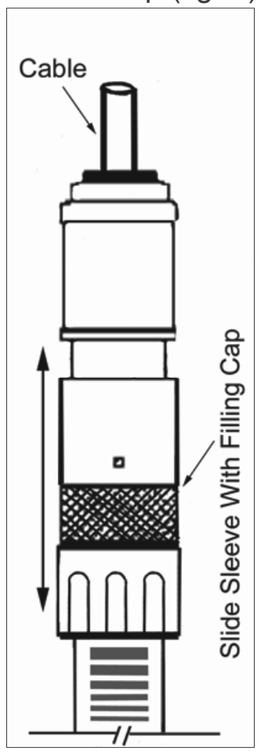
Specification

Concentration Range:	Saturated to 1 x 10^{-6} *M* (saturated-0.02 ppm)
pH Range:	5 to 7 pH at 1 *x* 10^{-6} *M* 5 to 11 pH at saturated
Temperature Range:	0 to 80"C continuous, 80 to 100°C intermittent
Electrode Resistance:	less than 50 megohms
Reproducibility:	±2%
Minimum Sample Size:	5 mL in a 50 mL beaker
Size:	Electrode length—155 mm Body Diameter—12 mm Cap Diameter—16 mm Cable Length—100 cm

Contents

Fluoride Electrode	1 ea.
Polishing Strip (MD0004)	2 ea.
1000ppm as F^- (SD2020)	1 oz.
TISAB with CDTA (AJ0009)	2 oz.
Reference Fill Solution (RF0007) (Mono models only)	1 oz.
Polygen Reference Fill Solution (RF0007P) (FastFil models only)	1 oz.
Plastic Pipette Instruction Manual (ISE4010-C00)	1 ea.

FastFil Cap (fig. 1)



Laboratory Products Warranty

Products designed and sold for use in laboratory applications are warranted to be free from defects in materials and workmanship for a period of six (6) months, provided that the product is used in accordance with the instructions provided and that the product has not been subjected to breakage, alteration, misuse, abuse or used in an application not normally intended for the product. In the event of a warranted failure within the warranty period, contact your supplier.

Please be prepared to discuss the details of the difficulty. If necessary, your supplier will issue a Return Authorization Number (RAN). Materials or goods returned without an RAN will not be accepted. Return the product to your supplier freight prepaid.

The warranty described above is exclusive and in lieu of all other warranties whether statutory, express or implied including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose and all warranties arising from the course of dealing or usage of trade. The buyer's sole and exclusive remedy is for repair or replacement of the non-conforming product or part thereof, but in no event shall ASI or it's dealers or agents of any tier be liable to the buyer or any person (or any special, indirect, incidental or consequential damages whether the claims are based in contract in tort (including negligence) or otherwise with respect to or arising out of the product furnished hereunder.

ISE4010-C00

The Fluoride Electrode is a hand crafted solid state ion-selective electrode which measures total free fluoride in aqueous solutions simply, quickly, economically, and accurately.

If you have the mono-model fluoride electrode, then you also need a reference electrode.

Carefully follow the directions on this instruction sheet to obtain the best performance and electrode life.

Forston Labs LabNavigator®2 Reference Guide

v1.01

SAFETY INFORMATION

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference and

(2) this device must accept any interference received, including interference that may cause undesired operation

RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Industry Canada - Class B This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

RF exposure warning: The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout interférence radioélectrique, même si cela résulte à un brouillage susceptible d'en compromettre le fonctionnement.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de ***Classe B prescrites dans la norme sur le matériel interférant-brouilleur: "Appareils Numériques," NMB-003 édictée par industrie Canada****. L'utilisation est soumise aux deux conditions suivantes: (1) cet appareil ne peut causer d'interférences, et (2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un disfonctionnement du dispositif. Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisie de telle façon que l'équivalent de puissance isotrope émis (e.i.r.p) n'est pas plus grand que celui permis pour une communication établie.* ***Avertissement d'exposition RF:*** *L'équipement est conforme aux limites d'exposition aux RF établies pour un environnement non supervisé. L'antenne (s) utilisée pour ce transmetteur ne doit pas être jumelés ou fonctionner en conjonction avec toute autre antenne ou transmetteur.*

ABOUT THIS GUIDE

LabNavigator 2, released in October 2012, ships with a Quick Start Guide intended to get you up and running with basic data collection and analysis. The LabNavigator 2 Reference Guide is an extended guide designed as a comprehensive resource detailing the features, hardware, and software of LabNavigator 2.

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I. GETTING STARTED WITH LABNAVIGATOR 2

What's Included

- LabNavigator 2 interface
- Rechargeable battery
- Power adapter
- USB cable
- Quick-Start Guide
- Stylus (in unit)
- Stylus tether

Using LabNavigator 2 for the First Time

Install the Battery

LabNavigator 2 ships without the battery installed. To install the battery, follow these simple instructions.

- Turn LabNavigator over and open the battery door by sliding the door lock and lifting the battery cover.
- Remove the small protective sticker covering the battery contacts.
- Install the battery with the label side up, ensuring the battery contacts align with the contacts on LabNavigator.
- Replace the battery door and make sure the door lock clicks closed.

LabNavigator with battery door removed

Charge for 8 Hours

We recommend charging the battery for eight hours prior to using LabNavigator for the first time on battery power. To do this, connect the included power adapter to LabNavigator and an AC power source. You can also charge LabNavigator using the LabNavigator 2 Charging Station (order code LN2-CRG, sold separately).

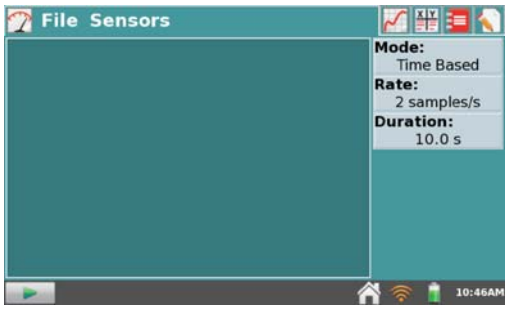
LabNavigator uses a high-quality lithium-ion battery. This is the same chemistry used in premium laptop and cell phone batteries, and you can expect similar performance. There is never a need to condition the battery by regular full discharge/charge cycles.

It is safe to leave the battery charging indefinitely, and there is no need to fully discharge the battery before charging. Battery life will depend on the sensors used, but in most cases you can obtain six or more hours of use before recharging. We recommend charging LabNavigator overnight to start the next day with a full charge. For more details about the battery, see LabNavigator Battery.

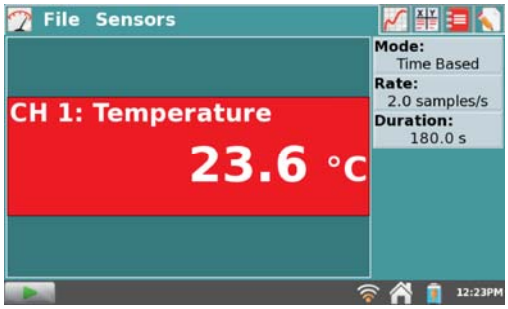
Quick Start to Data Collection

Follow these steps to get up and running quickly with basic data collection. For more details, see Data Collection.

1. Turn on LabNavigator by pressing and releasing the power button located on the top edge of LabNavigator. The LabNavigator App will launch automatically.



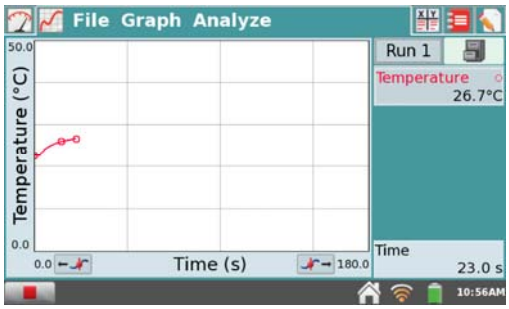
2. Connect an analog sensor to the CH 1 port on LabNavigator (or connect a digital sensor to the DIG 1 port). LabNavigator App will auto-ID the connected sensor and automatically set up the default collection rate for the sensor.



   ***Note**: If your sensor is from a source other than Forston Labs but has a BNC connector, the sensor requires the use of the Electrode Amplifier and the sensor will not auto-ID. Instead, you will need to set up the sensor manually. To do this, tap the Sensors menu and choose Sensor Setup. Next, tap the field labeled "No Sensor" adjacent to the appropriate port to view a list of sensors. Tap to select the sensor.*

3. Next, tap Collect  . Data collection will begin and LabNavigator will graph the data collection in real time.

   You can stop collection early by tapping Stop  .



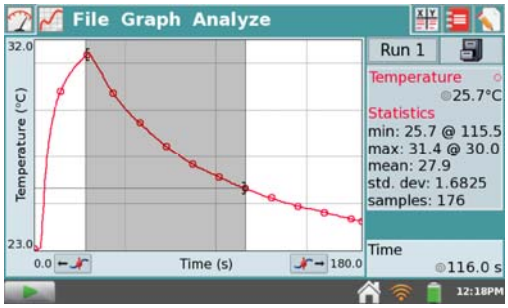
4. Once data collection is complete, the graph autoscales to the data. Tap the graph to examine a point of interest. The coordinates of the point are shown in the pane to the right of the graph. Tap another point or tap the Examine buttons to move the cursor left and right .

5. To select a region of data for analysis, tap-and-drag across the graph to highlight the desired region.

   ***Note**: To analyze all of the data, you do not need to select a region.*

   Statistics

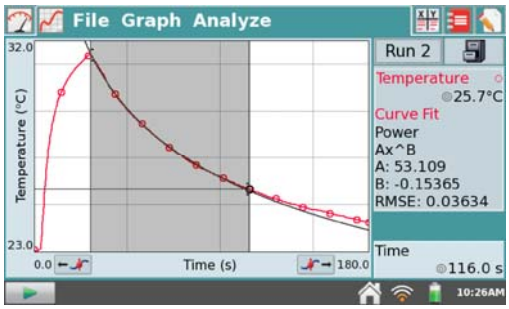
   To view statistics for the selected data, tap Analyze on the Graph screen, then choose Statistics. Tap the checkbox to select a data set. The statistics information is then displayed in the panel to the right of the graph.



   To remove the displayed statistics, tap Analyze on the Graph screen, choose Statistics, then tap the checkbox to unselect the data set.

   Curve Fit

   To fit a curve to the selected data, tap Analyze on the Graph screen, then choose Curve Fit. Tap the checkbox to select a data set. On the Curve Fit screen, tap Choose Fit, then choose the type of equation you would like to fit to the data. LabNavigator App will automatically determine the fit coefficients. A preview of the fit applied to the data



   ***Note**: The Curve Fit coefficients cannot be manually adjusted. To enter your own parameters, see the sub-section Model within Data Analysis.*

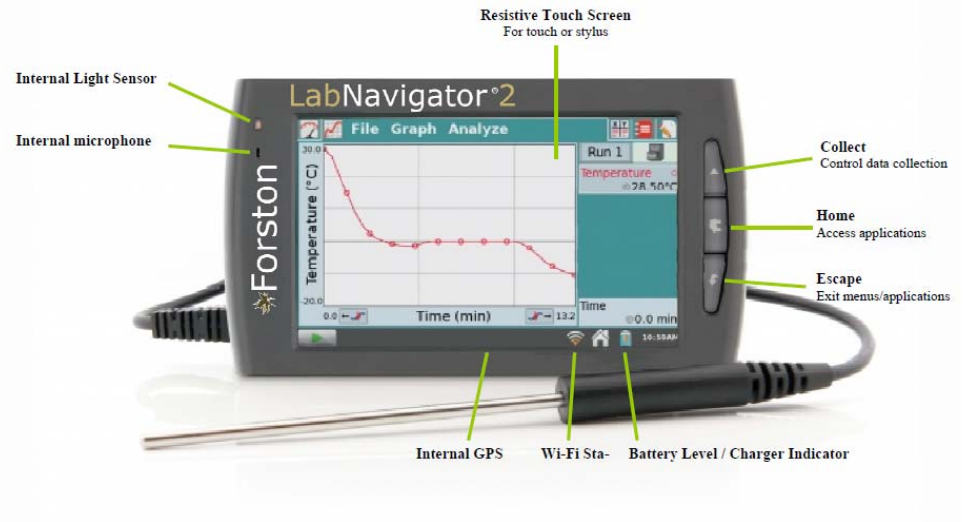
   On the Curve Fit screen, tap OK to apply the fit and return to the Graph screen.

   To remove the fit, tap Analyze on the Graph screen, choose Curve Fit, then tap the checkbox to unselect the data set.

For detailed information on these features, as well as other data collection and analysis options, see

- LabNavigator App

II. LABNAVIGATOR HARDWARE



Once LabNavigator 2 is connected to AC power or the battery has been charged, press the power button located on the top of the unit, near the left edge. LabNavigator will complete its booting procedure and then launch the LabNavigator App by default, as shown above. If the screen does not light after a moment, connect the power adapter to LabNavigator and to an AC power source and try the button again.

Power Button

- **Power on** – If the screen is off for any reason (LabNavigator is off, asleep, or the screen has turned off to conserve battery power) pressing and releasing the power button once will turn LabNavigator back on. If LabNavigator was off, LabNavigator will also complete its booting procedure which takes about a minute and then display LabNavigator App.

- **Sleep/wake** – When LabNavigator is on, pressing and releasing the power button once will put LabNavigator into a sleep mode. Note that the sleep mode does not start until you release the power button. In this mode, LabNavigator uses less power but the battery can still drain. This mode is useful if you are going to return to data collection again soon, in which case waking LabNavigator from sleep is quicker than a cold boot. To wake LabNavigator from sleep, simply press and release the power button.

- **Shut down** – To shut down LabNavigator, hold the power button down for about five seconds. You will then see a message indicating that LabNavigator is shutting down. Release the power button, and allow LabNavigator to shutdown. To cancel the shutdown procedure at this point, simply tap Cancel. You can also shutdown LabNavigator by tapping Home, tapping the System folder, then tapping Shut Down.

- **Emergency Shutdown** – If you hold the power button down for about eight seconds, the unit will power off uncleanly. This is the same as pulling the battery out of the unit while it is running. This is not recommended unless LabNavigator is frozen, as you may lose your data and potentially cause file system corruption.

Touch Screen

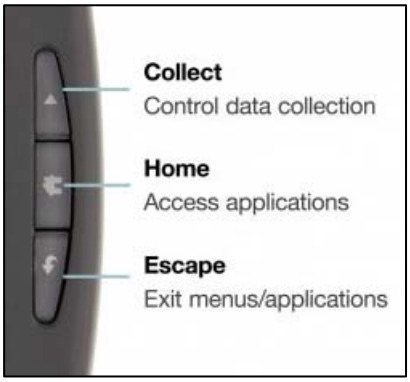
LabNavigator has an LED backlit resistive touch screen that quickly responds to pressure exerted on the screen. LabNavigator is controlled primarily by touching the screen. The software is designed to be finger-friendly. In some situations, you may desire having more control for precise navigation. In such cases, we recommend using the included stylus.

If you are having trouble viewing the color screen or are using LabNavigator outside in bright sunlight, we recommend changing to the High Contrast mode. From the Home menu, tap Preferences, then Light & Power. Tap the checkbox for High Contrast to enable this mode.

Hardware Keys

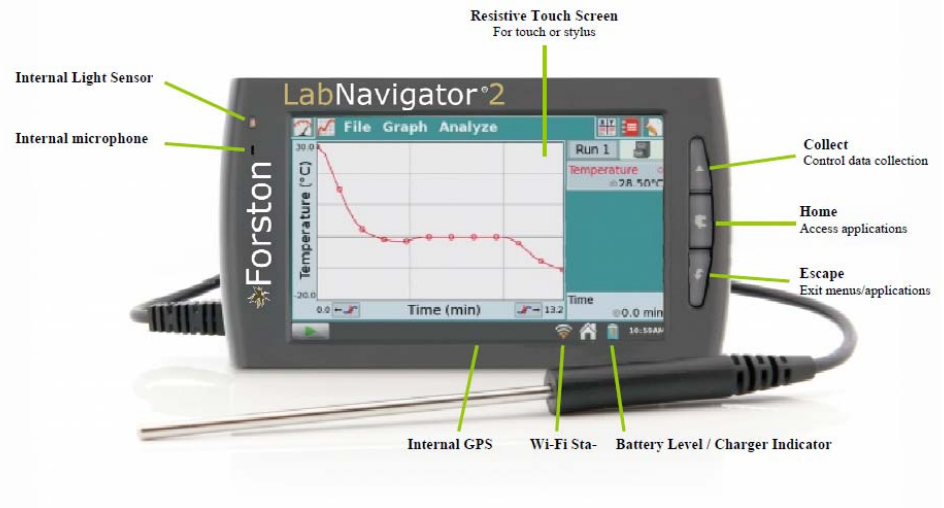
In addition to using the touch screen, the three hardware keys can also be used to control your LabNavigator.

- **Collect** – This key starts and stops data collection within LabNavigator App
- **Home** – This key launches the Home screen
- **Escape** – This key closes most applications, menus, and exits dialog boxes without taking action (i.e., cancels dialog boxes)



Sensor Ports

LabNavigator has three analog sensor ports (CH 1, CH 2, and CH 3) for analog sensors such as our pH Sensor, Temperature Sensor, and Force Sensor. Also included is a full-size USB port for USB sensors, USB thumb drives, and USB printers. In addition to the power button, the top edge of LabNavigator has two digital sensor ports (DIG 1 and DIG 2) for Drop Counters, and other digital sensors.

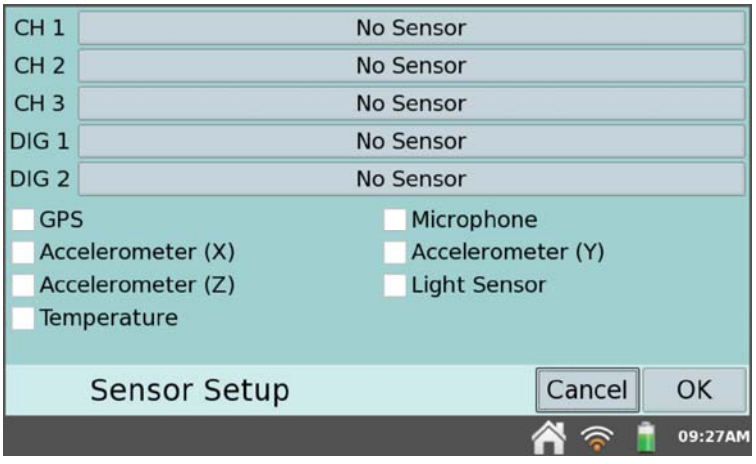


Also located on the top edge are the audio ports and a micro SD card slot for expanding disk storage. On the side opposite of the analog ports, there is a stylus storage slot, an AC power port for recharging the battery, and a mini USB port for connecting LabNavigator to a computer. In between these ports, there is a serial connection for charging the unit in a LabNavigator 2 charging station (order code LQ2-CRG, sold separately), and a stylus tether attachment point.

Internal Sensors

LabNavigator also has several built-in sensors, including a GPS, microphone, accelerometers, temperature sensor, and relative light sensor.

To enable internal sensors within LabNavigator App, tap Sensors, and choose Sensor Setup. Within the Sensor Setup dialog box, tap a checkbox to enable the associated sensor. Then tap OK to return to the LabNavigator App Meter screen.



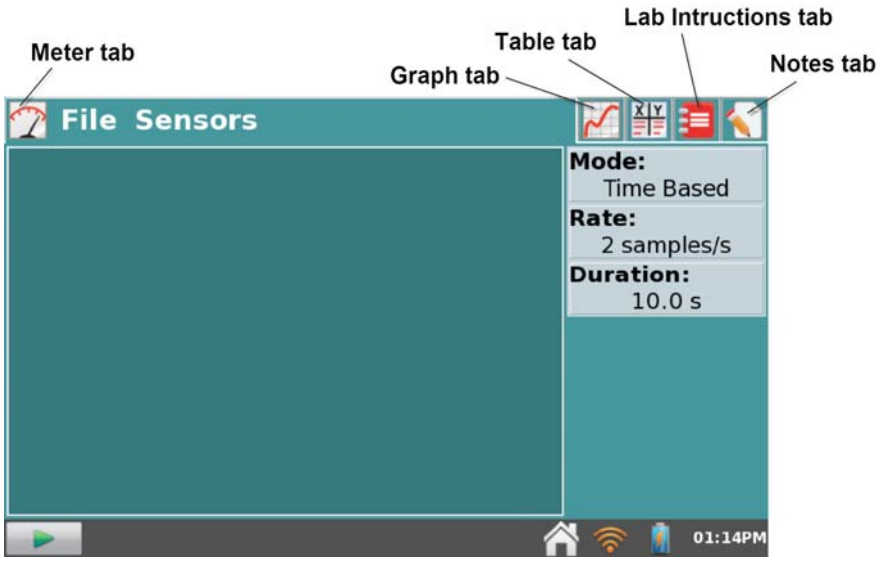
Sensor Setup dialog box

III. LABNAVIGATOR APP

The data-collection and analysis software, LabNavigator App, is the heart of your LabNavigator. When you turn on LabNavigator, the LabNavigator App starts automatically. If the LabNavigator App is not showing on your screen, tap Home, and tap LabNavigator App.

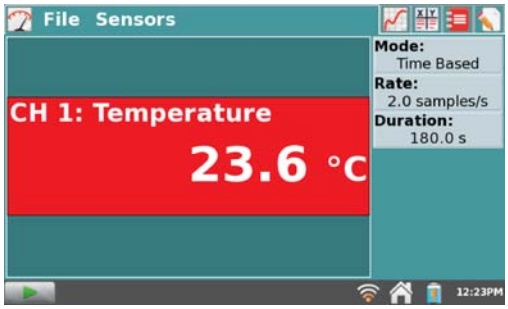
Navigating LabNavigator App

The LabNavigator App has five different screens. Tap on the desired tab to display the associated screen.



LabNavigator App

- **Meter screen** – Set up sensors, data-collection parameters, and see a digital meter for your connected sensors. For a detailed description of how the Meter screen is used for data collection, see Data Collection.



- **Graph screen** – See a graph of your data and perform statistical analysis of your data, including curve fits. For a detailed description of how the Graph screen is used for data analysis, see Data Analysis.

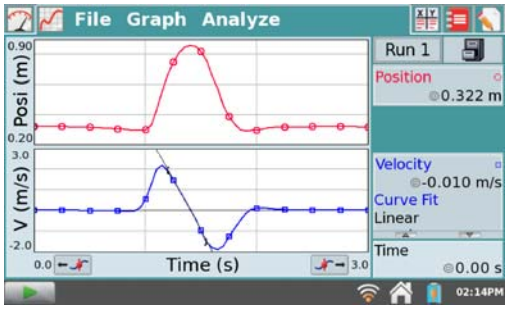
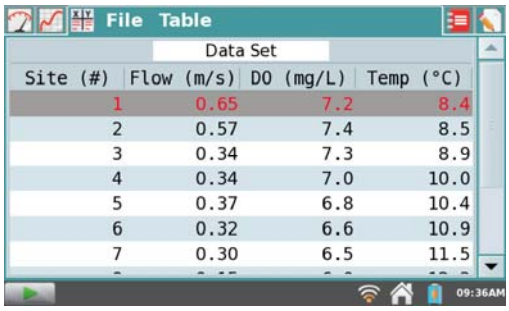
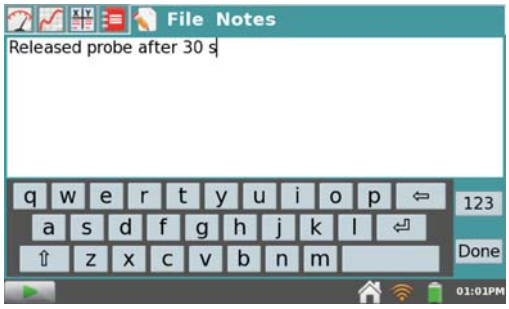


Table screen – See a tabular representation of your data, create manual and calculated columns, and manually enter data. For a detailed description of how the Table screen is used for data analysis, see Manipulating Data from the Table Screen.



Methods screen – You can pre-load your own methods (converted to the proper file format using the included NavCoPilot Software) onto your LabNavigator for user reference.

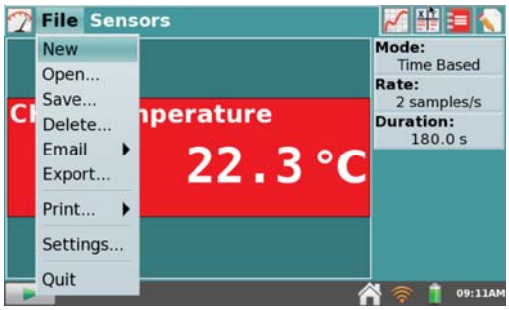
Notes screen – Record observations about your experiment. For more information, see Adding Notes.



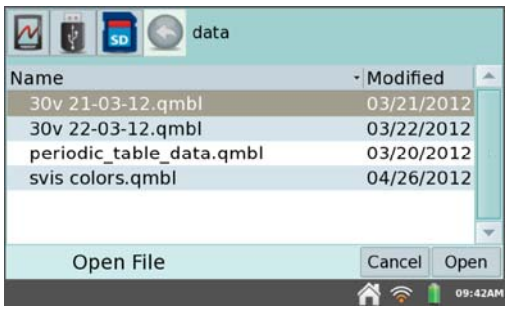
File Menu

A LabNavigator App file can contain data collection settings, graphs, data tables, analyses, and even notes. These files have a *.qmbl* extension and can be saved to the internal storage space on LabNavigator or to an external storage space such as a USB thumb drive or micro SD card.

All five tabs within LabNavigator App share the same File menu which is similar to the File menu on a computer. From the File menu, you can perform a number of tasks related to LabNavigator App files, such as opening, saving, and closing files, adjusting file settings, printing, and more. These are described in more detail as follows.



- **New** – Choosing New from the File menu will close the existing file and open a new file. If you have unsaved data, you will be prompted to either save or discard the data before continuing. This is an easy way to reset the data collection mode and calibrations back to default values.
- **Open** – Choosing Open from the File menu displays a list of files that you have saved on LabNavigator. To open a file, tap on the file name, then tap Open. To open a file from an external storage source, tap the source icon (USB, SD) to display the files available on that source, then tap on the file name, and tap Open.



- **Save** – Choosing Save from the File menu displays the Save As dialog box where you can tap on a source icon (USB, SD, LabNavigator) to select a destination, then tap in the File name field to assign a name to the file.

- **Delete** – Choosing Delete from the File menu displays a file list similar to that accessible by choosing open. Tap on a source icon (USB, SD, LabNavigator) to select the source of the file to be deleted, then tap the file name to be deleted, then tap Delete. You can delete only one file at a time.

- **Email** – Choosing Email from the File menu allows you to email the Data File, Graph, Text File, or Screen Shot from the current file, if you are connected to a wireless network with Internet. For detailed instructions on setting up this feature, see Emailing from LabNavigator.

- **Export**– Choosing Export from the File menu allows you to export the currently opened data file in a text format for use with other applications. Tap on a source icon (USB, SD, LabNavigator) to select a destination, then tap OK to complete the export.

  A typical use of this feature is to export a text file to an SD card or a USB flash drive for further data manipulation on a computer with a spreadsheet program. The exported file contains all column values from all runs in the current session, delimited by tabs. For more detailed instructions on using this feature, see Storing LabNavigator App Files.

- **Print** – Choosing Print from the File menu allows you to print the Graph, Table, Methods, Notes, or Screen from the current file to a USB or Wi-Fi-enabled printer. For detailed instructions, see USB Printing and Wirelessly Printing from the LabNavigator, respectively.

- **Settings** – Choosing Settings from the File menu allows you to adjust file settings for the current session. These settings are not global; rather, they are specific to and saved within the LabNavigator file. These settings return to the default upon choosing New from the File menu.
  - **Angle Units for Trigonometric Calculcations** - Calculated columns, curve fits, and modeled functions may use trigonometric calculations; choose Degrees or Radians here. The default is set to radians.
  - **Number of Points for Derivative Calculations** – Calculated columns, curve fits, modeled functions, and even the automatic setup for sensors may use numerical derivatives. The algorithm for such derivatives utilizes a user-defined number of points. The default value of seven points is good for many tests but you may want to choose a larger number.

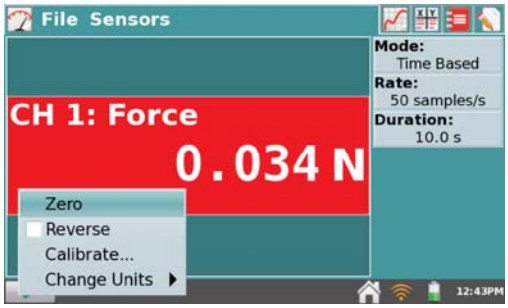
- **Quit –** Choosing Quit from the File menu exits the LabNavigator App. Since other applications can be run simultaneously with LabNavigator App, there is typically no need to quit the LabNavigator App during standard use.

Data Collection

The Meter screen, selectable by tapping the Meter tab , is the default view for the LabNavigator App. Use the Meter screen to set up your sensors and data-collection parameters, as well as to monitor a real-time reading of your sensor.

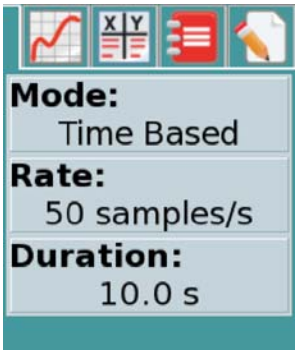
Digital Meters

A digital meter for each connected sensor is shown on this screen. Tap on a meter to change the sensor's settings. The available options will depend on the sensor and may include options such as change units, calibrate, zero, and reverse. These options can also be accessed by tapping Sensors, and choosing the desired option from the menu.



Data-Collection Summary

A summary of the data-collection settings (Mode, Rate, Duration) is shown in the pane at the right of the Meter screen.



For most sensors, the default data-collection mode is Time Based. The default collection rate for the connected sensors is set up automatically when LabNavigator identifies the sensor. To modify the data-collection settings, tap on the summary box. Alternatively, you can tap Sensors, then choose Data Collection. For detailed descriptions of data-collection modes and parameters, see Data-Collection Settings.

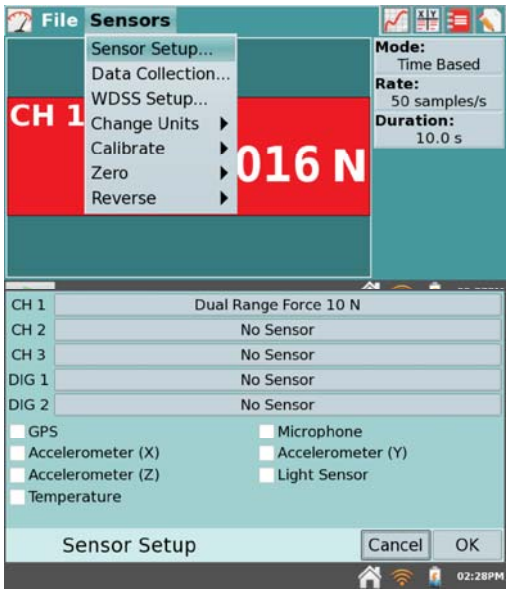
Data-Collection Controls

Tap the Collect button  displayed in the lower right corner of any LabNavigator App screen to start data collection. During data collection, this button changes to a Stop button which you can tap at any time to end data collection.

During selected data-collection modes (e.g., Events with Entry), a Keep button  will appear to the right of the Stop button. In this mode, you must tap  to record the data point in the data table. For more information, see Events with Entry.

Data-Collection Settings

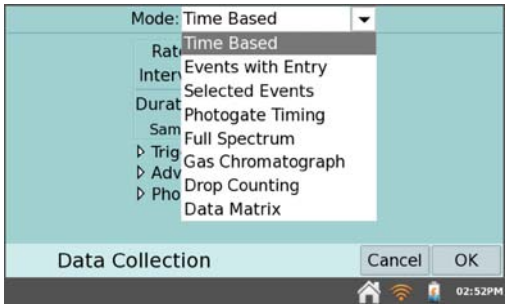
The Sensors menu gives access to detailed setup controls. Use this menu to set up the internal sensors, non-auto-ID sensors. You can also use this menu to change the data collection parameters and specific sensor settings.



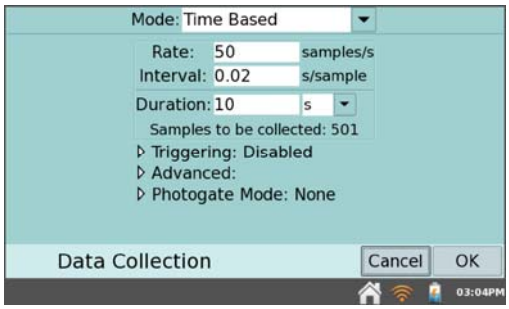
- **Sensor Setup** – Choosing Sensor Setup from the Sensors menu displays a dialog box showing which sensors are currently connected. If you are using a sensor that does not auto-ID, you will need to manually set up the sensor. To do this, tap on the field displaying "No Sensor" for the channel to which your sensor is connected. In response, LabNavigator displays a list of possible sensors. Tap to select the appropriate sensor. Then tap OK.

You can also activate (or deactivate) the internal sensors from the Sensor Setup. Check the box next to the desired sensor to make that sensor available for data collection.

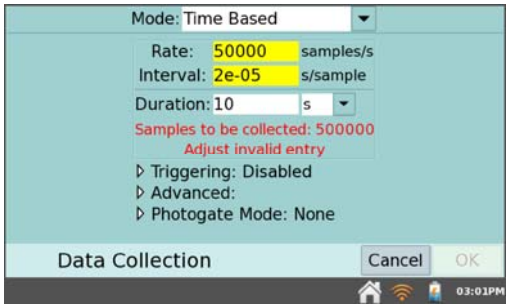
- **Data Collection** – Choosing Data Collection from the Sensors menu displays allows you to set the data-collection mode and associated parameters. The parameters listed will depend on the mode selected.



  - **Mode: Time-Based** – Time-based data collection is the default data-collection mode for most sensors. In this mode, sensor readings are recorded at regular time intervals.

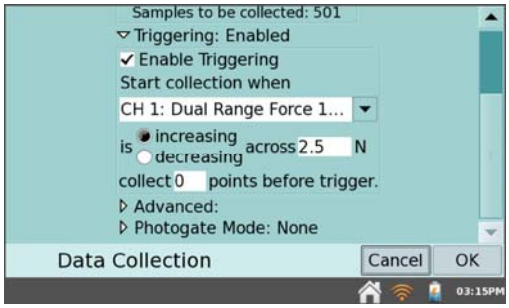


    Adjustable parameters for this mode include the rate (or interval) and the duration of data collection. The total number of samples to be collected based on these parameters will be displayed.

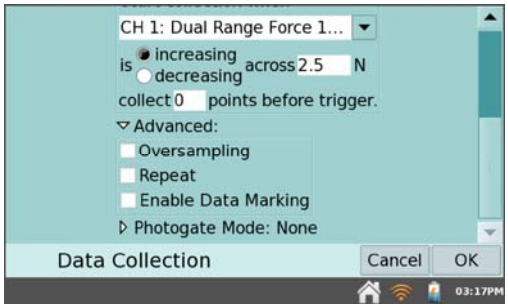


    Under some circumstances, the Rate and Duration fields may be highlighted in yellow or red. The *yellow* warning indicates that the rate has been set to value slower or faster than what is recommended for the connected sensor, or that the number of samples could lead to performance issues. The *red* warning indicates one of the following: the rate has been set to a value slower or faster than what a connected device and/or sensor configuration can support; the number of samples exceeds the storage available; or, the number of samples exceeds 2000 (for rates faster than 80,000 samples per second).

    Triggering – Triggering is only available in the Time Based mode, and can be enabled by simply tapping the associated checkbox. When enabled, LabNavigator will wait for a trigger condition to be met before beginning data collection. The sensor name, the level, and the direction of change (increasing or decreasing) can all be set here. You can also set the number of points to be saved before the trigger condition is met.



    Advanced – The Advanced field has three options that can be independently

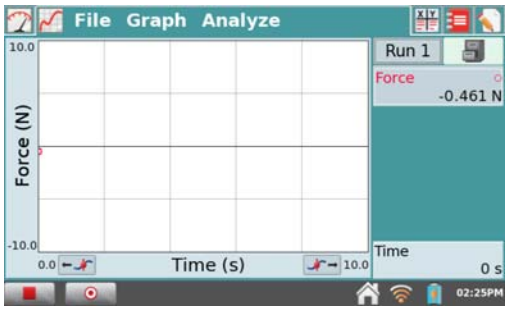


enabled by simply tapping the associated checkbox.

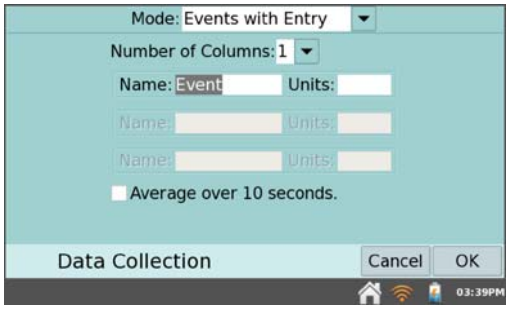
Oversampling can be used with data-collection rates less than ten samples per second. When Oversampling is enabled, the sensor will sample at a rate higher than the number of samples per second that you set, and then LabNavigator averages those readings and records the averages in the data table. This setting can be used to reduce measurement noise by combining a burst of readings into one value. For example, oversampling can sometimes reduce the influence of unseen but real variations, such as as those from a flickering light source.

Repeat can be used with data-collection rates less than 250 samples per second. When Repeat is enabled, a new data-collection run is started as soon as the current run has ended. Data for each run is overwritten when a new run is started. This setting is helpful when doing exploratory investigations.

Enable Data Marking can be used to mark points of interest during a time-based data collection. When enabled, a Mark Data button will appear when data is being collected. Simply tap duing data collection to mark that particular point as a point of interest. After completing data collection, data marks can be named as part of the analysis process.



- **Mode: Events with Entry** – Sometimes experiments do not depend on time, but depend on the setting of another quantity. For example, using Boyle's law one wants to know the pressure as a function of the volume of gas. Thus, in Events with Entry mode, no time information is recorded.

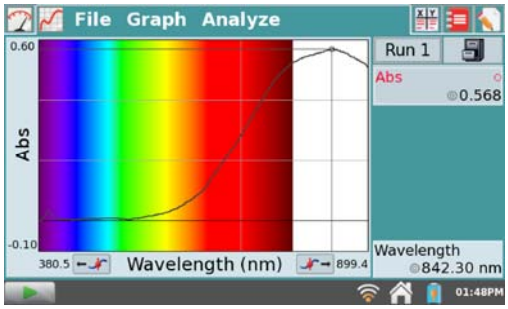


When setting up this mode, you can enter a name and units for the entry, or independent variable, column. One or two additional columns of data can be entered as you collect data. You also have an option to average data over ten seconds and report the averaged reading.

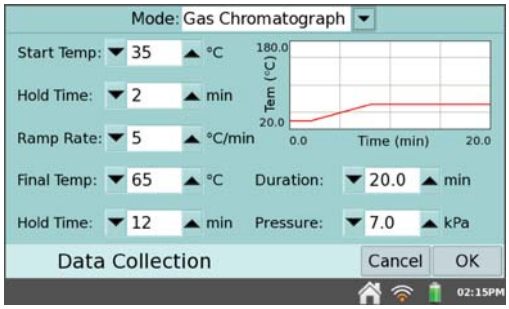
In Events with Entry mode, once data collection is started, a Keep button appears. Tap the Keep button to record the sensor value (e.g., gas pressure in the Boyle's law application). In response, LabNavigator will prompt for the Entry value (e.g., gas volume in the Boyle's law application). Sensor values are plotted versus the Entry values, as shown in the screenshot at right.

- **Mode: Selected Events** – Selected Events is similar to the Events with Entry mode, except that entries of 1, 2, 3… are entered automatically for you. No time information is recorded in Selected Events mode.

- **Mode: Full Spectrum** – Full Spectrum data-collection mode can only be used with Spectrometers and is the default mode when a Spectrometer is connected. In Full Spectrum mode, Intensity, Absorbance, Fluorescence (NavSpec+ only), or %Transmittance can be measured as a function of wavelength.



- **Mode: Gas Chromatograph** – LabNavigator 2 supports the use of the Forston Labs Mini Gas Chromatograph (GC). When a Mini GC is plugged in the LabNavigator 2 USB port, the software will automatically identify the Mini GC and select the Gas Chromatograph mode. This mode should not be entered unless a Mini GC is attached.



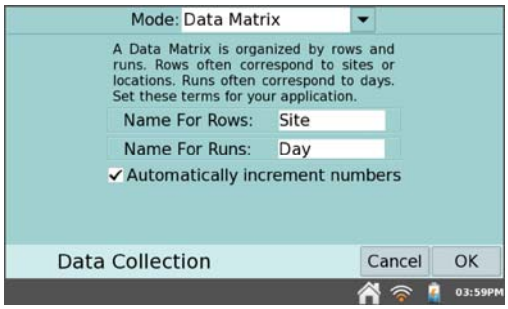
In this mode, various parameters are defined for the user to establish a temperature and pressure profile adequate for the current experiment. When the mode is first entered, a set of default parameters is displayed. If you wish to change these parameters, tap in the parameter field to enter a new value or adjust the default value by tapping the arrow buttons. These values will be reflected in the preview of the time-dependent temperature graph displayed at right. After setting the parameters, tap OK to initiate the Mini GC warm up.

***Note**: A new message will appear, "Do not inject until GC is ready." The Mini GC will take a few minutes to warm up and stabilize. When the Mini GC is ready for injection, the message will read, "Inject and select Collect simultaneously."*

- **Mode: Drop Counting** – In this mode, you can choose to calibrate drops so that the volume of titrant is recorded in units of milliliters. Choose Calibrate from the Sensors menu. The Forston Labs Drop Counter is set to use a default calibration of 28 drops/mL. If you choose to calibrate the sensor, the volume of an individual drop will be determined by the number of drops that pass through the Forston Labs Drop Counter and dividing by the total volume of the drops. Follow the instructions on the screen to complete a custom calibration. Alternately, the

Equation tab allows you to input a previously determined value for drops/mL. Enter the drops/mL value (e.g., 28.0), then choose OK.

- **Mode: Data Matrix** – This mode is primarily used for field work. It provides a way to collect data referenced to two parameters such as the locations of the sampling sites and the dates on which they were sampled. It also allows you to collect data from an unlimited number of sensors by permitting sensors to be swapped in and out of LabNavigator during data collection.



- **Change Units** – In some cases, you may have the option to display the sensor data in another set of units. Choosing Change Units from the Sensors menu allows you to select a different set of units. Choosing a new unit will change all existing runs for that sensor to the new unit, as well as any subsequent runs. If this feature is grayed-out in the menu, then the data for that particular sensor cannot be displayed in another set of units.

- **Calibrate** – Most sensors do not need to be calibrated, as a factory calibration for that sensor is read from the sensor when LabNavigator identifies it. However, some sensors do require calibration and you will use the Calibrate tool accessible from the Sensors menu. In such cases, follow the detailed calibration instructions provided in the USB drive included with your LabNavigator. Sensor booklets are also available online at www.forstonlabs.com

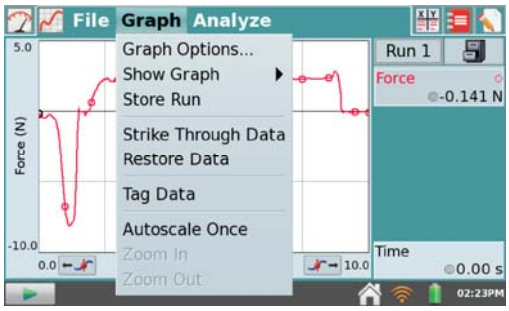
- **Zero** – Choosing Zero from the Sensors menu will set the current sensor reading to zero by adding an offset to the current reading. Not all sensors can be zeroed.

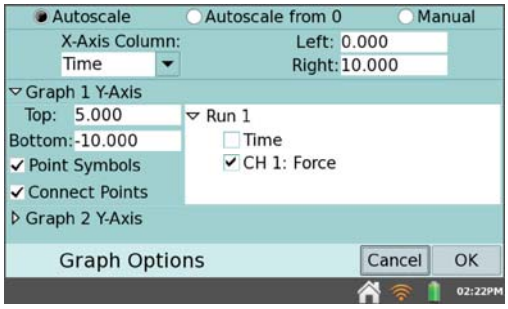
- **Reverse** –Some sensors read both positive and negative values. Choosing Reverse from the Sensors menu will swap the sign of the readings with respect to the default settings. Not all sensors can be reversed.

Graph Settings

LabNavigator App automatically switches to the Graph screen when data collection begins. From this screen, you can adjust graph settings in real-time during data collection, or after data collection has ended. You can choose what is plotted, how the graph is scaled, how the data is formatted, and choose data to ignore by striking through the values.

- **Graph Options** – To control how the data are graphed, tap the Graph menu and choose Graph Options. Here you can choose the columns used for the x- and y-axes and the axes limits.





Selecting **Autoscale** will cause the graph range to adjust to the data range after data collection ends. Autoscale from 0 does the same, but includes the origin. Manual scaling will respect values entered in the range limits, unless incoming data falls outside the range. In this case the range will expand to include the data. To enter range limits, tap in each field and use the keyboard to enter numeric values.

The **Point Symbols** option is selected by default, and will surround some, but not all, of the points with a circle. This allows easy identification of a trace by the corresponding mark in the graph legend. Simply tap the associated checkbox to disable this feature.

The **Connect Points** option connects data points with straight-line segments. These lines help the eye follow the data trend, but in some cases are not appropriate. On by default, unchecking Connect Points will leave only the actual points on the graph.

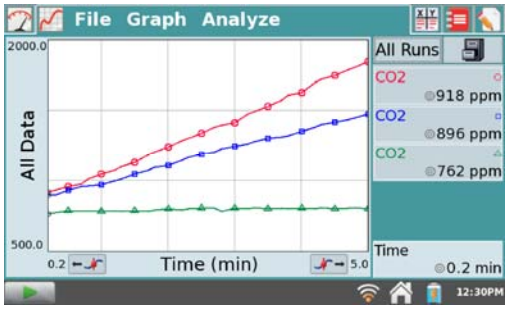
To specify which columns are being graphed, tap the desired column under the proper run heading to place a checkmark.

LabNavigator can display a single graph, or two graphs. The two graphs share a common x-axis column and range. Tap the triangle next to Graph 1 Y-Axis or Graph 2 Y-Axis to show or hide the settings for that axis. If no column is selected for Graph 2, only one graph will be drawn.

When you are done setting Graph Options, tap OK to return to the Graph screen.

- **Show Graph** – Choosing Show Graph from the Graph menu lets you quickly jump between displaying one or two graphs. You can also choose the Full Width option, to remove the data collection summary box and maximize the graphs on the screen.

- **Store Run** – You can collect several runs for comparison. Choosing Store Run from the Graph menu allows you to save the current run, and then proceed with more data collection. As a shortcut, you can simply tap the File Cabinet .



Collect another run by tapping the Collect button. Your new run is displayed on the graph. To see your first run, tap the Run 2 button to the

left of the Filing Cabinet, and select either Run 1 or All Runs. In this way, you can gather multiple runs for comparison, and view just the ones you want.

Data Analysis

In addition to data collection, LabNavigator App also allows you to analyze the data within LabNavigator.

Data can be analyzed from the Graph screen, selectable by tapping the Graph tab, as well as the Table screen, selectable by tapping the Table tab. Several common analysis features are described in greater detail, below.

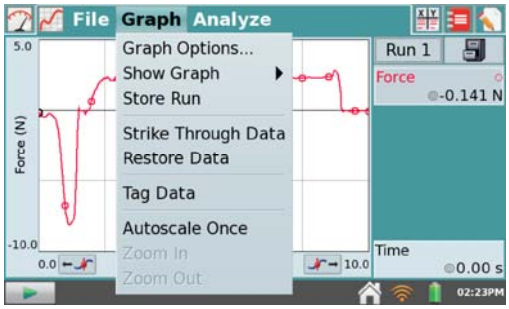
Examining Data on the Graph Screen

To examine data from the Graph screen, tap on a data point of interest. The Examine cursor jumps to the data point with the nearest x-value to that which you tapped. Cursor lines highlight the x- and y-axis values, and the right-side readouts display the associated numerical values of the point. You can make fine adjustments to the cursor location by using the Left Examine Button and Right Examine Button located on either side of the horizontal-axis label.

In some cases, you may want to examine data for a particular region on the graph. To select a portion for analysis, simply tap and drag across the desired region. You can adjust the trailing endpoint of the selected region using the Examine Buttons, if needed. Or, for greater control, you can optionally use the stylus.

Adjusting the Graph View

You can adjust the graph view in real time during data collection, or after data collection has ended, by applying one of the following actions from the Graph menu.



- **Autoscale Once** – Tap Autoscale Once will quickly reset the axes of the currently selected graph based on the data. It is an easy way to automatically scale both axes.
- **Zoom In** – Select a region on the graph, then tap Zoom In to automatically adjust the axes for viewing the selected region.
- **Zoom Out** –Tap Zoom Out to undo a Zoom In and return the graph axes to the previous settings. If Zoom In is used several times, Zoom Out will undo each Zoom In, one at a time.
- **Graph Options** – Tap Graph Options to manually adjust graph settings. To adjust the graph view, change the values in the Left and Right fields for the x-axis and y-axis.

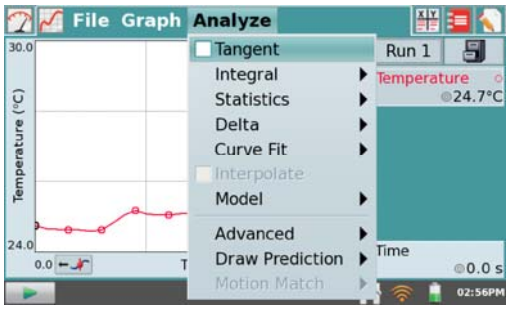
Manipulating Data from the Graph Screen

You can manipulate data from the Graph screen or from the Table screen. If using the Graph screen, first tap to select a data point of interest or tap-and-drag to select a region of data. Then, choose the desired tool from the Graph menu. Upon tapping on the tool, the action will be applied to the data.

- **Strike Through Data** and **Restore Data** – Use these tools to ignore/restore selected data. Struck data are ignored for analysis and graphing, and the graph will update accordingly. To restore all data, tap the Graph menu and choose Restore Data.
- **Tag Data** – Use this tool to tag a data point with a comment. After selecting the point and tapping Tag Data, a circle will be displayed on the graph to "tag" the data. To add a comment, tap in the info box at the right and enter a comment into the blank field.

Analyzing Data from the Graph Screen

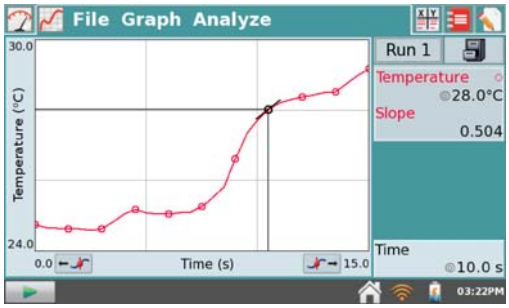
The Analyze menu on the Graph Screen gives you access to additional tools such as tangent lines, integrals, statistics, and curve fits. To apply one of these tools, tap the Analyze menu and tap to select the desired tool. If prompted, select a column or data set to which the analysis will be applied.



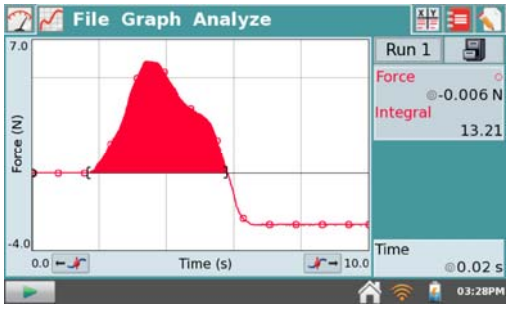
Upon enabling an analysis tool, a summary of analysis information is displayed at the right. Scroll arrows will appear, if needed. Optionally tap the summary to display the values on a detail dialog for ease of reading.

The following analysis tools are available from the Analyze menu.

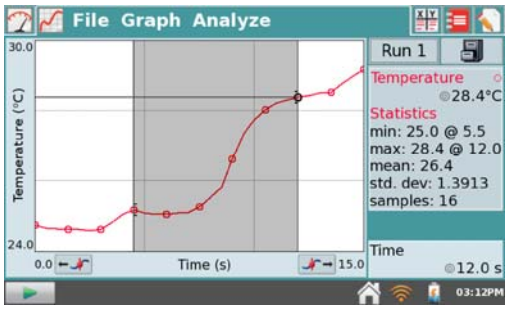
- **Tangent** – The Tangent mode enhances the Examine cursor by adding a tangent line and numeric display of the slope as you tap different locations on the graph.



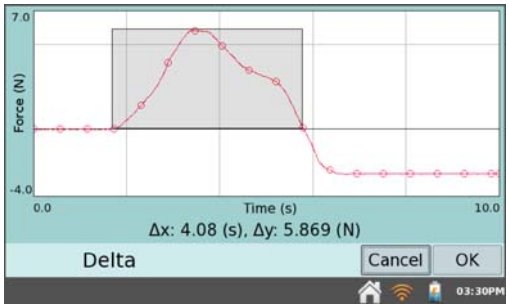
- **Integral** – The Integral tool numerically integrates graphed data. Select a region, if needed, then choose Integral from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name. The integral will be drawn, and the numeric result will be displayed to the right of the graph.



- **Statistics** – The Statistics tool displays statistics for graphed data. Select a region, if needed, and then choose Statistics from the Analyze menu. Enable the tool by tapping on the displayed sensor or column name. Descriptive statistics will be displayed to the right of the graph. If a region is selected, brackets are drawn to indicate the region used for calculations

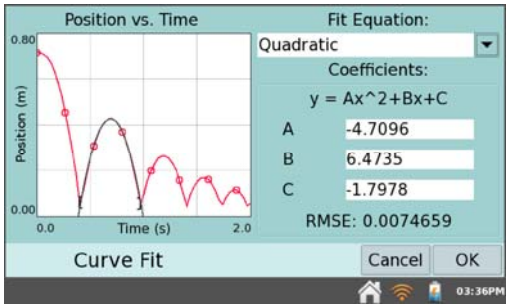


- **Delta** – The Delta tool opens a preview window where you can examine x- and y-deltas. Choose Delta from the Analyze menu to open the preview window. Then tap-and-drag to create a



box overlaid on the graph. The vertical side of the box yields Δy, and the horizontal side of the box yields Δx. Tap OK to keep these values and display the box on the Graph screen. To exit the Delta tool without displaying the box on the Graph screen, tap Cancel.

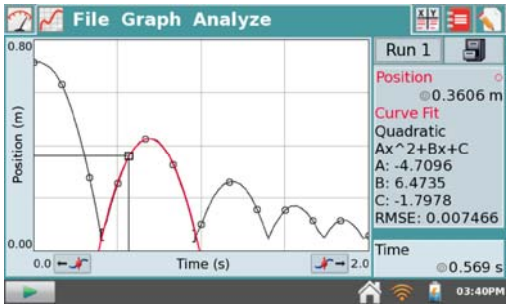
- **Curve Fit** – The Curve Fit tool allows you to automatically fit a chosen function to your data. If a region of the graph is selected, only that region is used for fitting. If there is no selection, the entire graph is used.



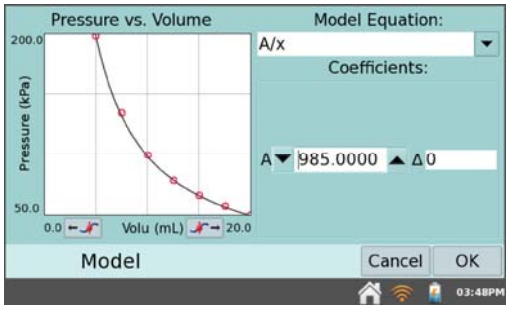
Enabling the curve fit displays a Curve Fit dialog box. Choose the desired fit equation from the drop-down menu. Upon choosing the fit equation, LabNavigator will display the fit in the preview graph at left. The fit coefficients and Root Mean Square Error (RMSE) are also displayed. Tap OK to keep this fit and display the curve on the Graph screen. To exit the Curve Fit tool without applying the curve, tap Cancel.

Tip: The RMSE (root mean square error) is a measure of how well the fit matches the data. The smaller the RMSE, the closer the data are to the fitted line. The RMSE has the same units as the y-axis data.

- **Interpolate** – Once you have performed a curve fit, you can use the Interpolate function to read values off of the fitted function. Choose Interpolate from the Analyze menu to enable the tool, then tap on the graph. The lines associated with the Examine cursor now locate a position on the fitted function, and coordinates along the fitted line are shown in the summary box at the right of the graph. You can tell that LabNavigator is in the Interpolation mode by the square cursor shown at the Examine point.



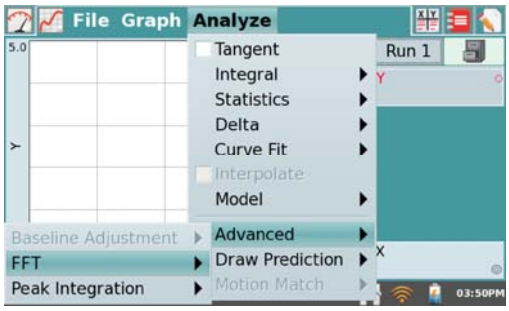
- **Model** –Model allows you to manually fit a chosen function to your data. Enabling the Model tool displays a Model dialog box where you can choose the desired model equation from the drop-down menu.



The model parameters (e.g., A, B and C) are adjustable. Change them by direct entry or by using the up and down arrows. Upon choosing the equation, LabNavigator will display the modeled function in the preview graph at left. Tap OK to keep this function and display the modeled function on the Graph screen. To exit the Model tool without applying the function, tap Cancel.

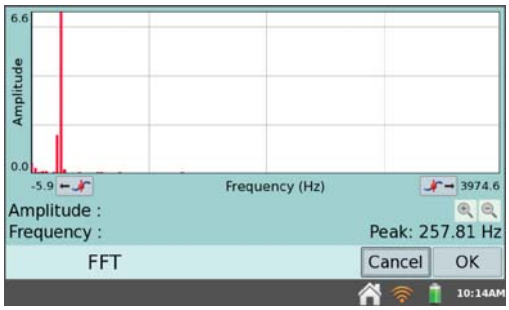
Tip: If no function appears when modeling, your parameters are defining a curve that is outside of the plot window.

- **Advanced** – Choosing Advanced from the Analyze menu allows you to access advanced analysis tools including Baseline Adjustment, Fast Fourier Transform (FFT), and Peak Integration.



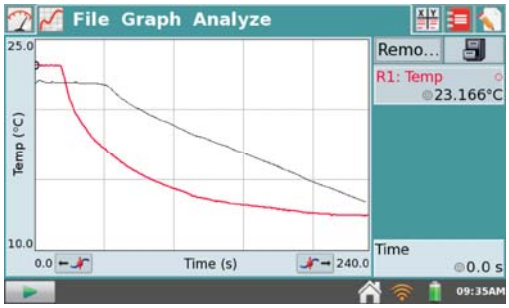
    - **Baseline Adjustment** – This tool applies a factor that raises or lowers the x-axis. Because the LabNavigator App uses the x-axis as its baseline when calculating an integral, adjusting the baseline may result in a better integral.

    - **FFT** – The FFT tool calculates a Fast Fourier Transform of the selected data. The FFT is displayed in a special graph that can be analyzed. Tap OK to return to the main graph. The peak frequency will be displayed on the graph legend..



    - **Peak Integration** – This option calculates the integral for a selected portion of a graph. It is most commonly used with the Forston Labs Mini GC, but it can be applied to any data plot. Peak Integration differs from the Integral tool in that it does not use the x-axis as the baseline. Instead, the integral for Peak Integration is evaluated from the minimum y-values to the left and right of a selected peak.

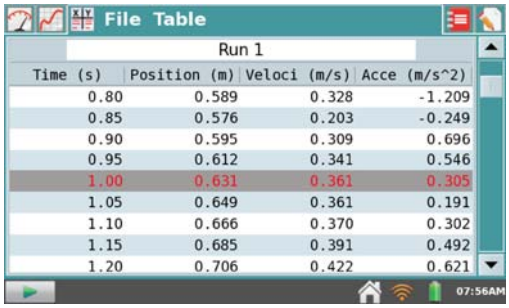
- **Draw Prediction** – The Draw Prediction tool gives you a free-hand sketch tool for drawing on the Graph screen. This can be used for a variety of purposes, but is most often used to sketch a prediction of how a graph will appear once data are subsequently collected.



  Upon enabling this tool, tap-and-drag across the screen for smooth curves, or tap the screen to connect subsequent taps with straight-line segments. The Reset button will remove your sketch if you need to start over. Tap OK to place your sketch on the main graph. To remove a prediction, choose Draw Prediction again from the Analyze menu.

Adjusting the Table View

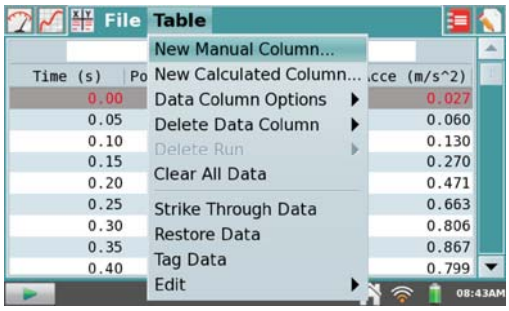
In addition to viewing and manipulating data from the Graph screen, you can also work with the data from the Table screen. Tap the Table tab to change to the Table screen. There are several shortcuts on this screen.



Alternatively, you can also access the fields by choose Data Column Options from the Table menu.

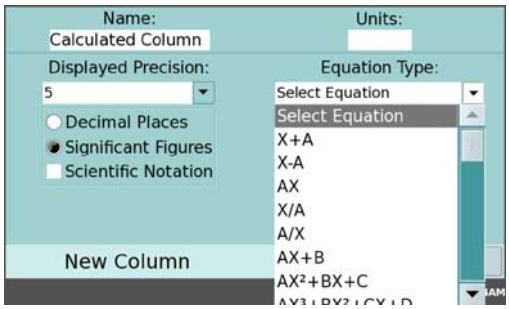
- Tap Run 1 in the name field to rename the run.
- Tap a column header (Time, Position, etc.) to change the column name, units, or displayed precision.

Manipulating Data from the Table Screen



The Table menu allows you to create, modify, or delete columns of data. Anything in columns can be graphed. The following tools are available from the Analyze menu:

- **New Manual Column** –New Manual Column creates an empty column into which you can enter or generate values directly. *Tip: To make a graph of data from other sources, enter values in two manual columns, and then plot them in a LabNavigator graph.*



- **New Calculated Column** –New Calculated Column creates a new column whose values are based on other columns by a mathematical formula. Tap the Name field to enter a name for the new column, tap the units field to enter the units, then tap the Equation Type field and choose an equation for the calculations in this column. For example, you might define a calculated column as the inverse square of another column. After creating a calculated column, you can display the calculated data on a graph, or manipulate it further with additional calculated columns.

- **Data Column Options** – This allows you to access the fields for setting the column name, units, and displayed precision. Alternatively, you can access these fields by simply tapping on the column name from the Table screen.

- **Delete Data Column** – This allows you to delete a manual or calculated column of data. Note that you cannot delete data collected from a sensor; however, you can hide data using the Strike Through Data tool.

- **Delete Run –** If you have stored at least one run using the Store Run tool, this option will be selectable from the Table menu. Upon choosing Delete Run, tap the desired run name to delete the run. You will not be able to delete the last run created.

- **Clear All Data** – This action will clear all data in the table. Upon choosing this option, you will be prompted to confirm.

- **Strike Through Data** and **Restore Data** – Use these tools to ignore/restore selected data. Struck data are ignored for analysis and graphing, and the graph will update accordingly. To restore all data, tap the Table menu and choose Restore Data. Note that you can also access these tools from the graph screen by tapping on the Graph menu.

- **Tag Data** – Use this tool to tag a data point with a comment. After selecting the point within the table and tapping Tag Data, a circle will be displayed on the graph screen to "tag" the data. To add a comment, tap to select the Graph tab, locate the tagged point and tap to place the Examine cursor at this point. Then tap the info box at the right and enter a comment into the blank field.

- **Edit** – This tool allows you to copy and paste values from one place to another. In particular, you might copy a range of values and paste them into notes on the Notes screen.

Viewing Methods

The Methods screen, selectable by tapping the Lab Instructions tab  , allows the user to view pre-loaded method instructions developed using the included NavCoPilot Method software.

Opening Forston Labs Methods

From the View screen, choose View Methods from the View menu. Tap on the desired method, tap OK, then choose the desired lab and tap OK.

In addition to scrolling through the instructions using the scrollbar at right, you can also zoom in on a particular portion of the instructions by selecting Zoom In from the View menu. Selecting Zoom Out from the View menu restores the previous view. Selecting Reset from the View menu restores the original view.

Adding Methods

Creating Your Own Methods

If you would like to create your own method content, you can do so using the NavCoPilot Software included with your LabNavigator.

Install the software on your PC, double click to open and the "Help" tab gives you step by step instructions on developing and loading your methods.

When your content is complete download your method to a USB flash drive or SD card.

Follow the provided instructions to transfer the update from the flash drive or SD card to your LabNavigator.

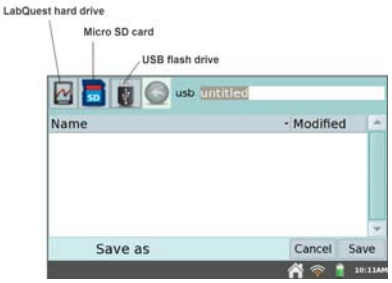
Adding Notes for your Test

The Notes screen, selectable by tapping the Notes tab  , allows users to enter notes as they perform an test. The menu gives access to standard edit commands of Cut, Copy, Paste, and Clear All.

Storing LabNavigator App Files

LabNavigator files have a *.qmbl* extension and can be saved to the internal storage space on LabNavigator, or to an external storage space such as a thumb drive.

LabNavigator will recognize additional storage space in a connected micro SD (Secure Digital) card or a USB flash drive. The drive or card may be formatted in FAT16 or FAT32 (the most common Windows and Mac OS formats) for reading and writing. LabNavigator cannot read NTFS- or HFS+-formatted drives.



To save a LabNavigator App file,

1. If saving to a micro SD card or USB flash drive, make sure the drive is inserted in the appropriate port on LabNavigator. ***Note****: After inserting the drive wait a few seconds while LabNavigator recognizes the drive before proceeding.*

2. Choose Save from the File menu. This opens a Save As dialog box.

3. Tap on the appropriate icon to select your storage destination.

   - LabNavigator internal hard drive

   - Micro SD card

   - USB flash drive (thumb drive)

4. After selecting your destination, tap on the name field to pull up the keyboard. Then enter the file name.

5. Tap OK to return to the Save As screen.

6. Tap Save to save the file.

Note*: You cannot create directories within LabNavigator App, but you can use directories that already exist on the SD card or USB drive. We recommend organizing your files on a USB drive or SD card by creating any needed folders on a computer before you use the drive or card with LabNavigator.*

Exporting LabNavigator App files

In some cases, you may wish to export the LabNavigator App file in a text format (.txt) for further analysis within a program such as Excel.

To do this, select Export from the File menu. Follow steps similar to those described in Storing LabNavigator App Files and choose Export from the File menu instead of Save As.

To open the file in a spreadsheet program, be sure the program's file browser is set to look for all files. Select your text file, then open it as you would any other .txt file.

If you have access to a wireless network with Internet, you can email the data file, graph, text file, or screenshot. For detailed instructions, see Emailing from LabNavigator.

Printing from LabNavigator App

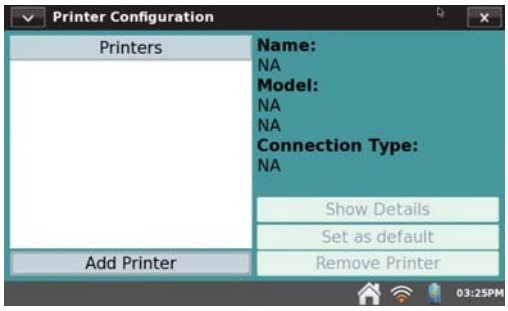
You may choose to print the graph, data table, methods, your own notes, or the screen as it is currently displayed in LabNavigator App. LabNavigator can print to a compatible printer via a USB cable or via a Wi-Fi network. To check current compatible printers please contact us at www.forstonlabs.com or at 800-301-1259

USB Printing

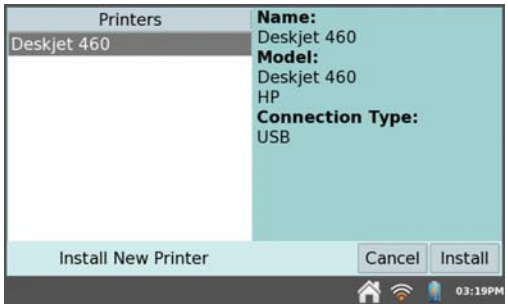
For printing to a USB printer for the first time, simply connect a compatible printer to the full-size USB port on LabNavigator, and turn on the printer.

1. Tap the Home icon at the bottom of the screen, tap Preferences, and then tap Printers.

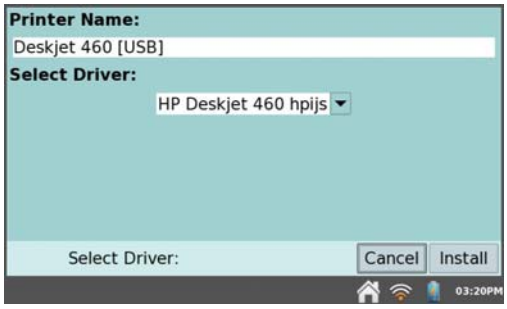
2. Tap the Add Printer button on the Printer Configuration screen.



3. Select the printer that appears in the list and tap Install.



4. Tap Install again to complete the printer installation process.



5. Close the Printer Configuration by tapping the X at the top right of the screen. This procedure need only be performed the first time you connect a particular printer.

To print, choose Print from the File menu. Tap to choose the item that you want to print. The Print Options screen appears and you may choose the printer and enter a Title and/or Footer for your printout. Tap Print to send the item to the selected printer.

Even though your printer may initially appear in the Printer list, a driver may not be found when you tap the Install button. Not all printers are supported. If a driver is found, printing may still error due to an incompatible printer. If you are sure that the printer is compatible and you are still getting an error, it may be caused by one of the following conditions: out of paper, out of ink/toner, a door on the printer is ajar, a paper jam, or you may have selected the wrong printer on the Print Options screen.

If you have access to a Wi-Fi enabled printer, you can print wirelessly. For detailed instructions, see Wirelessly Printing from LabNavigator.

IV. USING LABNAVIGATOR 2 WITH A MOBILE DEVICE

LabNavigator 2 includes Forston Labs Data Share, a feature that broadcasts sensor data to one or more devices wirelessly from the LabNavigator 2 interface. Using a compatible web browser, users can:

- collaboratively collect experiment data
- analyze an individual copy of the data on their device
- examine their data and perform analyses such as statistics, linear fits, and quadratic fits
- add a title and comment to their graph
- use photo or screenshot features on their device to capture an image of the graph for their lab report

To use LabNavigator 2 with a mobile device, follow these instructions.

Set up data sharing on LabNavigator

1. From the Home screen, tap Connections.

2. From the Connections screen, tap Connection Information.

3. From the Connection Information dialog box, tap the Name field to enter a name for the LabNavigator (e.g., LabNavigator A). Then tap  to close this window.

   Note the HostName that is displayed. The HostName will be a combination of the name (without spaces) followed by *.local* (e.g., LabNavigatorA.local).

4. From the Home menu, tap Connections, then tap Data Share/Graphical Analysis.

5. From the Data Share/Graphical Analysis dialog, turn on data sharing by tapping On. Optionally, you can also choose to allow remote control of data collection on the LabNavigator from the mobile device. Tap  to close this window.

Connect LabNavigator to a Network

6. Tap Connections on the Home screen, then tap Network.

7. Tap to enable the Wi-Fi radio.

   A Network Configuration dialog box is displayed listing any networks that LabNavigator sees, as well as an option to Create Network.

Existing network

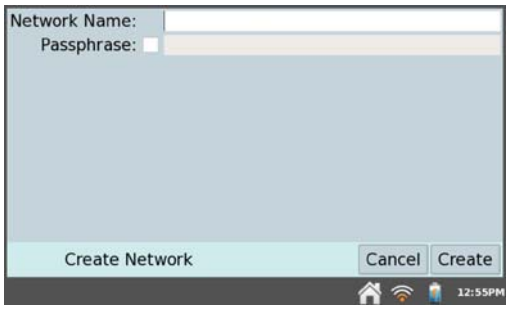
If you have an existing network to which you would like to connect, locate the network within the list and tap to select.

Create a new LabNavigator Network (Ad-Hoc Network)

If you do not have access to an existing Wi-Fi network you can quickly and easily set up a network with LabNavigator 2.
***Note**: This will allow users to connect to this network with their mobile devices. This network will not support access to the internet. The email function of LabNavigator will not work with a LabNavigator ad-hoc network.*

- From the Network Configuration box, tap Create Network.
- Tap the Network Name field and assign a name to this new network (e.g., My Network).

- *Optional: Protect your network by assigning a password to your network that you will provide only to your students. To do this, select the Passphrase check box and assign a password to your new network (e.g., science).*
- Tap Create.



***Note**: Some Android implementations seem to have trouble viewing and connecting to ad-hoc networks. These devices require the use of an existing (infrastructure) network.*

Access LabNavigator from your Mobile Device

8. On your mobile device, connect to the same network to which LabNavigator is connected (step 7).

9. On your mobile device, open the browser and type in the HostName for your device (e.g., LabNavigatorA.local).

   Optional: If your mobile device has a QR-code reader, tap Connections from the Home screen on LabNavigator and then tap Data Share/Graphical Analysis. A QR-code associated with the HostName is displayed. Use a QR-scanning application on your mobile device to connect to your LabNavigator.

V. USING LABNAVIGATOR WITH A COMPUTER

Transferring Data from LabNavigator to a Computer

Automatically transferring data:

Forston Labs provides custom PC Apps at reasonable rates for sending data directly to your hard-drive for use in your existing or new LIMS or Control Systems at selected intervals. Please contact us at info@forstonlabs.com or 800-301-1259 for details.

Manually transferring data:

You can also download any saved data from LabNavigator to the computer. After an experiment is complete on LabNavigator, choose Save from the LabNavigator File menu. Give the experiment an identifying name. You may save multiple LabNavigator files on LabNavigator this way.

Tip: When taking data in the field, store experiments as files on the LabNavigator. To do this, choose Save from the File menu, and give the experiment a descriptive name. Choose either the LabNavigator, or optionally a USB drive or SD card, as the location. This way you can save as many tests as you like.

Deleting Data on LabNavigator

The LabNavigator Browser includes a Delete function. Choose Delete from the LabNavigator Browser, and select the file you want to remove from LabNavigator.

Tip: Use the LabNavigator Browser to mass delete files from LabNavigator. Click to select multiple files, and click Delete. This is the only way to delete more than one file at a time.

VI. EMAILING FROM LABNAVIGATOR

If LabNavigator is connected to a network with Internet access, you can email your data file, graph, text file, or screen shot.

To set this up, follow these instructions:

1. First, you will need to connect LabNavigator to a network with Internet. To do this, follow steps 6-8 from Connect LabNavigator to a Network.

   ***Note**: A LabNavigator Network (Ad-hoc Network) does not have Internet access. You will need to join an existing network with Internet.*

2. From the Home screen, tap Connections, then tap Email.

3. The Email Configuration dialog box is displayed. Enable email by selecting On.

4. Enter your outgoing email server information and tap Save.

VII. WIRELESSLY PRINTING FROM LABNAVIGATOR

As described in USB Printing you may print wirelessly by connecting directly to a compatible Wi-Fi enabled printer or by connecting to a Wi-Fi access point that is wired to a network which includes a compatible printer.

You can set this up as follows:

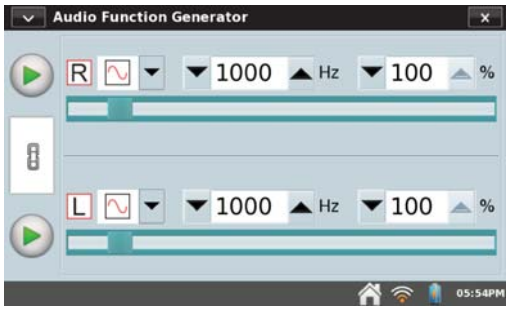
1. First, you will need to connect LabNavigator to a network with Internet. To do this, follow steps 6-8 from Connect LabNavigator to a Network.

2. Once you have connected, either to the Wi-Fi printer itself, or to a Wi-Fi access point, you are ready to follow the same instructions as described in USB Printing.

VIII. ADDITIONAL APPS ON LABNAVIGATOR

Several accessory applications can be launched from the Home menu. It is not necessary to quit the LabNavigator App to use these accessories; to return to LabNavigator App, either close the accessory using the close button in the upper right corner of the screen, or switch to the LabNavigator App by tapping LabNavigator App from the Home menu.

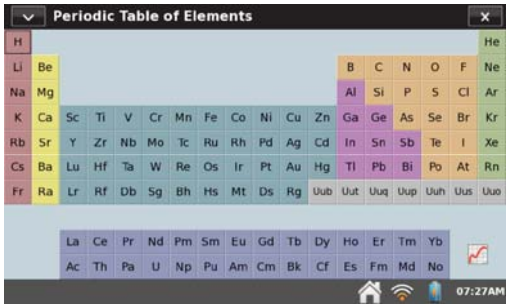
Audio Function Generator



From the Home screen, tap Audio Function Generator to launch this app. The function generator is used to create waveforms in the audio frequency range. Select a waveform, frequency, and volume for each channel. Start and stop using the buttons at left. The link between left and right channels is on by default, so that both start and stop together. Click the link icon to control the channels independently.

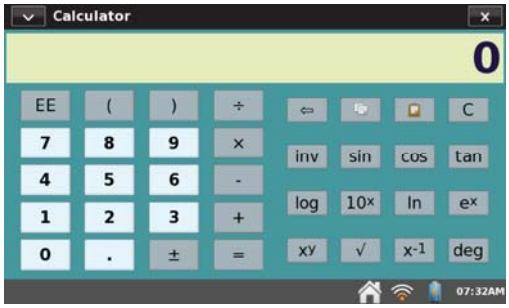
The sliders can also be used to control frequency. Tapping left or right of the slider will halve or double the frequency.

Periodic Table



From the Home screen, tap Periodic Table to launch this app. The Periodic Table contains standard reference information on the elements. Tap an element to see details; close the detail window using the upper right close button.

Calculator



From the Home screen, tap Accessories, then tap Calculator.

This app is a standard scientific calculator which uses algebraic notation. You can use this calculator at any time; to dismiss it, tap Home. You can copy a calculator result and paste it into the Notes tab.

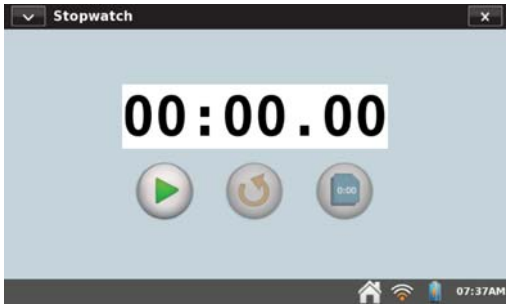
Sound Recorder

From the Home screen, tap Accessories, then tap Sound Recorder.

The sound recorder is used to capture short audio clips, typically for voice notes. To record a clip, tap the record button . To stop, tap the square red stop button. Play the clip back using the green play button. The disk

button allows you to save the clip, which can later be opened using the open file folder icon. The blank page icon clears out any current audio clip.
Tip: Use Sound Recorder to quickly make audio notes on tests.

Stopwatch



From the Home screen, tap Accessories, then tap Stopwatch.

The Stopwatch Application is a simple timer. Tap the start button to begin timing; tap it again to stop. Subsequent taps will continue to start and stop the timer. Tap the middle reset button to return the timer to zero. The copy button will place the current time on the clipboard for pasting into the Notes screen of LabNavigator App, or into the calculator.

APPENDIX A. LABNAVIGATOR 2 TECHNICAL SPECIFICATIONS

Display

- 11.2 cm x 6.7 cm (13.1 cm diagonal) screen
- 800 x 480 pixel color display at 188 dpi
- LED backlight
- Portrait or landscape screen orientation
- High-contrast mode for outdoor visibility

Processor

- 800 MHz Application Processor

Connectivity

- Wi-Fi 802.11 b/g/n

User Interface

- Resistive touch screen
- Touch and stylus navigation for efficiency and precision

Data Acquisition

- 100,000 samples per second
- 12-bit resolution
- Built-in GPS, 3-axis accelerometer (± 2 g), ambient temperature sensor, light sensor (uncalibrated intensity), and microphone

Environmental Durability

- Operating Temperature: 0 – 45°C
- Storage Temperature: -30 – 60°C
- Splash resistant
- Rugged enclosure designed to withstand a fall from lab bench

Size and Weight

- Size: 8.8 cm x 15.4 cm x 2.5 cm
- Weight: 350 g

Ports

- 5 sensor channels
- USB port for sensors, flash drives, and peripherals
- USB mini port
- DC power jack
- MicroSD/MMC slot
- Audio in and out

Storage

- 200 MB
- Expandable with MicroSD and USB flash drive

Power

- Rechargeable, high-capacity battery
- DC charging/powering through external adapter (included)

APPENDIX B. LABNAVIGATOR MAINTENANCE

LabNavigator Battery

LabNavigator uses a high-quality lithium-ion battery. This is the same chemistry used in premium laptop and cell phone batteries, and you can expect similar performance. There is never a need to condition the battery by regular full discharge/charge cycles.

Use only the supplied AC adapter or optional LabNavigator 2 Charging Station (order code Nav2-CRG, sold separately) to charge the LabNavigator battery. A replacement adapter can be purchased from our web site (order code Nav-PWR).

The battery takes about eight hours to completely charge. It is safe to leave the battery charging indefinitely, and there is no need to fully discharge the battery before charging. Battery life will depend on the sensors used, but in most cases you can obtain six or more hours of use before recharging. We recommend charging LabNavigator overnight to start the next day with a full charge.

For use with a computer, either the battery must be charged or the LabNavigator must be connected to AC power. The LabNavigator cannot operate on USB power alone. When the LabNavigator is running and connected to the computer, the USB connection will, however, slowly charge the battery.

When using LabNavigator as a standalone device, the screen will dim after a few minutes of no use, even during data collection. However, LabNavigator will not turn itself off until the battery is almost discharged. No data will be lost, as LabNavigator App will save a backup file before shutting down.

Battery life will depend on the sensors and features used. To optimize day-to-day battery life, set the screen brightness to the minimum acceptable level, and turn off LabNavigator when it is not in use. Also disconnect any sensors you are not actively using. To access power-saving options, tap Preferences on the Home Screen, then tap Light & Power.

The long-term life of the battery will vary, but you can expect about three hundred to four hundred full charge/discharge cycles before the battery will need to be replaced. In this count, a charge from half-way to a full charge would count as half of a charge cycle. In typical school use, the battery can last three years or more. Exposure to temperatures over 35°C will significantly reduce battery life.

As a battery reaches the end of its useful life, the run time will become shorter and shorter. Eventually the run time will be too short for your application, and you will want to replace the battery. Rechargeable batteries are considered a consumable, and as such are warranted for one year. A replacement battery can be ordered from our web site (order code LN2-BAT). Recycling information is available at www.call2recycle.org.

LabNavigator Case and Screen

The LabNavigator is water and shock resistant. Do not submerge in liquids. Wipe clean with a damp cloth only; do not use any solvents including ammonia or glass cleaners.

Stylus Tether

LabNavigator includes a stylus and a tether. If desired, you can attach the tether to the stylus and the LabNavigator. Additional styluses are available from Forston Labs.

LabNavigator Software

LabNavigator arrives with its own software, LabNavigator App, preloaded. The LabNavigator App will be updated from time to time to introduce new features and to improve performance. Most users will want to run the latest version available.

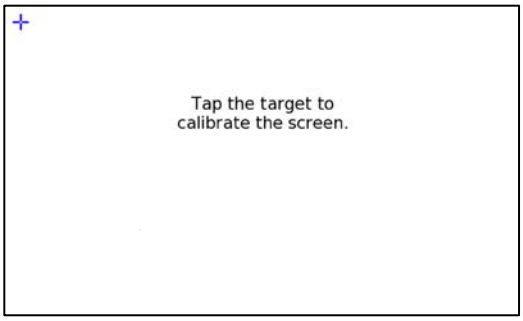
Free updates with step-by-step instructions as they are available can be found at www.forstonlabs.com

Screen Calibration

To do this, tap System from the Home menu. Then choose Calibrate Screen.

Follow the on-screen instructions for tapping the plus sign with the stylus.

If you are unable to access the Calibration tool, press and hold the Home key until the Calibration tool is displayed.



Getting Additional Help

For access to user manuals, forums, and our technology information library, please visit our web site at:

www.forstonlabs.com

You may also contact Forston Labs directly:

800-301-1259

APPENDIX C. LICENSE INFORMATION

This product contains certain open source software originated by third parties that is subject to the GNU General Public License as published by the Free Software Foundation, GNU Library/Lesser General Public License (LGPL) and different and/or additional copyright licenses, disclaimers or notices. These licenses give you the right to redistribute and/or modify the software.

The software is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

Complete source code for the open source software is available on request from Forston Labs. Contact us at info@forstonlabs.com, or by writing to

Source Code Request
Forston Labs
320 E. Vine Dr. #128
Fort Collins, CO 80524

Source code will be made available for download, or you may request a CD-ROM of the code. A shipping and handling fee will be charged for a CD-ROM.

The exact terms of GPL, LGPL and some other licenses are provided to you with the source code distribution. You may also read the license at http://www.gnu.org/licenses/

APPENDIX D. WARRANTY

Forston Labs warrants this product (with the exception of the battery) to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.

The LabNavigator 2 battery is a consumable, and as such, Forston Labs warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer.

Forston Labs
320 E.Vine Drive #128
Fort Collins, CO 80524
info@forstonlabs.com • www.Forstonlabs.com

Revised May 29, 2012

SOP Deviation Form

6720 South Macadam Avenue, Suite 125
Portland, Oregon 97219
503.670.1108

ANCHOR QEA

SOP DEVIATION FORM

June 28, 2020

PROJECT NAME: Former Reynolds Metals Reduction Plant – Longview

Reason for Deviation

Water quality parameters were not collected at soil depth intervals where there was an insufficient volume of groundwater in the bore hole for both the fluoride sample and parameters.

Description of Deviation

The Fluoride Field Screening Using Direct Push Drilling SOP states that a groundwater sample will be collected for fluoride field screening and water quality parameters at each 5-foot depth interval. At depth intervals where there was not sufficient volume of groundwater for the fluoride field screening and water quality parameters only a fluoride sample was collected.

Special Equipment, Materials, or Personnel Required

Not applicable

Description of How Deviation Modifies Project Data Quality Objectives (if applicable)

Deviation has no impact on project Data Quality Objectives

Initiator's Name:	Sasha Norwood	**Date:**	6/28/20
Field Manager:	Tim Stone	**Date:**	6/30/2020

Attachment A2
Field Forms

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI2 – Former Reynold ~~Reduction~~ Production Plant **DATE:** 4/15/20

SITE ADDRESS: 4029 Industrial Way, Longview, WA **PERSONNEL:** Ben Uhl, Sasha Norwood

WEATHER: **WIND FROM:** N | NE | E | ~~SE~~ | S | SW | W | (NW) | NONE | LIGHT | (MEDIUM) | HEAVY

(SUNNY) | CLOUDY | (RAIN) → ~~fog~~ | ?

TEMPERATURE: (F) ~~40 .6 °C~~ 60°F [Circle appropriate units]

TIME	COMMENTS
5:57	MOB to Millennium BT in Longview, WA to conduct hydraulic conductivity profiling and fluoride screening (PDI2)
7:10	Arrive - Tim Stone (Anchor QEA) already on site. We perform quick site tour prior to sub contractor arrival.
	• Meet security guard – Larry
	• Meet site employee – Brandon (assits w/ gates, IDW, etc)
	• use channel 1 on radio to contact.
8:00	Cascade Drilling crew on site (Cody Spiker, Jesse Blackamy & Charles Windland). Locates Down Under (LDU) on site (Cody "#2") – didn't catch his last name but 2 Cody's @ LDU
9:15	Anchor QEA & Cascade perform health + Safety Meeting for site specific items AQ + Cascade items, plus COVID-19
9:46	Crew sets up @ PDI2-PRB-DP-10hc. Prior to drilling, underground utilities cleared. (DP-10 + DP-09)
	→ drill rate = 0.7-0.8 (in-sec) or about 4.5 ft/min
10:11	Dissapation test conducted @ 15.0' bgs, as shown on TV screen
	– wait ~10 mins for dissapation test.
	For test, pump was turned off and pressure is measured to calculate water level depth.
10:42	Circuit breaker on HPT unit tripped, troubleshoot briefly
	Resume Perform 2nd dissapation test @ 30.2' bgs (10 min test) (groundwater @ 12.8 from final HPT Logs)
11:20	Drilling crew, except (Cody Spiker) takes lunch (offsite)
12:20	Drillers back from site
12:33	Commence drilling (HPT) @ PDI2-PRB-DP-09hc
	→ drill rate = 0.7-0.8"/sec or 4.5'/min
	→ dissapation test @ 18.5' bgs (12:39 to 12:59)
	→ dissapation test @ 26.7' bgs

Signature: Benjamin A. Uhl

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI 2 - Former Reynolds Production Plant **DATE:** 4/15/20

SITE ADDRESS: 4029 Industrial Way, Longview, WA **PERSONNEL:** Ben W., Seth N. / Cascade Drilling

WEATHER: **WIND FROM:** N | NE | E | (SE) | (S) | SW | W | (NW) | NONE | LIGHT | (MEDIUM) | HEAVY

(SUNNY) | CLOUDY | RAIN | ? **TEMPERATURE:** °F 70s °C

[Circle appropriate units]

TIME	COMMENTS
14:00	Complete DP-09 hydraulic conductivity boring. End boring @ 30.1' bgs. No final dissapation test, based on an increase in pressure.
14:20	Drillers start gathering tooling/equipment to start water sampling activities @ DP-10
14:53	Call w/ Dimitri V. to discuss groundwater sample target intervals:
	DP-10hC (southern boring) - DTW logged @ 12.8' bgs
	Sample Intervals 1) 13-14' bgs
	2) 16-17' bgs seperate boring for each
	3) 19-20' bgs target interval
	4) 23-24' bgs
	5) 28-29' bgs
	DP-09hC (northern boring) - DTW logged @ ~7.0' bgs
	1) 8-9' bgs
	2) 14-15' bgs seperate boring for each
	3) 19-20' bgs target interval.
	4) 24-25' bgs
	5) 29-30' bgs
15:26	Drillers finish bringing equipment off over to DP-10F (DP-10) to commence drilling. Cascades uses 0.005" stainless steel well point sampler. Total length of sampler is 4' but we only expose ~1' intervals to target groundwater. Crew brought 4 of them
15:51	Temp well point sampler set @ 13-14' Intervals w/ DTW (bgs) @ 11.8'
16:20	Crew completes install of 4 intervals to 24' bgs
16:22	Collect measurements from top four (1'-foot) sample intervals. (See next page).

Signature: Benjamin A. Wee

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI 2 - Former Reynolds Production Plant **DATE:** 4/15/20

SITE ADDRESS: 4029 Industrial Way, Longview, WA **PERSONNEL:** Ben W./Sasha N./Cascade

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | (NW) | NONE | (LIGHT) | MEDIUM | HEAVY

(SUNNY) | CLOUDY | RAIN | ?

TEMPERATURE: °F 70s. °C [Circle appropriate units]

TIME	COMMENTS
16:22	(13'-14') DTW(bgs) = 6.9', DTB(bgs) = 14', casing length above ground = 1.1'
16:28	(16'-17') DTW(bgs) = 6.82', DTB(bgs) = 16.98', casing length above ground = 2.18'
16:31	(19'-20') DTW(bgs) = DRY, DTB(bgs) = 20.1', casing length above ground = 0.25'
16:36	(23'-24') DTW(bgs) = DRY, DTB(bgs) = 24', casing length above ground = 1.0'
16:40	Cascade Drilling (except Spike-fixing P pump) offsite.
16:50	Collect groundwater sample for ~~field screen~~ fluoride field screening (see ~~PWO~~ FSDS)
17:00	Collect GW sample from 16-17' screen interval. Seperate boing for each target interval
	→ Well points (19-20 & 23-24) are dry, will let recharge overnight
	Anchor QEA staff cleans up equipment + supplies for the day
17:40	Anchor QEA staff + Cody Spiker offsite. I call Cheryl V. to let her know all work crews are offsite.
17:45	MOB to Portland, OR

BAW
4/16/20

Signature: Benjamin a Wee

From: Benjamin Uhl
To: Tim Stone
Subject: Millennium BT Daily Report - PDI 2 Fluoride Screening
Date: Wednesday, April 15, 2020 9:04:00 PM

Good evening Cheryl,
Below is a daily field summary as related to fluoride screening activities.

- (07:10) Anchor QEA on-site (Tim Stone and Ben Uhl). Perform site reconnaissance, verifying access and observing ground conditions on west side of Black Mud Pond (work area).
- (07:45) Locates Down Under on site (Cody).
- (08:00) Cascade Drilling (Cody Spiker, Jesse Blakeney, and Charles Windland) on site. Anchor QEA (Sasha Norwood) on site.
- (08:28) All work crews mobilize to western area of Black Mud Pond. Ben Uhl marks boring locations for utility clearance, while Cascade Drilling stages drill rig and support vehicles.
- (09:00) Locates Down Under completes utility clearance at boring locations PDI2-PRB-DP-9 and PDI2-PRB-DP-10. No utilities determined to be present within work area.
- (09:15) Anchor QEA and Cascade Drilling Health and Safety meeting. Topics include health and safety as related to site-specific requirements, daily work operations, and COVID-19. Cascade Drilling also performs drilling health and safety items.
- (09:46) Commence direct-push drilling at PDI2-PRB-DP-10hc for hydraulic conductivity profiling.
- (10:54) Complete hydraulic conductivity profiling at PDI2-PRB-DP-10hc.
- (11:20) Cascade Drilling – Lunch.
- (12:20) Cascade Drilling – Returns from lunch.
- (12:33) Commence direct-push drilling at PDI2-PRB-DP-09hc for hydraulic conductivity profiling.
- (14:00) Complete hydraulic conductivity profiling at PDI2-PRB-DP-09hc. Anchor QEA staff interprets hydraulic conductivity charts to select groundwater sample intervals at each of the two boring locations.
- (15:26) Cascade Drilling brings drill tooling to the PDI2-PRD-DP-10 boring location.
- (15:51) Cascade Drilling crew begins to install stainless-steel temporary well points at PDI2-PRB-DP-10F (4 total). Crew utilizes GeoProbe "closed-point" stainless-steel temporary well point sampler (0.005-inch slot stainless-steel screen) targeting the following 1-foot groundwater sample intervals:
    - 13 – 14 feet below ground surface (bgs)
    - 16 – 17 feet bgs
    - 19 – 20 feet bgs
    - 23 – 24 feet bgs
- (16:22) Anchor QEA staff begins groundwater sample collection and water quality measurements at PDI2-PRB-DP-10hc temporary well points.
    - 13 – 14 feet bgs (collect groundwater sample)
    - 16 – 17 feet bgs (collect groundwater sample)

    - 19 -20 feet bgs (well point dry – let recharge overnight)
    - 23 – 24 feet bgs (well point dry – let recharge overnight)
- (16:40) Cascade Drilling off site and Anchor QEA staff cleans up.
- (17:40) Anchor QEA staff off site.

Please not hesitate to let me know if you have any questions. Anchor QEA staff and Cascade Drilling we be on site tomorrow AM at 8:00.

Regards,

-Ben.

Ben Uhl, RG, LG
Senior Geologist

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Portland, Oregon 97219
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C 971.285.5288

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI2- Former Reynolds Production Plant **DATE:** 4/16/20

SITE ADDRESS: 4029 Industrial Way, Longview, WA **PERSONNEL:** Ben Uhl/Sasha M/Cascade Drilling

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | (NW) | NONE | (LIGHT) | MEDIUM | HEAVY

(SUNNY) | CLOUDY | RAIN | ?

TEMPERATURE: ~~(F)~~ ~~°C~~ [Circle appropriate units]

TIME	COMMENTS
6:15	MOB to Anchor QEA office to help James M. place boat into bed of pickup for surveying activities @ Millennium.
6:48	I MOB to Millennium BT to continue PDI2 groundwater sampling.
7:48	Arrive, check in w/ security & pickup radio.
8:00	Sasha/Cascade Drilling arrive and we MOB to western perimeter of Black Mud Pond (BMP).
8:11	Gear up @ DP-10. Collect static water level measurements @ 4 locations that were set last ~~(A)~~ night.
8:27	(13-14') DTW (TOC) = 7.91'
8:30	(16-17') DTW (TOC) = 9.22' } sampled on 4/15/20 but set overnight for static H_2O level
8:24	(19-20) DTW (TOC) = 12.20'
8:32	(23-24) DTW (TOC) = 6.33'
8:50	Collect groundwater sample from (19-20') depth interval
8:43	Collect groundwater sample from (23-24) depth interval
9:33	Drillers install 28-29' depth interval, however when I measured DTB (bgs) ~~interval~~ @ base of screen was set @ 28' bgs. I direct drillers to re-drill & set screen @ 28-29' bgs. Maybe screen has silt @ bottom. I watched Drillers measure rod/screen going into hole. DTW 27-28' bgs = 29.64 TOC) 2' casing sticking up above ground so DTW = 31.64' (TOC)
9:50	Commence re-drill of 28-29' interval
9:52	Refusal w/in upper 10 ft bgs, offset boring
10:08	(~~28-29~~) temp well point set (28-29) → then (27-29, following page)
10:14	@ DTW (TOC) = 29.51'
	DTB (TOC) = 29.75'
	Above ground casing length = 1.35'
	→ will return later in day to collect water level + groundwater sample.

Signature: Bojanna Uhl

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI2 - Former Reynolds Production Plant **DATE:** 4/16/20

SITE ADDRESS: 4029 Industrial Way, Longview, OR **PERSONNEL:** Ben Uhl / Sash N / Cascade

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | (NW) | NONE — (LIGHT) | MEDIUM | HEAVY

(SUNNY) | CLOUDY | RAIN | ? **TEMPERATURE:** (70's. °C [Circle appropriate units]

TIME	COMMENTS
10:21	Cascade crew MOBs to decon, while I wipe down rental truck + drill rig levers w/ Clorox disinfectant wipes.
10:58	Drillers commence @ DP-09 @11:32
11:03 set	(8-9') DTW(TOC) = 9.11', DTB(TOC) = 9.82', DTB(bgs) = 8.8', stick-up casing (ℓ) = 1.02'
11:10 set	(14-15') DTW(TOC) = 9.81, DTB(TOC) = 18.90', DTB(bgs) = 14.55', stick-up casing (ℓ) = 4.35' (11:38)
set 11:17 / DTW 11:42	(19-20) DTW(TOC) = 22.9', DTB(TOC) = 24.0', DTB(bgs) = 19.84', stick-up casing (ℓ) = 4.16'
~~11:42~~ 13:09 (FB)	(24-25) DTW(TOC) = 28.14', DTB(TOC) = 29.0', DTB(bgs) = 25.0', stick-up casing (ℓ) = 4.0'
12:06	DTW (TOC) @ 8-9' depth interval = 8.00' (TOC)
	Sample top 3 depth intervals then pull stainless steel temporary well points.
12:31	Crew commences (29-30') depth interval (out of order)
12:58	Crew commences (24-25') depth interval.
13:09	Collect measurements @ (24-25') depth interval (see above).
13:12	(29-30) DTW(TOC) = 33.20', DTB(TOC) = 33.98', DTB(bgs) = 29.18', stick-up casing (ℓ) = 4.02
13:53	DTW (TOC) @ 29-30 interval = 32.6'
14:01	DTW (TOC) @ 24-25' interval = 27.00'
	Complete sample collection @ 24-25' depth interval + wait for recharge during sampling.
15:25	Direct drillers to expose additional foot of screen length set the 28-29 depth interval. New depth interval is 27-29' bgs. 21-29
	Initial depth to water (TOC) = 29.54', casing stick-up length ~~4~~ 2.35'
~~14:55~~ (FB)	Collect groundwater sample @ DP-10-27-29
15:50	Collect ~~sample~~ fluoride field screening sample also (3) 125-ml vials for field screening / archieve.
16:32	Drillers clean up + decon equipment. Sasha + I collect purgewater / decon water samples for fluoride field screening.

Signature: Benjamin A. Uhl

Daily Log

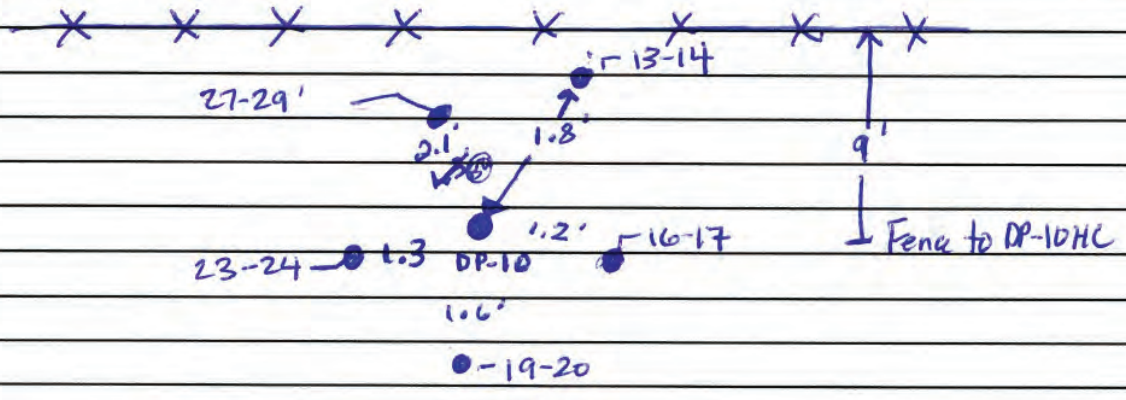
ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

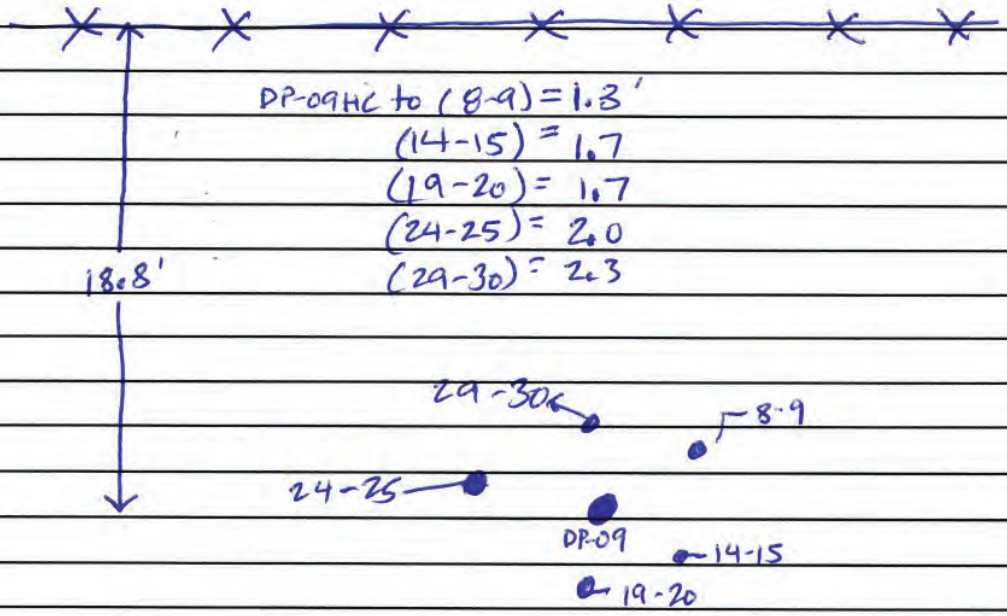
PROJECT NAME: PDI2 - Former Reynolds Production Plant
DATE: 4/16/20
SITE ADDRESS: 4029 Industrial Way, Longview, WA
PERSONNEL: B. Uhl/S. Norwood/Cascade

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | (NW) | NONE | (LIGHT) | MEDIUM | HEAVY
(SUNNY) | CLOUDY | RAIN | ?
TEMPERATURE: (°F) 70s . °C
[Circle appropriate units]

TIME	COMMENTS
	DP-10F (offset Measurements



N	DP-09F (offset measurements)



Signature: Benjam A. Uhl

Daily Log

ANCHOR QEA

Anchor QEA, LLC
6720 SW Macadam Ave., Suite 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: PDI2-Former Reynolds Production Plant
DATE: 4/16/20
SITE ADDRESS: 4089 Industrial Way, Longview, WA
PERSONNEL: B. Uhl / S. Norwood / Cascade

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | (NW) | NONE | (LIGHT) | MEDIUM | HEAVY
(SUNNY) | CLOUDY | RAIN | ?
TEMPERATURE: (F) 70s . °C
[Circle appropriate units]

TIME	COMMENTS
	IDW generated.
	0.25-gallons of purgewater
	~10-gallons of decon water.
	Brandon (MBT) called Cheryl V. to verify where to store generated IDW. Brandon informs me there are two empty drums for decon water & ~1.5 drums full of previous PDI purgewater. He told me to place decon-into empty drums & purgewater in to ~~drum~~ drum ½ full.
	→ labeled same as label already on drums (see photos)
17:15	Sasha (AQ) offsite
17:30	Ben Uhl / Cascade offsite. I call Cheryl V. to inform her that crews are offsite & let her know we are done w/ fieldwork. MOB to office to unload w/ Sasha.
18:30	Arrive

BAU
4/16/20

Signature: Benjamin A. Uhl

Benjamin Uhl

From: Benjamin Uhl
Sent: Thursday, April 16, 2020 8:25 PM
To: Kristin Gaines; Maidman, Michele; Cheryl Vezzani
Cc: Nicole LaFranchise; Kendra Skellenger; Rebecca Gardner; Sasha Norwood; Dimitri Vlassopoulos; Nik Bacher; Tim Stone
Subject: PDI2 Daily Report - April 16, 2020: Former Reynolds Metals

Good Evening Kristin, Michele, and Cheryl,

The following is the April 16, 2020 daily progress report for pre-remedial design investigation part 2 (PDI2) being conducted at the Millennium Site in accordance with the Ecology-approved *Former Reynolds Metals Reduction Plant-Longview, Pre-Remedial Design Investigation Work Plan and Work Plan Addendum*. This was the 2nd day of PDI2 investigation.

PDI2 PROGRAM UPDATE

Personnel On-Site

- Ben Uhl and Sasha Norwood (Anchor QEA); Cody Spiker and Jesse Blakeney (Cascade Drilling)
- Oversight: None
- Visitors: None

Direct Push Sampling Program

Temporary screens were advanced to the following intervals:

- DP-9 (8-9 feet bgs) – groundwater sample collected and tested for Fluoride
- DP-9 (14-15 feet bgs) – groundwater sample collected and tested for Fluoride
- DP-9 (19-20 feet bgs) – groundwater sample collected and tested for Fluoride
- DP-9 (24-25 feet bgs) – groundwater sample collected and tested for Fluoride
- DP-9 (29-30 feet bgs) – groundwater sample collected and tested for Fluoride
- DP-10 (19-20 feet bgs) – installed on 4/15 with sample collection on 4/16 and tested for Fluoride
- DP-10 (23-24 feet bgs) – installed on 4/15 with sample collection on 4/16 and tested for Fluoride
- DP-10 (27-29 feet bgs) – groundwater sample collected and tested for Fluoride
- Groundwater sampling activities completed

Investigative-Derived Waste

- Approximately 0.25-gallons of purge water was generated and placed in 55-gallon drum, staged in drum storage area
- Approximately 10-gallons of decontamination water was generated and placed in 55-gallon drum, staged in drum storage area

Health and Safety

- Cascade Drilling and Anchor QEA field staff held daily tailgate meeting. The meeting served to coordinate health and safety procedures for general drilling and sampling operations. The Anchor QEA and Cascade teams discussed and agreed upon practical ways to successfully implement COVID-19 protective procedures developed by each entity.
- No reportable incidents.

Samples Shipped

- No samples shipped today.

Deviations

- None.

Please let us know if you have any questions or concerns.

Thank You,

Ben Uhl, RG, LG
Senior Geologist

ANCHOR QEA, LLC
buhl@anchorqea.com
6720 SW Macadam Avenue, Suite 125
Portland, Oregon 97219
D 503.924.6187
C 971.285.5288

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2- Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-09F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-09-08-09
DUP ID: — Time: ~~12:10~~ 820

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		PRTLY CLDY		CLOUDY		RAIN		No Wind	TEMPERATURE:	70's °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
4/16/20	12:06	8.0			9.82	1.82	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)² x 0.163 | 1.5(d) | 1" = 0.041 | 2" = 0.174 | 6" = 1.469 | 8" = 2.611 | 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	—	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	—	
White Poly	4/16/20	12:10	(B) P-Pump	1	125 ml **250 ml** 500 ml	None	YES	~~NO~~ YES (B)	—	√

Total Bottles (include duplicate count): ~~4~~ 3 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
~~YELLOW - Poly~~	~~Ammonia (SM 4500-NH3 G)~~ ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4500-P E)~~
~~RED TOTAL - Poly~~	~~Total Metals (Na, Mg, K, Ca (200.7))~~
WHITE - Poly	~~Ions (SO4, Cl, F (300.0))~~ Alkalinity ~~(total and bicarbonate (SM2320B))~~ ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE-DISSOLVED

WATER QUALITY DATA Purge Start Time: 12:10 Pump stop time: 12:14

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		12:06		8.0							
2		12:13	~300ml		18.9	—	848	7.98	—	—	• parameters collected from "total" sample = silty, no odor • collect dissolved sample for fluoride screening • well point purged dry after sample collection & approx 1/3 of YSI cal cup. Wait ~2 mins + point recharged enough to fill remainder of cal cup. • dissolved sample = clear, no odor.
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-09F 14-15
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-09F-14-15
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	(NW)	(LIGHT)	MEDIUM	HEAVY
WEATHER:	(SUNNY)		PRTLY CLDY		CLOUDY		RAIN		No Wind	**TEMPERATURE:**	70's °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
4/16/20	11 :32	9.81			18.09	8.28	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)^2 x 0.163 (1.5(d)) 1" = 0.041 2" = 0.174 6" = 1.469 8" = 2.611 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	---	
(White Poly)	4/16/20	11 :45	(B) P-Pump	(1)	125 ml **250 ml** 500 ml	(None)	(YES)	~~NO~~ YES	---	√

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
~~YELLOW - Poly~~	~~Ammonia (SM 4500-NH3 G)~~ ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4500-P E)~~
~~RED TOTAL - Poly~~	~~Total Metals (Na, Mg, K, Ca (200.7))~~
(WHITE - Poly)	~~Ions (SO4, Cl, F (300.0))~~ Alkalinity (total and bicarbonate (SM2320B)) ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE - DISSOLVED

WATER QUALITY DATA Purge Start Time: 11:45 Pump stop time: 11:49

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		11:32		9.81							• "Total" water quality parameters = silty, dark gray "rotten-egg" odor
2		11:48			17.9	-	11,689	9.96	-	-	
3		11:51	~300mL	10.5							• "Dissolved" sample dark gray w/ rotten-egg" odor
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-09F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-09F-19-20
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	(NW)	(LIGHT)	MEDIUM	HEAVY
WEATHER:	(SUNNY)		PRTLY CLDY		CLOUDY		RAIN	No Wind	**TEMPERATURE:**	70's	°F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW		Volume (gal) [Water Column x Gal/ft]
4/16/20	11 :42	22.90			24.00	1.1	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)² x 0.163 (1.5(d)) 1" = 0.041 2" = 0.174 6" = 1.469 8" = 2.611 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	---	
(White Poly)	4/16/20	11 :55	P (B) Pump	1	125 ml **250 ml** 500 ml	None	YES	~~NO~~ YES	---	✓

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
YELLOW - Poly	Ammonia (SM 4500-NH3 G) TKN (351.2) Total Phosphorus (SM 4500-P E)
RED TOTAL - Poly	Total Metals (Na, Mg, K, Ca (200.7))
WHITE - Poly	Ions (SO4, Cl, F (300.0)) Alkalinity (total and bicarbonate (SM2320B)) Nitrate as N (300.0) Nitrite as N (300.0) DISSOLVED FLUORIDE

WATER QUALITY DATA Purge Start Time: 11:55 Pump stop time: 12:01

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		11:42		22.90							• "Total" water quality = dark gray
2					19.5	-	19,630	9.66	-	-	
3		12:03	~30mL	23.10							• "dissolved" sample = dark gray
4											
5											• both have "rotten-egg" odor.
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-09F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-09F-24-25
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		PRTLY CLDY		CLOUDY		RAIN		No Wind	**TEMPERATURE:**	°F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW		Volume (gal) [Water Column x Gal/ft]
4/16/20	14 : 01	27.00			29.00	2.0	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)² x 0.163 | LS(d) 1" = 0.041 | 2" = 0.174 | 6" = 1.469 | 8" = 2.611 | 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used]
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	—	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	—	
White Poly	4/16/20	14 : 31	B	1	125 ml **250 ml** 500 ml	None	YES	~~NO~~ YES	—	√

Total Bottles (include duplicate count): 4 **MS & MSD** (circle if collected) 1

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
~~YELLOW - Poly~~	Ammonia (SM 4500-NH3 G) ~~TKN (351.2)~~ Total Phosphorus (SM 4500-P E)
~~RED TOTAL - Poly~~	Total Metals (Na, Mg, K, Ca (200.7))
WHITE - Poly	Ions (SO4, Cl, F (300.0)) Alkalinity (total and bicarbonate (SM2320B)) ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE – DISSOLVED

WATER QUALITY DATA Purge Start Time: Pump stop time: 14:34

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		14:01		27.00							
2		14:33	~30mL		18.6	–	1,106	6.75	–	–	• "Total" water quality = cloudy/almost clear
3											
4											• "Dissolved" sample = cloudy/almost clear
5											
6											
7											• Well purged dry after sample collection and water quality measurements
8											
9											
10											
11											
12											• Temp probe showed 22.2°C when tightening lid on cal cup. – 18.6°C collected when lid not tightened
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-09F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-09F-29-30
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		PRTLY CLDY		CLOUDY		RAIN		No Wind	TEMPERATURE:	70's °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
4/16/20	13:53	32.6			33.98	1.38	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)^2 x 0.163 (1.5Cd) 1" = 0.041 2" = 0.174 6" = 1.469 8" = 2.611 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other Stainless Steel Check Valve

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	—	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	—	
White Poly	4/16/20	14:10	B/F	1	125 ml **250 ml** 500 ml	None	YES	NO	—	√

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
YELLOW - Poly	Ammonia (SM 4500-NH3 G) TKN (351.2) Total Phosphorus (SM 4500-P E)
RED TOTAL - Poly	Total Metals (Na, Mg, K, Ca (200.7))
WHITE - Poly	Ions (SO4, Cl, F (300.0)) Alkalinity (total and bicarbonate (SM2320B)) Nitrate as N (300.0) Nitrite as N (300.0) FLUORIDE- DISSOLVED

WATER QUALITY DATA Purge Start Time: 14:20 Pump stop time: 1926

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		14:26	~300mL	DRY							• Well point purged dry after ~300mL of dissolved sample collection + filter capacity, turbid, no odor.
2		19:30			NA	—	1,109	7.86	—	—	
3											• Collect water quality parameters @ lab @ end of day.
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant
WELL ID: PDI2-PRB-DP ~~09F~~ 10F (89)
SITE ADDRESS: 4029 Industrial Way, Longview, WA
BLIND ID: PDI2-PRB-DP ~~09F~~ 10F -13-14
DUP ID:
Time:

WIND FROM:	N	NE	E	SE	S	SW	W	(NW)

(LIGHT) MEDIUM HEAVY

WEATHER: (SUNNY) PRTLY CLDY CLOUDY RAIN No Wind

TEMPERATURE: 70 °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc)	[Water Column] DTB-DTW		[Water Column x Gal/ft] Volume (gal)
4/15/20	15:51	~~11.8~~ 12.9			15.1	2.2	X 1	
4/15/20	16:22	~~9.8~~ 10.0			15.1	~~8.2~~ 7.1	X 3	

Gal/ft = (dia./2)² x 0.163 (1.5(d)) 1" = 0.041 2" = 0.174 6" = 1.469 8" = 2.611 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	~~NO~~ YES	---	
White Poly	4/15/20	16:50	B	1	125 ml **250 ml** 500 ml	None	YES	~~NO~~	---	✓

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
~~YELLOW - Poly~~	Ammonia (SM 4500-NH3 G) ~~TKN (351.2)~~ Total Phosphorus (SM 4500-P E)
~~RED TOTAL - Poly~~	Total Metals (Na, Mg, K, Ca (200.7))
WHITE - Poly	Ions (SO4, Cl, F (300.0)) Alkalinity (total and bicarbonate (SM2320B)) ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE - DISSOLVED

WATER QUALITY DATA Purge Start Time: 16:50 Pump stop time: 16:52

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		16:22		8.00							"Total" water quality= dark gray + turbid
2		16:50			17.4	–	12,143	9.13	–	–	
3		1655	~350mL	6.71							• "Dissolved" sample = dark gray
4											
5											• Both samples = "rotten-egg" odor.
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments: 4/16/20 (8:27) DTW (TOC) = 7.91'

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhe (PRINTED NAME) Benjamin A. Uhe (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-10F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-10F-16-17
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		PRTLY CLDY		CLOUDY		RAIN		No Wind	TEMPERATURE:	70's °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
4/15/20	16:28	9.0			19.16	10.16	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)^2 x 0.163 | 1.5(d) | 1" = 0.041 | 2" = 0.174 | 6" = 1.469 | 8" = 2.611 | 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	—	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO YES	—	
White Poly	4/15/20	16:35	B	1	125 ml **250 ml** 500 ml	None	YES	NO	—	√

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
YELLOW - Poly	~~Ammonia (SM 4500-NH3 G)~~ ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4500-P E)~~
RED TOTAL - Poly	~~Total Metals (Na, Mg, K, Ca (200.7))~~
WHITE - Poly	~~Ions (SO4, Cl, F (300.0))~~ ~~Alkalinity (total and bicarbonate (SM2320B))~~ ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE-DISSOLVED

WATER QUALITY DATA Purge Start Time: 16:35 Pump stop time: 1646

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		16:28		9.0							
2		16:45			17.2	—	19,919	9.64	—	—	"total" & "dissolved" sample = dark gray w/ "rotten-egg" odor
3		1708	~300mL	8.82							
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PRD Former Reynolds Production Plant **WELL ID:** PDI2-PRB-PP-10F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-PP-10F-19-20
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY		PRTLY CLDY		CLOUDY		RAIN		No Wind	**TEMPERATURE:**	70°S °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc)	[Water Column] DTB-DTW		[Water Column x Gal/ft] Volume (gal)
4/16/20	8:24	12.20			20.35	8.15	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)^2 x 0.163 | 1.5(d) 1" = 0.041 | 2" = 0.174 | 6" = 1.469 | 8" = 2.611 | 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml ~~250 ml~~ ~~500 ml~~	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	125 ml ~~250 ml~~ ~~500 ml~~	HNO_3	YES	NO	---	
White Poly	4/16/20	8:28	B	1	125 ml ~~250 ml~~ ~~500 ml~~	None	YES	NO	---	✓

Total Bottles (include duplicate count): 4 1 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
YELLOW - Poly	Ammonia (SM 4500-NH3 G) ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4500-P E)~~
RED TOTAL - Poly	~~Total Metals (Na, Mg, K, Ca (200.7))~~
WHITE - Poly	Ions (~~SO4~~, Cl, ~~F (300.0)~~) ~~Alkalinity (total and bicarbonate (SM2320B))~~ ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE-DISSOLVED

WATER QUALITY DATA Purge Start Time: 8:28 Pump stop time: 8:32

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (µS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		8:28		12.20							
2		8:31			11.9	-	4,748	6.87	-	-	clear, odorless for total & dissolved sample
3		8:34	300mL	11.3							
4											
5											• water quality parameters collected from "dissolved" sample.
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments: Well point set on 4/15 & was "Dry" upon installation.

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant **WELL ID:** PDI2-PRB-DP-10F
SITE ADDRESS: 4029 Industrial Way, Longview, WA **BLIND ID:** PDI2-PRB-DP-10F-23-24
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	(NW)	(LIGHT)	MEDIUM	HEAVY
WEATHER:	(SUNNY)		PRTLY CLDY		CLOUDY		RAIN		No Wind	**TEMPERATURE:**	70's °F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc)	[Water Column] DTB-DTW		[Water Column x Gal/ft] Volume (gal)
4/16/20	8:32	6.33			25.0	~~25.00~~ 18.67	X 1	
/ /	:						X 3	

Gal/ft = (dia./2)² x 0.163 (1.5(d)) 1" = 0.041 2" = 0.174 6" = 1.469 8" = 2.611 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other_____

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	~~125 ml 250 ml~~ 500 ml	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	~~125 ml 250 ml~~ 500 ml	HNO_3	YES	~~NO~~ YES	---	
(White Poly)	4/16/20	8:43	B	(1)	~~125 ml 250 ml~~ 500 ml	None	(YES)	NO	---	√

Total Bottles (include duplicate count): 4 2 **MS & MSD** (circle if collected)

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
~~YELLOW - Poly~~	Ammonia (SM 4500-NH3 G) ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4500-P E)~~
RED TOTAL - Poly	~~Total Metals (Na, Mg, K, Ca (200.7))~~
(WHITE - Poly)	Ions (~~SO4, Cl, F (300.0)~~) Alkalinity (~~total and bicarbonate (SM2320B)~~) ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE-DISSOLVED

WATER QUALITY DATA Purge Start Time: 8:43 Pump stop time: 8:47

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (uS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		8:43		6.33							
2		8:46			11.9	—	2,390	6.23	—	—	"Total" + dissolved" sample / purge water = clear, odorless
3		8:48	300mL	5.04							
4											
5											
6											• Water quality parameters collected from "dissolved" sample
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G] [Cumulative Totals]

Comments: well point installed on 4/15 & was "dry" upon installation.

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA
6720 SW Macadam Ave, Suite 125, Portland, OR 97219
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: PDI2-Former Reynolds Production Plant WELL ID: PDI2-PRB-DP-10F
SITE ADDRESS: 2029 Industrial Way, Longview, WA BLIND ID: PDI2-PRB-DP-10F-27-29
DUP ID: Time:

WIND FROM:	N	NE	E	SE	S	SW	W	(NW)	LIGHT	MEDIUM	HEAVY
WEATHER:	(SUNNY)	PRTLY CLDY		CLOUDY		RAIN		No Wind	TEMPERATURE:	70°S	°F

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DTW (feet btoc)	Correction Factor	Corrected DTW	DTB (ft btoc) [Water Column]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
4/16/20	10:14	29.51			29.75	0.24	X 1	
4/16/20	15:25	29.54			29.75	0.21	X 3	

Gal/ft = (dia./2)² x 0.163 | 1.5(d) | 1" = 0.041 | 2" = 0.174 | 6" = 1.469 | 8" = 2.611 | 10" = 4.080

§ METHODS: (A) Dedicated Submersible Pump (B) Peristaltic Pump (C) Bladder Pump (D) Waterra inertial pump (E) Dedicated Pneumatic Pump (F) Other, Stainless Steel Check Valve

GROUNDWATER SAMPLING DATA

Bottle Type	Date	Time	Method §	#	Volume	Preservative [circle]	Ice	Filter	pH	[√ if used] √
Yellow Poly	/ /	:		2	125 ml **250 ml** 500 ml	H_2SO_4	YES	NO	---	
Red Poly-total	/ /	:		1	125 ml **250 ml** 500 ml	HNO_3	YES	NO	---	
White Poly	4/16/20	15:50	B/F	1	125 ml **250 ml** 500 ml	None	YES	YES NO	---	✓
Total Bottles (include duplicate count):				4	MS & MSD (circle if collected)					

BOTTLE TYPE	ANALYSIS PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
YELLOW - Poly	~~Ammonia (SM 4500-NH3 G)~~ ~~TKN (351.2)~~ ~~Total Phosphorus (SM 4501-P E)~~
RED ~~TOTAL~~ - Poly	~~Total Metals (Na, Mg, K, Ca (200.7))~~
(WHITE - Poly)	Ions (~~SO4, Cl, F (300.0)~~) ~~Alkalinity (total and bicarbonate (SM2320B))~~ ~~Nitrate as N (300.0)~~ ~~Nitrite as N (300.0)~~ FLUORIDE - DISSOLVED

WATER QUALITY DATA Purge Start Time: 15:50 Pump stop time: 1620

Meas.	Method §	Time (24hr or elapsed)	Purged (gal)(L)	DTW (ft)	Temp (°C)	DO (mg/l)	Spec Cond (uS/cm)	pH (Standard Units)	ORP (mV)	Turbidity (NTU)	Water clarity/color
1		~~15:50~~									
2		15:25		29.54							
3		19:29	~300mL		NA	-	1,170	7.52	-	-	• Turbid "total" sample w/parameters collected @ lab
4											
5											• well purged dry numerous times during sample collection.
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

[Select A-G]

Comments:

ft btoc = feet below top of casing DTW = depth to water DTB = depth to bottom

SAMPLER: Benjamin A. Uhl (PRINTED NAME) Benjamin A. Uhl (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA

6720 SW Macadam Ave, Suite 125
Portland, OR 97219
(503) 670-1108

PROJECT NAME: Millennium Bulk Terminals-Longview (West) **WELL ID:** G7-D
SITE ADDRESS: 4029 Industrial way, Longview, WA **BLIND ID:** G7-D
PROJECT #: 200730-01.02 Task: 01-D-03 **DUP ID:**

WIND FROM: N | NE | E | SE | S | SW | (W) | NW — **LIGHT** | MEDIUM | HEAVY
WEATHER: (SUNNY) | PRTLY CLOUDY | CLOUDY | RAIN — **TEMPERATURE:** °F 60. °C
[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft) [Product Thickness] [Water Column] 91.3% [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW		Volume (gal)
4/14/20	13:20	32.90	---	9.68	---	23.22	X 1	3.78
4/15/20	12:02	32.90	---	11.70	---	21.20	X 3	11.35

Gal/ft = (dia./2)^2 x 0.163 | 1" = 0.041 | (2" = 0.163) | 3" = 0.367 | 4" = 0.653 | 6" = 1.469 | 10" = 4.080 | 12" = 5.875

§ METHODS: (A) Waterra (B) Peristaltic Pump (C) Disposable Bailer

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth: [√ if used]

Bottle Type	Date	Time	Method §	Amount & Volume mL	Preservative [circle]	Ice	Filter	pH	√
White Poly	4/15/20	:	B	0	250, **500**, 1L	None	YES	NO	NA	—
White Poly	4/15/20	12:10	B	1	125, (500) 1L	(None)	(YES)	(YES)		✓
Red Total Poly	—	:			250, 500, 1L	HNO_3	YES	NO		—
Red Diss. Poly	—	:			250, 500, 1L	HNO_3	YES	YES		—

Total Bottles (include duplicate count): (1)

Analysis Allowed per Bottle Type

BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
WHITE - Poly	(Cl) (SO_4) **(F)** **Total & Dissolved Flouride**
YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
GREEN - Poly	(Total Cyanide) (Free Cyanide) (Weak and Dissociable Cyanide)
RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 13:28 SAMPLE TYPE (circle): Low Flow; 3x Purge; Well Dry

Meas.	Time	Cum. Volume	DTW(ft TOC)	pH	E Cond (µS)	Temp °C	DO	ORP	Water Quality
1	13:32	1.5 L	11.35	6.14	1497	13.1	1.03	106.2	SLIGHT BRN TINT
2	13:36	2.7 L	12.69	6.37	1483	13.4	0.38	42.8	CLEAR, SLIGHT TINT
3	13:40	3.5 L	13.55	6.37	1478	13.5	0.26	13.7	" "
4	13:44	4.3 L	14.21	6.40	1468	13.5	0.20	-5.0	" "
5	13:48	4.9 L	14.77	6.42	1461	13.7	0.17	-16.6	" "
6	13:52	5.5 L	15.28	6.39	1454	13.5	0.15	-24.7	" "
7	:		UNABLE TO KEEP FLOW INCREASE PUMP SPEED						
8	14:02	7.5 gal	20.90	6.28	1427	12.7	~~1.09~~ 1.19	9.2	SLIGHT BRN TINT
9	14:06	3.5 gal	24.61	6.39	1405	12.6	1.32	2.7	" "
10	14:06	4.5 gal	26.11	6.38	1426	12.8	1.25	-4.2	CLEAR, COLORLESS
11	14:09		WELL DRY AWAIT TO RECHARGE						
12	:		.	.		.			

[gallons or liters: 1 gal = 3.79 liters] [Clarity, Color]

Turbidity before sample collection (NTU) 131 **Turbidity after sample collection (NTU)** 113

SAMPLER: JAMES MAYER
(PRINTED NAME) (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR QEA

6720 SW Macadam Ave, Suite 125
Portland, OR 97219
(503) 670-1108

PROJECT NAME: Millennium Bulk Terminals-Longview (west) **WELL ID:** PZ-7

SITE ADDRESS: 4029 Industrial way, Longview, WA **BLIND ID:** AQ - PZ7 - 041420

PROJECT #: 200730-01.02 **Task:** 01-D-03 **DUP ID:** —

WIND FROM:	N	NE	E	SE	S	SW	(W)	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	(SUNNY)	PRTLY CLOUDY	CLOUDY	RAIN					**TEMPERATURE:**	(°F) 60.	°C

[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft) [Product Thickness] [Water Column] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW		Volume (gal)
4/14/20	12:28	19.08	---	9.89	---	9.19	X 1	1.50
/ /	:	.	---		---	.	X 3	4.50

Gal/ft = (dia./2)² x 0.163	1" = 0.041	(2") = 0.163	3" = 0.367	4" = 0.653	6" = 1.469	10" = 4.080	12" = 5.875

§ METHODS: (A) Waterra (B) Peristaltic Pump (C) Disposable Bailer

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth: 18.0 [√ if used]

Bottle Type	Date	Time	Method §	Amount & Volume mL	Preservative [circle]	Ice	Filter	pH	√
White Poly	4/14/20	13:10	B	1	250, (500), 1L	(None)	(YES) ~~NO~~	NA	~
White Poly	4/14/20	13:10	B	1	125, (500), 1L	(None)	(YES)	(YES)	~
Red Total Poly	/ /	:			250, 500, 1L	HNO_3	YES	NO	
Red Diss. Poly	/ /	:			250, 500, 1L	HNO_3	YES	YES	
Total Bottles (include duplicate count):				2					

Analysis Allowed per Bottle Type

BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
WHITE - Poly	(Cl) (SO_4) (F) Total & Dissolved Flouride
YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
GREEN - Poly	(Total Cyanide) (Free Cyanide) (Weak and Dissociable Cyanide)
RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 12:32 SAMPLE TYPE (circle): Low Flow; 3x Purge; Well Dry

Meas.	Time	Cum. Volume	DTW(ft TOC)	pH	E Cond (µS)	Temp °C	DO	ORP	Water Quality
1	12:36	0.9L	10.43	6.66	2067	13.1	0.47	65.3	Brown, particles
2	12:40	1.75L	10.59	6.68	1963	13.0	0.32	36.4	LIGHTER BROWN
3	12:44	2.4L	10.65	6.69	1408	13.1	0.21	2.5	" "
4	12:48	3.0L	10.67	6.69	1263	13.3	0.17	-11.8	CLEAR, SLIGHT BROWN TINT
5	12:52	3.6L	10.75	6.64	1225	13.2	0.13	-25.9	" "
6	12:56	4.1L	10.75	6.62	1205	13.6	0.12	-33.0	" "
7	13:00	4.6L	10.77	6.55	1192	13.7	0.11	-38.7	" "
8	:		.	.		.			
9	:		.	.		.			
10	:		.	.		.			
11	:		.	.		.			
12	:		.	.		.			

[gallons or liters: 1 gal = 3.79 liters] [Clarity, Color]

Turbidity before sample collection (NTU) 64.3 **Turbidity after sample collection (NTU)** 57.9

SAMPLER: James Meyer (PRINTED NAME) (SIGNATURE)


HPT - Anchor QEA - Longview, WA
4029 Industrial Way
Legend
HPT Borings
Previous Borings
PZ Wells
PZ-6
PDI-PRB-DP-04
PDI2-PRB-DP-09hc
PDI-PRB-DP-03
PDI2-PRB-DP-10hc
PZ-7
N
400 ft
Google Earth

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date: 4/16/2020
Project Name: Longview PDI2
Project Number: 200730-01.02
Project Manager: Nicole LaFranchise
Phone Number:
Shipment Method: Hand delivered

ANCHOR QEA

Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland, OR 97219

Line	Field Sample ID	Collection Date/Time	Maxtrix	No. of Containers	Parameters							Comments/Preservation
1	PDI2-PRB-DP-10F-13-14	4/15/2020	WG	2								All samples field filtered. Second container is sample + TISAB
2	PDI2-PRB-DP-10F-16-17	4/15/2020	WG	2								
3	PDI2-PRB-DP-10F-19-20	4/16/2020	WG	2								
4	PDI2-PRB-DP-10F-23-24	4/16/2020	WG	2								
5	PDI2-PRB-DP-10F-27-29	4/16/2020	WG	4								All samples field filtered. One container is sample + TISAB
6	PDI2-PRB-DP-09F-08-09	4/16/2020	WG	2								All samples field filtered. Second container is sample + TISAB
7	PDI2-PRB-DP-09F-14-15	4/16/2020	WG	2								
8	PDI2-PRB-DP-09F-19-20	4/16/2020	WG	2								
13	PDI2-PRB-DP-09F-24-25	4/16/2020	WG	2								
14	PDI2-PRB-DP-09F-29-30	4/16/2020	WG	2								
15												

Relinquished by: Sasha Norwood	Company: Anchor QEA	Received by:	Company:
Signature/Print Name	Date/Time: 4/16/20 @ 2000	Signature/Print Name	Date/Time:
Relinquished by:	Company:	Received by:	Company:
Signature/Print Name	Date/Time:	Signature/Print Name	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

of

CASCADE
DRILLING | TECHNICAL SERVICES

CASCADE DAILY WORK REPORT

CITY, STATE, PHONE #: BOISE, ID 208.345.0878
CITY, STATE, PHONE #: PORTLAND, OR 503.775.4118
CITY, STATE, PHONE #: WEST JORDAN, UT 801.542.7159
CITY, STATE, PHONE #: WOODINVILLE, WA 425.485.8908

CLIENT: Anchor QEA | PROJECT #: 306-20-1060 | DAY: Tuesday | DATE: 4/15/20
JOB LOCATION: Longview, WA | DIG ALERT #: | JOB #: 306-20-1060

Well # / Bore #	Depth Drilled	DESCRIPTION OF WORK (Please explain reasons for Down Time, Standby Time, and Shop Time)	HOURS Start	HOURS Stop	Total Hrs	Charge Hours
		A.M Shop Time	6:00	6:45		0.75
		Travel to Site	6:45	8:00		1.25
		Arrive on site @ 8:00 // Mob to Borings + H+S	8:00	10:30		2.5
		- Health + Safety				
		- SOW Review + Site Walk				
		- Warm Up + Pre-HPT Setup				
		Start HPT // PDI2-PRB-DP-10hc + DPI2-PRB-DP-09hc	10:30	15:00		4
		- 2 Dissipation Tests, Each				
		- Max Depth 30'				
		Lunch	12:00	12:30	0.5	—
		Construct Site Map // QA/QC Review	15:00	17:30		2.5
		Offsite @ 17:30				
		Travel to Shop	17:30	19:00		1.5
		PM Shop Time	19:00	19:30		0.5
Total Ft.		TOTAL CHARGEABLE RIG HOURS				
					TOTAL	13

RIG ENGINE HOURS: START | STOP

EQUIPMENT

DRILL RIG#		COMPRESSOR/JACKHAMMER	
SUPPORT TRUCK #	x1	SNOW FENCE RENTAL	
SUPPORT TRUCK #		CONTINUOUS SAMPLER	
TRAILER #		CONTINUOUS SAMPLER FOOTAGE	
BOBCAT		# OF CORE CUTS	
AUTO HAMMER		# OF BULLDOG CUTS	
GROUT MIXER		# OF SERVICE RUNS	
GROUT PUMP		# OF SAW CUTS	
PERISTALTIC PUMP		PORTABLE RESTROOM	
FORKLIFT/HOPPER		EXHAUST DUCTING	

CASING

TYPE		SLOT		
20' SCREEN				
10' SCREEN				
5' SCREEN				
20' BLANK				
10' BLANK				
5' BLANK				
5' PP SCREEN				
10' PP SCREEN				
SLIP CAP				
THREADED CAPS				
LOCKING CAPS				
DRIVE SHOE				
CENTRALIZERS				
LOCKS				

MATERIALS

ITEM	QTY	ITEM	QTY
SAND		WELL COVER 8"	
READYMIX		WELL COVER 12"	
QUICKSET		MONUMENT CASING	
PORTLAND		BOLLARDS	
ASPHALT		SOIL DRUMS	
BENTONITE GROUT		DEVELOPMENT DRUMS	
BENTONITE CHIPS		DECON DRUMS	
BENTONITE POWDER		HOLE COVER PLATES	
BENTONITE PELLETS		PLASTIC SHEETING	
BENTONITE GRANULAR		TRAFFIC CONTROL	
SAMPLER TUBES		CORE BOXES	
SHELBY TUBES		PLYWOOD	
PROBE POINTS		SOIL SAMPLES	
GW PROBE POINTS		WATER SAMPLES	
EXP POINTS		MACRO LINERS	
SAMPLER SHOE		AUGER PLUGS	
		DRILL OUT BITS	

LABOR

NAME	SIGNATURE	SHOP		TOTAL HRS
Cody J Spiker	Cody J Spiker			13

CREW WITH PER DIEM | CHARGEABLE EXTRA LABOR HRS

UTILITIES FOUND OR HIT

REMARKS → Equipment Used: 17-70649 (HPT / HRSC Van)

Client Signature Ben Hall

Operator Signature Cody J Spiker


Container On Hold Pending Analysis
CONTENTS PURGE WATER 4/15→4/16/20
Generated during PDI-PRB-2 FLUORIDE SCREENING
GEOPROBE BORINGS (BLACK MUD POND VICINITY)
ORIGIN OF MATERIALS WEST PERIMETER OF BMP
ADDRESS 4029 INDUSTRIAL WAY, LONGVIEW, WA
CONTACT CHERYL VEZZANI (503-502-8925)
DO NOT TAMPER WITH CONTAINER
AUTHORIZED PERSONNEL ONLY
Container On Hold Pending Analysis
CONTENTS PURGE WATER / DECON WATER
Generated During PDI-PRB FLUORIDE SCREENING of GROUNDWATER GEOPROBE BORINGS
ORIGIN OF MATERIALS WEST PERIMETER OF BMP
ADDRESS 4029 INDUSTRIAL WAY, LONGVIEW WA
CONTACT CHERYL VEZZANI
503-502-8935
DO NOT TAMPER WITH CONTAINER
AUTHORIZED PERSONNEL ONLY
2/14/2020


Container On Hold Pending Analysis
CONTENTS DEIONIZED WATER 4/16/20
PUSH PROBE BORINGS GENERATED DURING
PDI2- PFAS FLUORIDE SCREENING
ORIGIN OF MATERIALS WEST PERIMETER OF R&D
ADDRESS 4029 INDUSTRIAL WAY, LONGVIEW, WA
CONTACT CHERYL VEZZANI (503-502-8925
DO NOT TAMPER WITH CONTAINER
AUTHORIZED PERSONNEL ONLY
Container On Hold Pending Analysis
DO NOT TAMPER WITH CONTAINER
AUTHORIZED PERSONNEL ONLY

Daily Safety Briefing Form

Date: 4/14/20
Project No: 200730-01.02(01-D-03; 0012)
Project Name: PDI2-Former Reynolds Production Plant

Person Conducting Meeting: _____ **Health & Safety Officer:** _____ **Project Manager:** _____

TOPICS COVERED:

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Near Miss Reporting Procedures
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential): _____
- ☐ Other: _____

Weather Conditions: _____

Daily Work Scope: _____

Site-specific Hazards: _____

Safety Comments: _____

Attendees

Printed Name	Signature
Ben Uhl	Ben Uhl
Cody J Spiker	Cody J Spiker
Jesse Blakeney	

End of Day Wellness Check

Daily Safety Briefing Form

Date: 4/15/20
Project No: 200730-01.02 (01-D-03, 0012)
Project Name: PDI2- Former Reynolds Production Plant

Person Conducting Meeting: _____ **Health & Safety Officer:** _____ **Project Manager:** _____

TOPICS COVERED:

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
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- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential): _____
- ☐ Other: _____

Weather Conditions: Drizzle (AM) / Sunny (PM)

Daily Work Scope: _____

Site-specific Hazards: _____

Safety Comments: _____

Attendees

Printed Name	Signature
Ben Uhl	Anchor QEA
Cody J Spiker	Cody J Spiker
Jesse Blakeney	

End of Day Wellness Check

Field Program COVID-19 Management Plan

Date: 4/15/20
Project No: (NAME) 2020 Millennium Cleanup - Longview PDI 2
Project Name: (NO) 20-730-01.02 Task: 01-D-03

In response to the global situation regarding Coronavirus Disease 2019 (COVID-19), Anchor QEA LLC has compiled the following guidance to support our ongoing field efforts, whether sediment sampling efforts, wet land delineations, ground water evaluation, site visits, or construction management. This Management Plan (Plan) is an addendum to the existing Health and Safety Plan (HASP) for the field activity and shall remain a portion of the HASP until superseded by other notification. All personnel who have previously signed acknowledging the HASP must sign off acknowledging this plan. Acknowledgement of this plan will be included with future acknowledgements of the overall HASP.

It is important to keep in mind that our underlying social distancing requirements and responsibilities are the foundation of all our activities. We also need to be cognizant to state and local orders and directives associated with COVID-19. Specific field efforts will require discussions between project manager and field staff to address availability, travel, and other specifics.

The objective of this Plan is to provide operational guidelines to the team which address the challenges presented by COVID-19 and ensure consistency in our response actions across the project team. These guidelines are consistent with and based on recommendations from the US Centers for Disease Control and Prevention (CDC), with multiple links provided throughout. If you should have questions or concerns, please direct those to your Field Lead, Staff Manager or Project Manager.

Some Site owners may conduct temperature screening prior to entering a Site. Until the CDC declares a pandemic and based on their declaration there is language to support such medical monitoring, this screening is optional. If you chose not to participate in temperature screening you will not be allowed on that Site and you should discuss with your Field Lead, Staff Manager, or your Project Manager.

The following describes minimum measures to be followed by the project team:

Prior to Coming to the Site

- Understand the community exposure and travel history of all employees. If an employee has traveled to an affected country outside the US or has had exposure to infected individuals within the US we require a self-quarantine from the project site for a minimum of 14 days to determine if symptoms develop or testing is positive for COVID-19.
  - The following link provides the CDC list of countries to avoid non-essential travel. https://wwwnc.cdc.gov/travel/notices

  - The following link provides CDC information on cases within the US. https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html
- If employees feel that they are sick or showing symptoms they are required to stay home and not report to work. They should call their manager and project manager immediately and notify them that they are sick. Showing up to work with symptoms will result in the employee being asked to leave to avoid potentially exposing others to the virus.
- If employees are showing symptoms it is recommended that they contact their health care provider for medical advice. This could include an examination and as testing as recommended by their health care provider. If you feel the need to visit a medical professional, it is recommended that you contact their office first to determine when you should visit.
- If employees show any symptoms they will be asked to leave and not return for a minimum of 14 days or until released by a healthcare professional. Symptoms include: Fever (> 100.4 F), cough, shortness of breath.
  - https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html

On-Site Preventative Measures and Cleaning Requirements

- All employees that work on the site will be required to undergo a site safety orientation (tail gate meeting) which will include information on specific measures to be followed to address efforts to prevent the spread of COVID-19. All field staff are required to vocalize concerns and ensure that protective measures that will slow the spread of COVID-19 are employed.
- Follow the Site-specific HASP PPE requirements.
- The first step to control spread of the virus at the project job site is focused on hygiene. All employees and management staff will follow CDC guidance regarding hand washing.
  - https://www.cdc.gov/handwashing/index.html
  - Hand wash stations and/or sanitizing wipes/sanitizing jell will be made readily available around the job site and within project office trailers. The availability of these supplies is limited.
- Office trailers will also be cleaned at least twice a day using disinfectant to wipe all surfaces that may be touched by hand including desk and table surfaces. In addition, office trailer personnel (as directed by the field lead) will be responsible for multiple daily cleaning of the various field offices and related workspaces.
- Field Support areas and equipment cabs will be cleaned throughout the day and at every shift change. All "touch" surfaces will be thoroughly wiped clean using a disinfectant.

- Employees should follow published guidance to limit transmission at home and outside of work: https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html
- The following links provide a list of USEPA recommended cleaning products able to kill the virus, as well as some initial guidance with alternatives if supplies run out:
  - https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf
  - If these products are not available, then either a diluted bleach solution of 70% alcohol solution will also work
  - https://www.cdc.gov/coronavirus/2019-ncov/community/home/cleaning-disinfection.html

Confirmed Case Response and Equipment & Facility Decontamination

Regarding COVID-19 exposures, there are three general scenarios:

- Primary exposure – These are employees who have tested positive for the virus. Unfortunately, as we know the process under which an employee is tested is still unclear and evolving.
- Secondary exposure – These are employees who within the last 14 days have had direct contact with someone outside of the office diagnosed with COVID-19.
- Tertiary exposure – These are employees who have direct contact with someone outside of the office that has been quarantined due to close contact with someone within the last 14 days who has been diagnosed with or is being screened for COVID-19. This will likely be a common exposure scenario. Any employee with symptoms associated with COVID-19 must notify their employer as soon as possible in addition to not reporting to work.

In the event there is a documented case of an employee becoming infected with COVID-19 (Primary Exposure) the field management team will take immediate action as follows:

- The employee should be immediately sent away for isolation if they are still at the site.
- The employees work steps will be traced back to identify work areas the individual may have contacted. All identified areas will be quarantined and marked off limits to all site personnel, until a decontamination process can be implemented.
- All identified areas will be disinfected by qualified individuals following CDC guidelines.
- Employees who came in direct contact with the individual will be offered the opportunity to seek medical testing.

In the event that an employee, who within the last 14 days, have had direct contact with someone outside of the field team diagnosed with COVID-19 (Secondary Exposure), the field management team will take immediate action as follows:

- Send employee home immediately and require testing or 14-day self-quarantine.

- Determine if the diagnosed individual has been instructed to self-quarantine by the local Health Department, and if so, consult with the Health Department for guidance.
- Let the Regional Lead know immediately.
- Notify the office of the situation and follow up with the field team after test results on the potential exposed employee are received.
- Continue cleaning of common touch areas with recommended disinfectants.
- If employee becomes infected this becomes a primary exposure scenario.

Situations where an employees may have had direct contact with someone outside of the field team that has been quarantined due to close contact with someone within the last 14 days who has been diagnosed with or is being screened for COVID-19 (tertiary) are more difficult to manage. Communication with the field team is recommended.

- Determine if the diagnosed or screened individual has been instructed to self-quarantine by the local Health Department, and if so, consult with the Health Department for guidance
- Let the Regional Lead know immediately
- Notify the office of the situation.
- Continue cleaning of common touch areas with recommended disinfectants.
- This becomes a secondary exposure scenario if the acquaintance is confirmed to be infected.

General Measures / Guidance

- Employees must follow the same prevention guidelines off-site, which includes travel, hotel, and other activities, in order to address potential exposures outside the workplace
- Employees should avoid close contact with other employees and practice social distancing (i.e., maintain more than 6 feet distance from others).
- Avoid touching your own mouth, nose or eyes.
- Hand washing stations with soap and water will be available at all restroom facilities. Frequent hand washing is recommended throughout the day. Washing with soap and water is one of the most effective ways to prevent the spread of germs.
- If soap and water are not available, use hand sanitizer with a minimum of 60% alcohol content.
- Time spent in large groups in enclosed spaces will be limited to the extent possible. Potential alternatives could include phone conferences or holding meetings outside (i.e., field crew safety meetings).
- Disinfecting wipes will be located throughout the site for wiping down hard surfaces as required.
- The frequency and scope of the cleaning program for project facilities (office trailers, bathrooms, other buildings and work areas) will be reviewed and increased as necessary.

- Areas where employees eat should be a focus of cleaning efforts.
- Field team equipment operators, vessel operators, and vehicle drivers (whether AQ equipment or sub consultant equipment) will be provided with disinfecting wipes to clean the enclosed spaces daily. Emphasis should be on hard surfaces that are commonly touched (steering wheel, door handles, levers, buttons).
- Alternates for critical job functions should be available.
- All employees will have their own PPE and will not share with others.
- All employees need to be vigilant regarding potential exposure and transmission of COVID-19. Avoiding any complications related to this outbreak will be a team effort as much as any safety or production concerns related to the project.

Field Program COVID-19 Management Plan

COVID-19 Management Plan Acknowledgement

Project Number: 190730-01.02

Project Name: Longview PSI

My signature below certifies that I have read and understand the policies and procedures specified in this Field Program COVID-19 Management Plan.

Date	Name (print)	Signature	Company
4/15/20	Ben Uhl	Ben Uhl	Anchor QEA
4/15/20	Cody J Spiker	Cody J Spiker	CTS
4/15/20	Jesse Bickerey		CTS
4-15-20	Charles Winland		CTS
15Apr20	Sasha Norwood		AnchorQEA
4/16/20	TROY LISTER		GIBBS + OLSON
4/16/20	Wesley McCutcheon		GIBBS & OLSON

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-L PDI **DATE:** 2/10/20

SITE ADDRESS: 4029 Delistrain Hwy **PERSONNEL:** James Meyer / Sasha Newman

WEATHER: **WIND FROM:** (N) | NE | E | SE | S | SW | W | NW | None

(SUNNY) | CLOUDY | Prtly Cldy | RAIN

(LIGHT) | MEDIUM | HEAVY

TEMPERATURE: 40-49 (°F)

TIME	COMMENTS
0745	on-site (James & Sasha)
0800	MBT-L PDI Kickoff Meeting
1030	H&S Tailgate (Sonic)
	Off-loading rigs
1145	Site-walk w/ Holocene Drilling & AECOM
1245	H&S Tailgate (Geoprobe)
1300	Begin PDI-PRB-DP-01
	0-5' DTW = 2.71 @ 1320 Sample
	5-10' DTW = 4.91 @ 1402
	10-15' DTW = 5.20 ft @ 1459
	15-20' DTW = 16.90 ft @ 1534
	20-25' DTW = ND @ 1625 Heave caused screen and inner rods to be clogged w/ silt/fine sand
	25-30' DTW = 30.2' ft @ 1655 Heave caused same issues. Leaving screened casing in ground overnight as water is slowly recharging. Plan is to collect sample in morning of 2/11/20.
1735	Tom & Chris (Holocene) off-site
1500	James & Sasha (Anchor) off-site

Comments:

Signature: _____

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: Longview PDI **DATE:** 2/11/20

SITE ADDRESS: 4629 Industrial Way **PERSONNEL:** James McLeod / Sasha Lucero

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F

TIME	COMMENTS
0730	On-site AQ (James + Sasha), Holocene (Chris + Tom)
0755	Tailgate meeting
	PDI-PRB-DP-01 25-30' DTW = 12.61 @ 0805
1015	Begin PDI-PRB-DP-02 Screen slot size = 0.004
	0-5' DTW = ND @ 1021
	5-10' DTW = ND @ 1036 Level is roughly 10 ft down
1135	New hole Begin PDI-PRB-DP-02 PVC Sch 80 .010 slot size
	0-5' DTW = ND @ 1135
	5-10' DTW = 9.78 ft @ 1205
	Filled 1 125 mL bottle w/ bailer. Allowed recharge for 30 minutes and filled 2 more 125 mL w/ bailer & TSE cap for parameters samples to be brought back to PDX lab for florida analysis
1310	10-15' not enough volume for parameters
	Sample taken @ 1335
	15-20' sample taken @ 1400 not enough volume for parameters
	20-25' sample taken @ 1435 " "
	25-30' sample taken @ 1500
1525	Begin PDI-PRB-DP-03
	0-5' DTW = ND @ 1525
	5-10' sample taken @ 1540 not enough volume for parameters
	10-15' sample taken @ 1615 Field parameters recorded
	15-20' sample taken @ 1655
1735	Holocene off-site
1750	James & Sasha off-site

Comments:

Signature: James McLeod

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-L PDI **DATE:** 2/12/20

SITE ADDRESS: 4029 Industrial Way, Longview WA **PERSONNEL:** James Mellon / Sasha Norwood

WEATHER: **WIND FROM:** (N) NE E SE S SW W NW None — SUNNY (CLOUDY) Prtly Cldy RAIN — (LIGHT) MEDIUM HEAVY — **TEMPERATURE:** 45 °F

TIME	COMMENTS
0705	JM James + Sasha on-site Hylebos (Tom, Chris) on-site
0735	H&S tailgate meeting
0750	PDI-PRB-DP-03 20-25' sample collected parameters / filtered
	25-30' sample collected @ 0825 unfiltered / no parameters
	@ 0835 soil sample collected off 25-30' screen
1030	Begin PDI-PRB-DP-07
	0-5' DTW = ND @ 08 1035'
	5-10' sample @ 1045 parameters recorded / filter
	10-15' sample @ 1100 parameters recorded / filter
	15-20' sample @ 1115 parameters recorded / filter
	20-25' sample @ 1150 no parameters recorded / filter
	screen + tubing clogged soil sample collected @ 1205
	25-30' sample @ 1300 parameters recorded / filter
1335	Begin PDI-PRB-DP-06
	0-5' DTW = ND @ 1340
	5-10' sample @ 1355 parameters recorded / filtered
Insufficient water left after sample collection to obtain parameters	10-15' sample @ 1410 no parameters recorded / filtered
	15-20' sample @ 1425 no parameters recorded / filtered
	20-25' sample @ 1450 no parameters recorded / filtered
	25-30' sample @ 1540 no parameters recorded / filtered
1615	JM 2/13/20 Begin ~~PDI-PRB-DP-05~~ B-08
	0-5' DTW = ND @ 1620
	5-10' sample @ 1630 parameters recorded / filtered
	10-15' sample @ 1645 no parameters recorded / filtered
	15-20' sample @ 1700 parameters recorded / filtered
	20-25' sample @ 1715 parameters recorded / filtered

Comments: 15 filters used, 30' 1/4" poly tubing

Signature: James Mellon

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-L PDI **DATE:** 2/12/20

SITE ADDRESS: 4029 INDUSTRIAL WAY LONGVIEW, WA **PERSONNEL:** JAMES MILLER / SACHA ARMAND

WEATHER: **WIND FROM:** (N) | NE | E | SE | S | SW | W | NW | None

(SUNNY) | CLOUDY | Prtly Cldy | RAIN

(LIGHT) | MEDIUM | HEAVY

TEMPERATURE: 45 °F

TIME	COMMENTS JM 2/13/20
1730	~~PDI-PRB-DI-05~~ B-08 LEFT IN ~~GROUND~~ OVERNIGHT @ 25-30 AND WILL SAMPLE IN AM OF ~~12/13~~ 2/13/20
1755	HOLIDAY OFF-SITE
1805	JAMES & SASHA OFF-SITE

Comments:

Signature: _____

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-L PDI **DATE:** 2/13/20

SITE ADDRESS: 4029 Industrial Hwy Longview WA **PERSONNEL:** James Mocken / Sasha Norwood

WEATHER: **WIND FROM:** N | ~~NE~~ | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

~~LIGHT~~ | MEDIUM | HEAVY

TEMPERATURE: 35-42 °F

TIME	COMMENTS
0700	Holocene (Tom + Chris) AQ (James + Sasha) on-site
0725	H&S Tailgate meeting (Tim on-site for assistance w/ Pump tests)
0755	~~MBT-PTES-DP-05~~ B-08 (Sump 2/13/20)
	25-30' sample @ 0755 parameters recorded / filtered
	~~0700~~ static DTW after 15 hours recharge = 6.41
0825	Pump test 6.41 6.12 DTW 3/4" diameter
	825 mL ~ 8 minutes @ 0818 7.55 DTW
	1650 mL at 16 minutes @ 0826 7.53 DTW
	2600 mL at 24 minutes @ 0834 7.55 DTW
	3450 mL at 32 minutes @ 0842 7.65 DTW
	4350 mL at 40 minutes @ 0850 7.61 DTW
	Ran pumps at lowest velocity possible
	Pump test 3/4" diameter Initial DTW = 10.78 DTW
	700 mL at 2 minutes 10.76
	1400 mL at 4 minutes 10.80
	2050 mL at 6 minutes 10.80
	2750 mL at 8 minutes 10.78
	3450 mL at 10 minutes 10.65
	Soil core collection
	Interval Time
	0-5 0930
	5-10 0935
	10-15 0940
	15-20 0945
	20-25 1050
	30-35 1110

Black cap = top
Red cap = bottom

Comments: 35 and snow

Signature:

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-2 PDI DATE: 2/13/20

SITE ADDRESS: ~~Lo~~ 1029 Dogfish Way Longview WA PERSONNEL: James Mellon / Sasha Redmond

WEATHER: WIND FROM: ~~N~~ NE E SE S SW W NW None

~~SUNNY~~ ~~CLOUDY~~ Prtly Cldy ~~RAIN~~

~~LIGHT~~ MEDIUM HEAVY

TEMPERATURE: °F

TIME	COMMENTS
1130	soil core collection: PDI-A23-DP-05 0-30ft in 5ft intervals
1235	~~Begin~~ PDI-A23-DP-05 0-5' DTW = ND 5-10' DTW = 5.97 ft @ 1240 DTW = 6.42 after simple correction Pump test at 5-10ft 200ml at 1minute DTW = 7.74 ft. 500ml at 3 minutes DTW = 8.40ft 650ml at 5 minutes DTW = 8.35ft DTW = 9.2ft @ 9minutes 1,025ml pump stopped pumping pH = 7.06 SU Conductivity = 719 µS/cm T = 9.5°C
	10-15' sample @ 1215 DTW = 10.92 @ initial static DTW =

Cumulative Time(min)	DTW(ft)	Cumulative Volume(ml)
1min	13.23	200ml
2min	13.47	300ml
3	13.70	400
4	13.77	450
5	13.77	525
6	13.70	600
8	13.55	700
10	13.88	875
15	14.10	1250
16	14.08	1325
17	14.08	1400
18	14.08	1475

pH = 7.02 SU
Conductivity = 1986 µS/cm
T = 9.4 °C

Comments:

Signature:

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: WBT-2 PDI **DATE:** 2/13/20

SITE ADDRESS: 4029 Industrial Way Longview, WA **PERSONNEL:** James Mckay / Sasha Noonan

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: 42 °F

TIME	COMMENTS
1400	PDI-PRB-DP-05 15-20' sample @ 1400 Pump test DTW = 6.15 ft Elapsed Time (min) / DTW (ft) / Cumulative Volume (gal) 2 / 6.00 / 550 4 / 5.94 / 900 6 / 5.93 / 1400 8 / 5.93 / 1800 10 / 5.93 / 2200 pH = 6.61 SU Conductivity = 4043 µS/cm T = 10.4°C Screen comes back clean w/ fine sand
	PDI-PRB-DP-05 20-25' sample @ 1450 DTW = 5.17 Pump test DTW = 5.20 Elapsed Time (min) / DTW (ft) / Cumulative Volume (gal) 0 / 7.63 / 0 2 / 7.69 / 1250 4 / 7.70 / 2450 6 / 7.67 / 3650 8 / 7.67 / 4850 pH = 6.39 SU Conductivity = 1976 µS/cm T = 11.4°C Screen w/ fine sand & silt
	PDI-PRB-DP-05 DTW = 14.46 25-30' sample @ 1530 T = 8.1 pH = 6.66 SU Conductivity = 3105 µS/cm Water went dry, would not stabilize Fine-grained sand in screen.

Comments: 30' @ 35' 1/4" Tubing = 65' Tubing used

Signature: _____

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: LNBFL PDI **DATE:** 2/13/20

SITE ADDRESS: 4029 Industrial Way Longview WA **PERSONNEL:** James Meador / Sasha Nemeth

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: 42 °F

TIME	COMMENTS
1605	Begin PDI-PRB-DP-04 0-5' DTW=ND 5-10' DTW=5.78 sample @ 1625 5.96
	DTW = 6.05ft Pump test Elapsed time (min) / Cumulative volume (ml) / DTW (ft) 2 / 1225 / 7.69 — pH = 7.00 SU 4 / 2400 / 7.70 — T = 10.4 °C 6 / 3650 / 7.67 — Cond. = 412.2 mS/cm 8 / 4900 / 7.70
	PDI-PRB-DP-04 10-15' DTW = 7.00 sample @ 1650
	Pumptest DTW = ~~8.2ft~~ 11.8ft Elapsed time (min) / Cumulative volume (ml) / DTW (ft) 2 / 550 / 11.80 — pH = 9.58 SU 4 / 1000 / 11.82 — T = 10.8 °C 6 / 1600 / 11.79 — Cond. = 805 mS/cm 8 / 2100 / 11.80 10 / 2600 / 11.81
	screen clean upon your retrieval from ground
1715	PDI-PRB-DP-04 ADVANCED TO 15-20' INTERVAL IN LOOSE GRAVELLY SAND

Comments: PDI-PRB-DP-04: 2 FIELD FILTERS USED
10 + 15 3/4" tubing = 25' 3/4" tubing

Signature: _____

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: MBT-L PDI **DATE:** 2/13/20

SITE ADDRESS: 4029 Industrial Way, Longview WA **PERSONNEL:** James Maloney / Sasha Nemeth

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: 42 °F

TIME	COMMENTS
1745	Holocene (Tom & Chris) off-site
1800	AQR (James & Sasha) off-site

Comments:

Signature: _____

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
6720 SW Macadam Ave, Ste 125
Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: Longview PDI **DATE:** 2/14/20

SITE ADDRESS: 4029 Industrial Way, Longview WA **PERSONNEL:** James Newton / Sasha Rolland

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: 45 °F

TIME	COMMENTS
0700	Hydrogeo (Chris + Tim) + AQ (James + Sasha) on-site.
0720	H&S Tailgate Meeting
	PDI-PRB-DP-04 15-20' DTW = 6.20 Before sample
	Sample @ 0720 Filtered
	DTW = 6.43 Before test
	Time / DTW / mL: 4 / 8.22 / 1800; 6 / 8.22 / 1800; 8 / 8.24 / 2400; 10 / 8.24 / 2900; 12 / 8.22 / 3450
	Parameters not recorded plenty of water, screen not clogged w/ any inspections
	PDI-PRB-DP-04 20-25' DTW = 14.00 Before sample
	Sample @ 0825 Filtered
	DTW = 17.72 Before test T = 10.2
	Time / DTW / mL: 4.5 / DRY / 675 — SpC = 13591; pH 9.74
	Unable to low-flow / pump test. Not enough water. ~~HC test~~ Depth-to-water was dry at lowest setting. Fine-grain gray sands on probe tip and screen.
	PDI-PRB-DP-04 25-30'
	Sample @ 0855 unfiltered DTW 26.13 Before sample
	DTW = 27.76 Before test
	Insufficient volume for pump test

Comments: 20' + 25' + 30' = 75'

Signature: _____

Daily Log

ANCHOR QEA

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Portland, OR 97219
Phone 503.670.1108

PROJECT NAME: Longview PDI **DATE:** 2/14/20

SITE ADDRESS: 4029 Industrial Way, Longview WA **PERSONNEL:** James Mahon / Sirha Mahon

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | None

SUNNY | CLOUDY | Prtly Cldy | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: ° F

TIME	COMMENTS
0945	Begin 0-20' soil core @ PDI-PIZB-DP-04
1000	Complete 0-20' soil core @ PDI-PIZB-DP-04
	- Decon Equipment & give water level indicator back to Casey & Garrett
	- Get GPS - Trimble and bring back to PDX office
	- Sand & grass seed over all PDB locations & where Holocene stuck.
	- Trash drop-off & label drums
1250	Holocene (Chris & Tim) off-site
1405	James & Sirha off-site & Driving back to PDX
1515	Arrive back @ PDX office & unload Equipment

Comments:

Signature: _____

ID: PIT-PRB-DP-01

Field Screening Data Measurement Form
Former Reynolds Metals Reduction Plant – Longview
Pre-Design Investigation

Boring ID: PIT PRB-DP-02
Date: 2/11/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	—	—	—	—	No water
5-10	38.84	7.86	495.7	11.7	water collected with bailer after 45 minutes, very slow recharge
10-15	1.01	—	—	—	Not enough water for parameters
15-20	0.59	—	—	—	Not enough water for parameters
20-25	0.85	—	—	—	Not enough water for parameters
25-30	0.54	—	—	—	Not enough water for parameters

Field Screening Data Measurement Form
Former Reynolds Metals Reduction Plant – Longview
Pre-Design Investigation

Boring ID: PDI PRG-DP-03
Date: 2/11/20 - 2/12/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	—	—	—	—	No water
5-10	441.9	—	—	—	Not enough volume for parameters
10-15	85.8	9.49	2454	12.0	
15-20	159.7	—	—	—	Not enough water for parameters
20-25	1.79	6.48	2529	11.6	
25-30	1.35	6.48	2529	11.6	Not enough water for parameters

Field Screening Data Measurement Form
Former Reynolds Metals Reduction Plant – Longview
Pre-Design Investigation

Boring ID: PDI-PRB-DP-04
Date: 2/13/20-2/14/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	—	—	—	—	No water
5-10	4.57	7.00	412.2	10.4	
10-15	13.0	9.58	1805	10.8	
15-20	137	—	—	—	Not enough water for parameters
20-25	174	9.74	13591	10.2	
25-30	125	—	—	—	Not enough water for parameters

Field Screening Data Measurement Form
Former Reynolds Metals Reduction Plant – Longview
Pre-Design Investigation

Boring ID: POL-PRB-DP-05
Date: 2/13/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5					No water
5-10	1.01	7.06	719	9.5	
10-15	1.09	7.02	1986	9.4	
15-20	0.55	6.61	4048	10.4	
20-25	0.36	6.39	1976	11.4	
25-30	0.39	6.66	3105	8.1	

Field Screening Data Measurement Form

Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation

Boring ID: PSI-PRB-DP-06

Date: 2/12/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5					No water
5-10	582.8	10.40	26,139	12.1	
10-15	512.9				Not enough volume for parameters
15-20	30.08				
20-25	68.40				
25-30	5.14				

Field Screening Data Measurement Form

Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation

Boring ID: PDI-PRB-DP-07

Date: 2/12/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	—	—	—	—	No water
5-10	0.22 ~~1.33~~ Switched	6.76	218.2	11.1	
10-15	0.28	6.38	240.3	11.6	
15-20	0.39	6.40	573.0	11.9	
20-25	0.52	—	—	—	Not enough water for parameters
25-30	0.29	6.51	1157	12.2	

PDI-PRB-DP-05 S.06

Field Screening Data Measurement Form

Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation

Boring ID: ~~PDI PRB DP-05~~ SB25 S.06

Date: 2/12/20

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	—	—	—	—	No water
5-10	146.64	9.83	9,099	10.5	
10-15	22.23	—	—	—	Not enough water for parameters
15-20	0.96	6.50	1,366	11.0	
20-25	0.68	6.34	963	9.6	
25-30	0.62	6.41	959	9.6	

Field Screening Data Measurement Form

Former Reynolds Metals Reduction Plant – Longview

Pre-Design Investigation

Boring ID: DI-PRB-DP-01

Date: 2/10/20 - 2/11/2020

Depth Interval (feet)	Fluoride (ppm)	pH (SU)	Specific Conductance (µS/cm)	Temperature (°C)	Notes
0-5	1.36	6.15	317.1	10.3	DTW = 2.71 ft
5-10	17.64	6.90	834	11.7	DTW = 4.91 ft
10-15	13.58	7.17	759	12.0	DTW = 5.20 ft
15-20	3.45	6.83	6359	12.0	DTW = 16.9 ft
20-25	—				No water produced
25-30	1.44	6.84	1731	10.0	DTW = 12.61 ft

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
1201 3rd Ave, Suite 2600
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/10/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: G. Timm S. Grunnet, S. Strelkl

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C

[Circle appropriate units]

TIME	COMMENTS
0900	Anchor on site
830	Safety Training & Arch. training w/ all
10:00	Tailgate safety meeting
11:15	Yellow Jacket unload drill rig from Lowboy trailer onsite
12:05	Driller fill drill rig w/ water
12:30	Mobilize to PL 10 → not properly located, move to SU 02 B3
13:18	Mobilize to SU 02 B3
14:42	Start drilling, drillers down w/ set up
17:30	end drilling @ 265 ft. Rinse TMIE
17:35	Anchor off site

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
1201 3rd Ave, Suite 2600
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/11/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: C. Timm & S. Grannatelli

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

TEMPERATURE: LIGHT | MEDIUM | HEAVY

°F 40 . °C

[Circle appropriate units]

TIME	COMMENTS
~~Anchor~~ 715	anchor onsite
730	Anchor at PW-SW02-B-03 to resume drilling & set up
745	H&S meeting
8:00	drilling start
10:00	drillers decommission hole
10:20	drill rig malfunction, repairs
11:01	Yellow Jacket offsite to supply store
1105	TROY COLE W/ COID on site
1130	Yellow Jacket back onsite w/ replacement hook/cable
1200	ON PWDI-SW02-B-02
1220	Start drilling
1500	Sensor on rig malfunction, drillers trouble shooting
1~~730~~	Anchor & Yellow Jacket off site

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/12/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: G. Timm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | 40°F?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C [Circle appropriate units]

TIME	COMMENTS
7:00	Anchor & Yellow Jacket onsite
730	Ascom & CHM onsite
800	Drillers warm drill rig & begin trouble shooting
11:00	Yellow Jacket (Drillers) off site to get new compressor & Sam Gammakers off site.
1143	Yellow Jacket back onsite
1200	Drilling SW02-B02 resumed
1345	off B-02 SW02.
1350	on B-01 SW02
1730	done B-01 SW02, decom. hole
1830	Anchor & Yellow Jacket off site
	1200 Move rigs to B06 SW02

Daily Log

ANCHOR QEA

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Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/13/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: GTimm, Casey Jansch

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

TEMPERATURE: LIGHT | MEDIUM | HEAVY — °F . °C [Circle appropriate units]

TIME	COMMENTS
715	Anchor of Yellow Jacket onsite
740	TEcomm, ~~onsite~~ Onsite
830	drillers ready for HSS meeting & turn on rig to warm up. HSS meeting conducted
907	Drilling SW02-B06 begins
1315	Done drilling SW02-B06, decommission hole
1340	Move rigs to B07 SW02
1415	Drilling start B07 SW02
1730	end drilling B07 SW02, decommisson hole
1830	off site after moving RIG to B05

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview
DATE: 2/14/2020
SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals
PERSONNEL: GTmm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | ?
SUNNY | CLOUDY | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 40 . °C
[Circle appropriate units]

TIME	COMMENTS
0715	Anchor QEA YJ onsite
0740	AECOMM onsite
0830	Safety Meeting
0858	Drilling Starts SU02-B-05
1220	Decommission SU02-B05
1254	Drilling Start SU02-B-04
~~1230~~	1130 AECOMM Anish & Kelly off site
1230	AECOMM onsite SARAH
1330	Don Carson Yellow Jacket onsite
1613	decommission hole SU B04
	Yellow Jacket to return tmr (Sat) to install lights to drill rig & decontaminate tooling/casing
1637	Additional hole drilled to collect waste material for proctor sampling @ a 1/0° angle
1651	Proctor Sample collected, breakdown rig so demob
1730	Anchor QEA offsite

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
1201 3rd Ave, Suite 2600
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview **DATE:** 2/[illegible]/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals **PERSONNEL:** [illegible]

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW — LIGHT | MEDIUM | HEAVY

SUNNY | CLOUDY (circled) | RAIN | ? — **TEMPERATURE:** °F 35 °C [Circle appropriate units]

TIME	COMMENTS
715	Anchor onsite
745	Yellow Jacket & AEcom are onsite
830	Safety meeting
845	drillers work on rig repairs
1025	Start drilling SU07-B01
1445	end SU07-B01
~~[illegible]~~ 1520	on SU07-B04 stop 1600 drilling.
~~[illegible]~~ 1615	Yellow Jacket off site
1622	Anchor off SU07 B04. leave hole to cont. in am
[illegible signature]	

Daily Log

ANCHOR QEA

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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview **DATE:** 2/18/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals **PERSONNEL:** G Timm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 30s . °C [Circle appropriate units]

TIME	COMMENTS
7	Anchor onsite
710	Yellow Jacket onsite
0800	Start drilling SU07-B04 again
0936	done drilling SU07-B04 to 62 ft
~~1330~~ 1350	Start SU07-B03
1350	done drilling - SU07 - B03
1415	Start drilling SU07 - B02
1619	end drilling SU07-B02; drillers decon &
	mobilize to SU-10.
1745	Anchor offsite; 45 off @ 1715

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
1201 3rd Ave, Suite 2600
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 02-19-2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: SS / GT / NB / TS

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | ? — SUNNY | CLOUDY | RAIN

TEMPERATURE: 25-52° F — LIGHT | MEDIUM | HEAVY — °F / °C [Circle appropriate units]

TIME	COMMENTS
0700	ON SITE, SECURITY CHECK-IN
0715	SET UP ON SU-10, WAITING FOR DRILLERS / ARCHEOLOGIST
0730	DRILLERS ON SITE
0755	ARCHEOLOGIST ON SITE
0830	BEGIN DRILLING SU10-B-01
1130	Done drilling SU10-B-01 Move to SU06
1319	Start SU06-B-09
1619	end SU06-B-09, Move to B-03
1630	AQ & YJ offsite
	Aden

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/20/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: GTimm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

~~SUNNY~~ CLOUDY RAIN ?

30s - 50s F

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C [Circle appropriate units]

TIME	COMMENTS
0700	AQ onsite
0720	YJ onsite at AECOMM
0740	Safety meeting
846	~~Start~~ SU06-B07
1215	Stop SU06-B07
1245	on SU06-B03, YJ conducts repairs on hydraulic lines of drill rig
14/45	Start SU06-B-04
~~0654~~	AQ & YJ off SU06
1647	

Daily Log

ANCHOR QEA

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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview
DATE: 2/21/2020
SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals
PERSONNEL: G Timm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 28 . °C
[Circle appropriate units]

TIME	COMMENTS
0700	AQ onsite
0715	TJ onsite
0730	Safety Meeting
0750	~~START~~ resume SU06-B-04
0900	AECOMM Anita Shepherd onsite
0910	End SU06-B-04. Mob. to SU06-B-03.
1000	on SU06-B-03, TJ break ~15 for food/water & water for RIG
1055	start SU06-B-03
1353	End SU06-B-03 Mob
1503	Start SU06-B-06
1719	end SU06-B-06.
1730	AECOMM off site

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/22/2024

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: G Timm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW | ?

SUNNY | CLOUDY | RAIN

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 40. °C

[Circle appropriate units]

TIME	COMMENTS
0630	CONSTEC onsite
0700	AQ onsite
0715	Accumm onsite
0730	YJ onsite, Safety Meeting
0840	Start Bucket-B02
1115	end Bucket-B02 & Mob
1200	Start Bucket-B08
1500	end Bucket-B08
1500	YJ & Anchor offsite

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/24/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: GTimm

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

TEMPERATURE: LIGHT | MEDIUM | HEAVY

°F 40s . °C

[Circle appropriate units]

TIME	COMMENTS
0700	AQ onsite for last day of drilling
0730	AECOM on site
0800	Yellow Jacket onsite
0907	Start SW06-B05
1055-1105	repairs to drill rig cables.
1219	Done SW06-B05 & mob to LAST BORING
1328	Start SW06-B01
1645	End SW06-B01

Daily Log

ANCHOR QEA

Anchor QEA, L.L.C.
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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview

DATE: 2/25/2020

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals

PERSONNEL: GT Tuinstra

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 30s . °C [Circle appropriate units]

TIME	COMMENTS
0730	AQ onsite
0745	Yellow Jacket onsite
0745	Safety meeting
0800	Begin Observation of GPS locating of Geotech Borings across Site.

Daily Log

[redacted]

PROJECT NAME: NWA Alcoa **DATE:** 2/22/2022

SITE LOCATION: 4029 Industrial Way **PERSONNEL:** S. Giannakos, J. Light

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C [Circle appropriate units]

TIME	COMMENTS
See Notes on bottom of page for detailed logging	
Equipment on site:	
0800	Anchor QEA on site, checked in with Cheryl and Heather
	Signed in w/ security
0915	Cascade Gas on site to clear gas utility. Anchor notified Cascade
	drillers to move to site.
0940	Cascade Gas off site, AQ on standby for chillers
1100	Cascade on site. AQ, cascade undergoing H&S orientation on site
1130	AQ, Cascade on location at PD13-B-01, H&S tailgate
1230	Begin boring B-01
230	Short lunch break
250	Continue drilling
1700	Completed B-01 to 41.5', ran out of daylight, began demob.
1830	AQ, Cascade off site.
Samples delivered to lab:	

Notes: Work performed, Phone calls made, Problems Issues/Resolutions, Visitors on site, Deviations from the Workplan
Safety infractions, Important comments/instructions to contractors

Signature: [signature]

Daily Log

ANCHOR QEA

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Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: Former Reynolds Metal Reduction Plan - Longview **DATE:**

SITE ADDRESS: 4029 Industrial Way - Millennium Bulk Terminals **PERSONNEL:**

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW

SUNNY | CLOUDY | RAIN | ?

LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F . °C
[Circle appropriate units]

TIME	COMMENTS
0715	AQ on site, sign in at the security Gate
0730	Cascade on site for H&S meeting
0800	Mob to B-02, prep for drilling.
0845	Safety tailgate.
0910	Begin boring PD13-B-02
1145	Completed boring PD13-B02, began boring mob to B01 to complete depth
1255	begin clearing PDi 3:13 01(2) to 41.5'
1415	Compete B-01(2), begin demob, Jake off site.
1345	Cascade Equipment truck need jump start, awaiting for final departure
1700	AQ-Cascade off site. Cascade to leave truck overnight and return with new batteries in the moring. Security gates have been locked and AQ+Cascade have signed out at security

Signature:

Daily Safety Briefing Form

ANCHOR QEA

Date: 2/22/2022
Project No: 20002-01.03
Project Name: NWIA Alcoa

Person Conducting Meeting: S. Giannakos
Health & Safety Officer: Tim Shaner
Project Manager: R. Gardner

TOPICS COVERED:

- [x] Emergency Procedures and Evacuation Route
- [x] Directions to Hospital
- [x] HASP Review and Location
- [ ] Safety Equipment Location
- [ ] Proper Safety Equipment Use
- [ ] Employee Right-to-Know/ SDS Location
- [x] Fire Extinguisher Location
- [ ] Eye Wash Station Location
- [ ] Buddy System
- [ ] Self and Coworker Monitoring
- [ ] Lines of Authority
- [ ] Communication
- [ ] Site Security
- [ ] Vessel Safety Protocols
- [x] Work Zones
- [ ] Vehicle Safety and Driving/ Road Conditions
- [ ] Equipment Safety and Operation
- [x] Proper Use of PPE
- [x] Decontamination Procedures
- [ ] Near Miss Reporting Procedures
- [x] Lifting Techniques
- [x] Slips, Trips, and Falls
- [ ] Hazard Exposure Routes
- [ ] Heat and Cold Stress
- [ ] Overhead and Underfoot Hazards
- [ ] Chemical Hazards
- [ ] Flammable Hazards
- [x] Biological Hazards
- [ ] Eating/Drinking/Smoking
- [ ] Reviewed Prior Lessons Learned
- [ ] Field Team Medical Conditions for Emergency Purposes (Confidential):
- [ ] Other:

Weather Conditions: Cold, occasional flurries of snow, cloudy

Daily Work Scope: Geotechnical drilling, soil sampling

Site-specific Hazards: slips, trips, falls, over head, pinch points, cold stress.

Safety Comments:

Attendees

Printed Name	Signature
Ryle King	
TARIQ BARAKAT	
Sam Giannakos	
Jake Light	

End of Day Wellness Check

Verbal health check to end the day.

PLAYING IT SAFE

Daily Safety Briefing Form

ANCHOR QEA

Date: 2/23/22
Project No: 20002.18-0.3
Project Name: NWA Alcoa

Person Conducting Meeting: S. Giannakos
Health & Safety Officer: Tim Shaner
Project Manager: Rebecca Gardner

TOPICS COVERED:

- [x] Emergency Procedures and Evacuation Route
- [x] Directions to Hospital
- [x] HASP Review and Location
- [x] Safety Equipment Location
- [ ] Proper Safety Equipment Use
- [ ] Employee Right-to-Know/ SDS Location
- [x] Fire Extinguisher Location
- [x] Eye Wash Station Location
- [ ] Buddy System
- [ ] Self and Coworker Monitoring
- [ ] Lines of Authority
- [x] Communication
- [x] Site Security
- [ ] Vessel Safety Protocols
- [x] Work Zones
- [ ] Vehicle Safety and Driving/ Road Conditions
- [ ] Equipment Safety and Operation
- [x] Proper Use of PPE
- [ ] Decontamination Procedures
- [ ] Near Miss Reporting Procedures
- [x] Lifting Techniques
- [x] Slips, Trips, and Falls
- [ ] Hazard Exposure Routes
- [x] Heat and Cold Stress
- [x] Overhead and Underfoot Hazards
- [ ] Chemical Hazards
- [x] Flammable Hazards
- [ ] Biological Hazards
- [ ] Eating/Drinking/Smoking
- [x] Reviewed Prior Lessons Learned
- [ ] Field Team Medical Conditions for Emergency Purposes (Confidential):
- [ ] Other:

Weather Conditions: Cold, Sunny.

Daily Work Scope: drilling, soil sampling

Site-specific Hazards: slips, trips, falls, cold stress.

Safety Comments: SG

Attendees

Printed Name	Signature
Steven Eddick	
Tariq Bycraft	
John Light	
S Giannakos	

End of Day Wellness Check

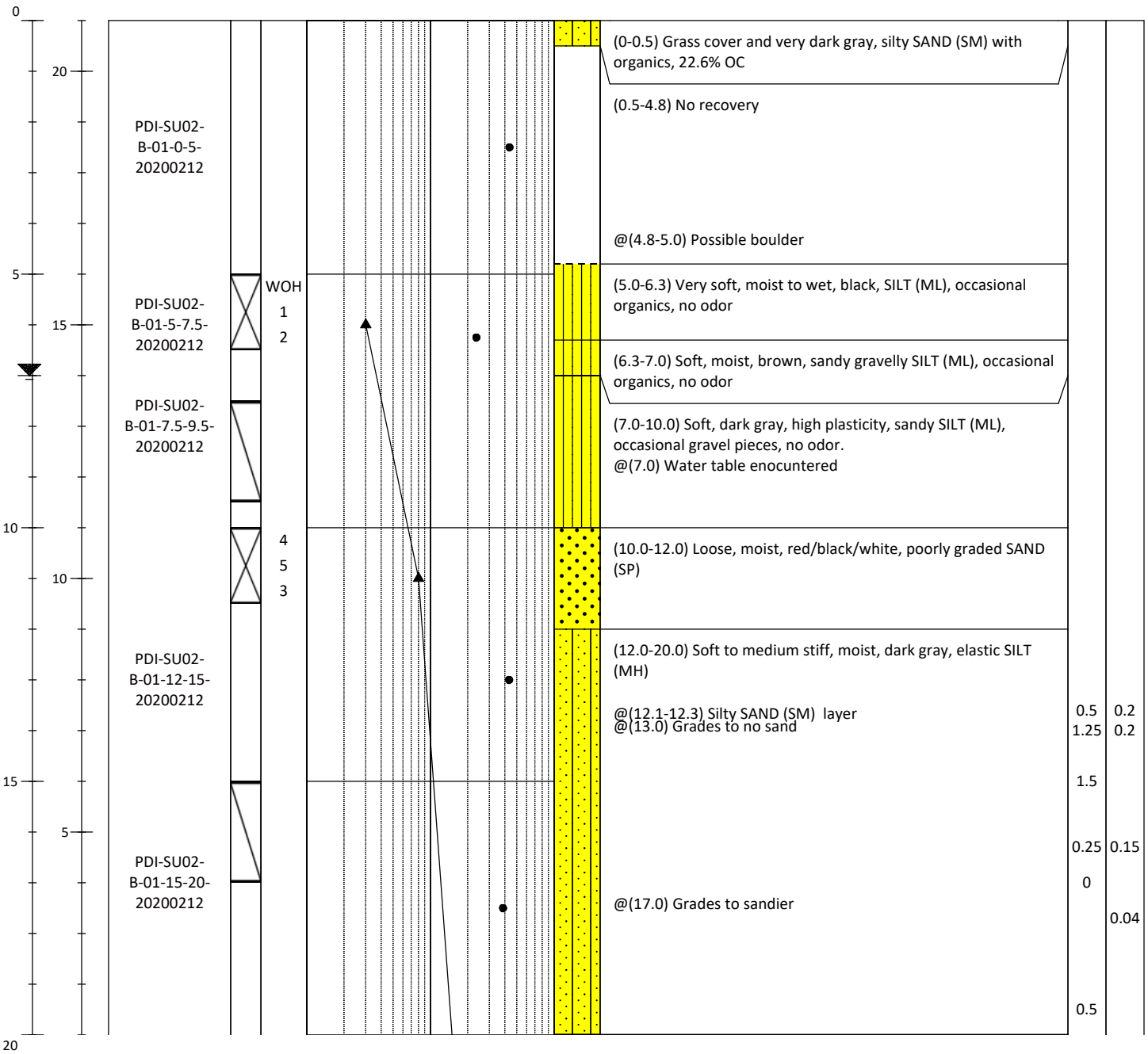
Verbal check at EOD

PLAYING IT SAFE

Attachment A3
Boring Logs

Soil Boring Log
SU02-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304876** E/LONG: **1003154**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **46.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **7.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **20.97**



ANCHOR QEA
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Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes: (30.0-34.0) Sampling rod sand under its own weight from 30 to 45 ft below ground surface

Soil Boring Log
SU02-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304876** E/LONG: **1003154**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **46.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **7.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **20.97**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20	0	PDI-SU02-B-01-20-25-20200212	4 8 8			(20.0-24.0) Medium dense, wet, gray, silty SAND (SM), trace organics (roots/wood fibers) @(22.0) Grades to sandier		0.1
25	-5	PDI-SU02-B-01-25-30-20200212	1 3 9			(24.0-30.0) Medium dense, wet, dark gray, pooly graded SAND (SP-SM) with silt		
30	-10		WOH WOH WOH			(30.0-39.0) Very loose, wet, gray, poorly graded SAND (SM) with silt. @(31.0) Grades to siltier	0	
35	-15	PDI-SU02-B-01-34-39-20200212				@(37-37.5) Wood debris encountered	0.25 0.3	
40						(39.0-46.0) Very soft, moist, grayish-brown, organic SILT (OL)	0.4	0.05

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▲ SPT N-Value
● Moisture Content (%)

Notes: (30.0-34.0) Sampling rod sand under its own weight from 30 to 45 ft below ground surface

Soil Boring Log
SU02-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304876** E/LONG: **1003154**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **46.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **7.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **20.97**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
40	-20	PDI-SU02-B-01-39-44-20200212		●		(39.0-46.0) Very soft, moist, dark grayish-brown, organic SILT (OL)	0.5	0.5
45	-25	PDI-SU02-B-01-44-46-20200212		●			0.6	0.6
50	-30					End of Boring at 46 FT		
55	-35							
60								

ANCHOR QEA
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Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes: (30.0-34.0) Sampling rod sand under its own weight from 30 to 45 ft below ground surface

Soil Boring Log
SU02-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304694.12** E/LONG: **1003680.96**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-11/12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **25.73**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
0	25	PDI-SU02-B-02-0-1-20200211				(0-1.0) Grass cover and very dark, moist, silty SAND (SM), contains gravel pieces		
		PDI-SU02-B-02-1-3-20200211				(1.0-3.0) Medium dense, moist, dark brown, silty SAND (SM) with occasional gravel pieces		
		PDI-SU02-B-02-3-4-20200211				(3.0-4.0) Medium stiff, moist, very dark gray, SILT (ML), with trace fine grained sand		
5						(4.0-4.5) Loose, medium dense, SAND (SP)		
	20		1 4 6			(4.5-6.0) Stiff, moist, gray/blue, SILT (ML), with gravel pieces		
						(6.0-7.5) Medium dense, moist, dark brown, silty SAND (SM) with occasional gravel pieces		
10						(7.5-20.5) Very loose to medium dense, moist, grayish-brown, poorly graded SAND (SP)		
	15		7 9 9			@(9.2) Grades to medium dense, moist, and gray/white/black/red		
15		PDI-SU02-B-02-9.2-20.5-20200211						
	10		5 4 5			@(15.0) Grades to loose		
20								

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Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304694.12** E/LONG: **1003680.96**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-11/12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **25.73**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20	5		1 0 1			(7.5-20.5) Very loose to medium dense, moist, grayish-brown, poorly graded SAND (SP)		
						(20.5-27.5) Very stiff, moist, gray/blue, SILT (ML), trace organics (wood debris)		
25	0	PDI-SU02-B-02-25-27-20200211						
						(27.5-34.0) Loose to dense, moist to wet, dark gray, silty SAND (SM)		
30	-5	PDI-SU02-B-02-27.5-34-20200211	5 13 10					
						@(34.0) Grades to gray/white/black, medium coarse grained silty SAND (SM)		
35	-10	PDI-SU02-B-02-35-37.3-20200212	1 2 6			@(36.0) Grades to loose		
						(37.3-42.5) Medium stiff to stiff, moist, dark gray, SILT (ML) with fine grained sand, substantial organics		
40		PDI-SU02-B-02-37.3-40-20200212				@(39.4-39.8) Wood pieces encountered		

ANCHOR QEA
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Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304694.12** E/LONG: **1003680.96**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-11/12-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **25.73**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40	-15	PDI-SU02-B-02-40-42-20200212				(37.3-42.5) Medium stiff to stiff, moist, dark gray, SILT (ML) with fine grained sand, substantial organics		
45	-20					End of Boring at 42.5 FT		
50	-25							
55	-30							
60								

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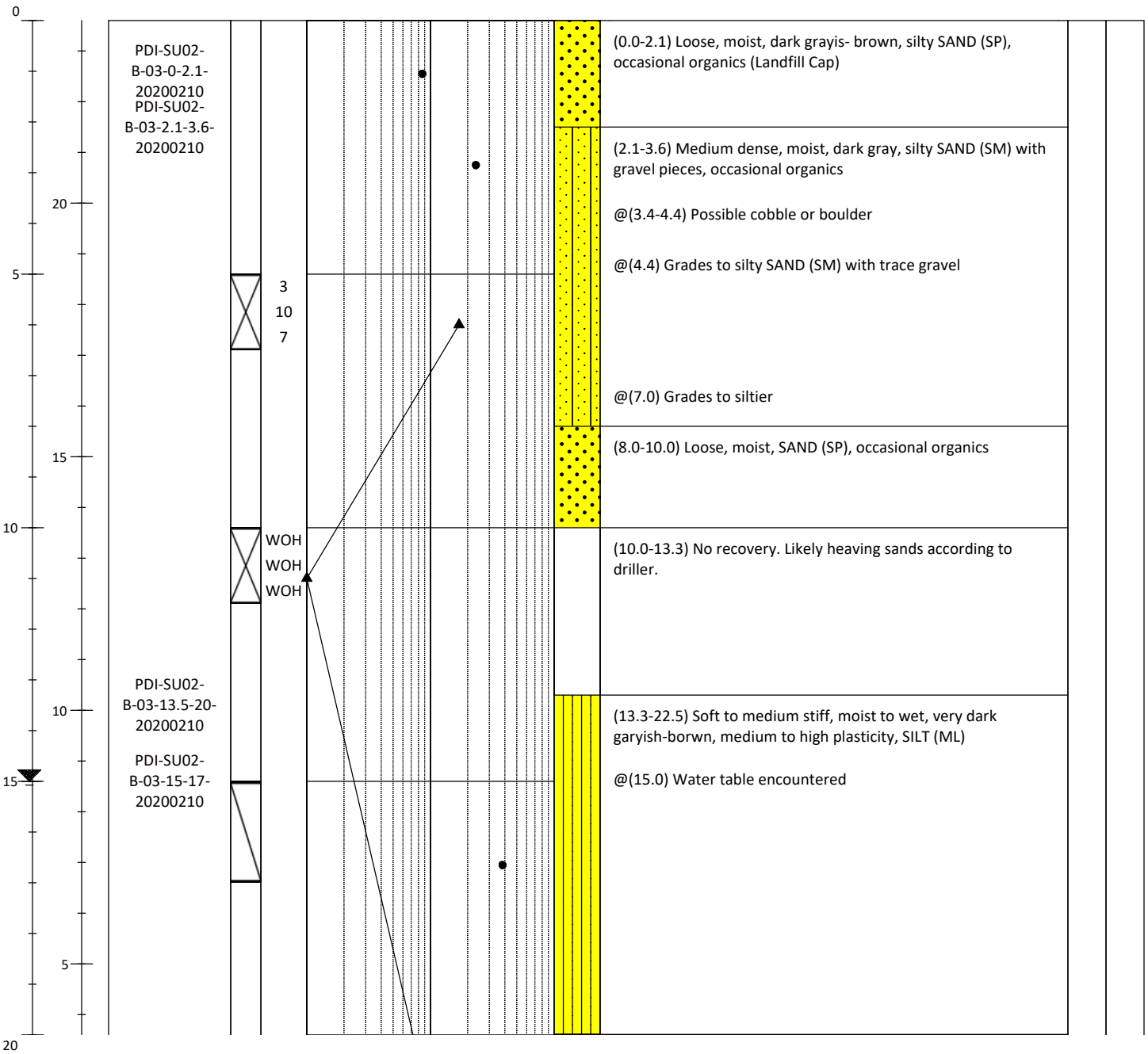
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304405** E/LONG: **1004597**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-10/11-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **15.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **23.61**



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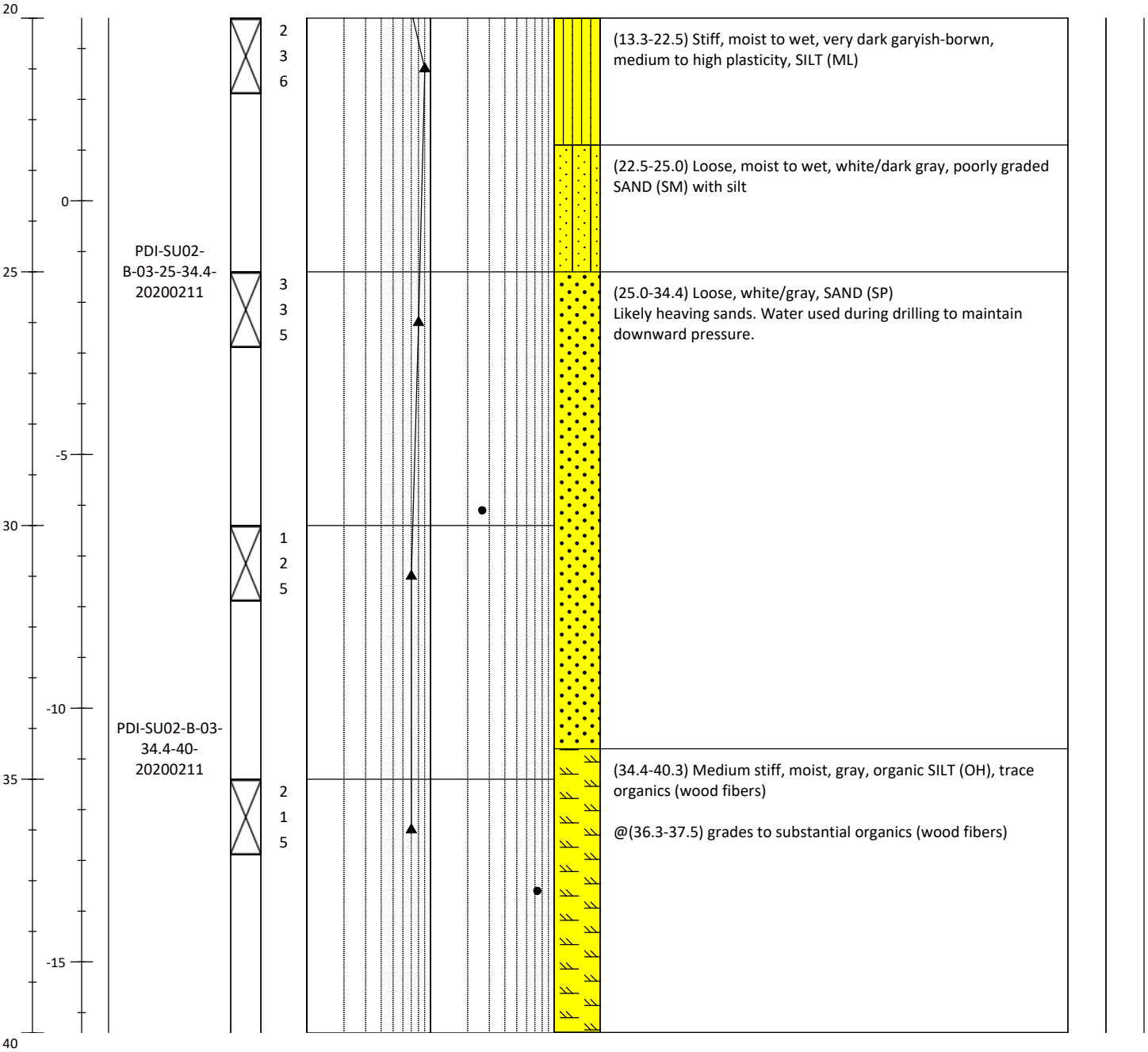
Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes: @(25.0-26.5) SPT in heaving sands

Soil Boring Log
SU02-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304405** E/LONG: **1004597**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-10/11-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **15.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **23.61**



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Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes: @(25.0-26.5) SPT in heaving sands

Soil Boring Log
SU02-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304405** E/LONG: **1004597**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-10/11-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **15.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **23.61**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40								
	-20					(34.4-40.3) Medium stiff, moist, gray, organic SILT (OH), trace organics (wood fibers)		
45						(40.3-41.5) Medium stiff, moist, dark grayish-brown, sandy SILT (ML)		
	-25					End of Boring at 41.5 FT		
50								
	-30							
55								
	-35							
60								

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▲ SPT N-Value
● Moisture Content (%)

Notes: @(25.0-26.5) SPT in heaving sands

Soil Boring Log
SU02-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304778** E/LONG: **1004480**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.94**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
0	15	PDI-SU02-B-04-1.1-5-20200214				(0.0-1.1) Loose, wet, dark grayish-brown, silty SAND (SM), significant organics (grass roots)		
						(1.1-6.0) Soft, moist to wet, black, sandy SILT (ML), trace to some organics (Black Mud)		
5	10	PDI-SU02-B-04-5-7-20200214						
		PDI-SU02-B-04-6-10-20200214				(6.0-12.4) Transition to native material at 6.0 FT. Soft, moist, gray silt (ML) with organics (roots)	1.5	0.35 (0.05)
10	5	PDI-SU02-B-04-10-12-20200214	0 1 2			@(11.0) Grades to gray/green with orange mottling		
		PDI-SU02-B-04-12.4-15-20200214				(12.4-25.0) Very loose, moist, gray/white/black, silty SAND (SM) with pockets of silt (ML)		
15	0		0 1 4			@(14.4) Pocket of SILT (ML)		
						@(16.0) Grades to loose		
		PDI-SU02-B-04-15-20-20200214				@(16.5) Grades to sandier		
20						@(17.6) Pocket of SILT (ML)		

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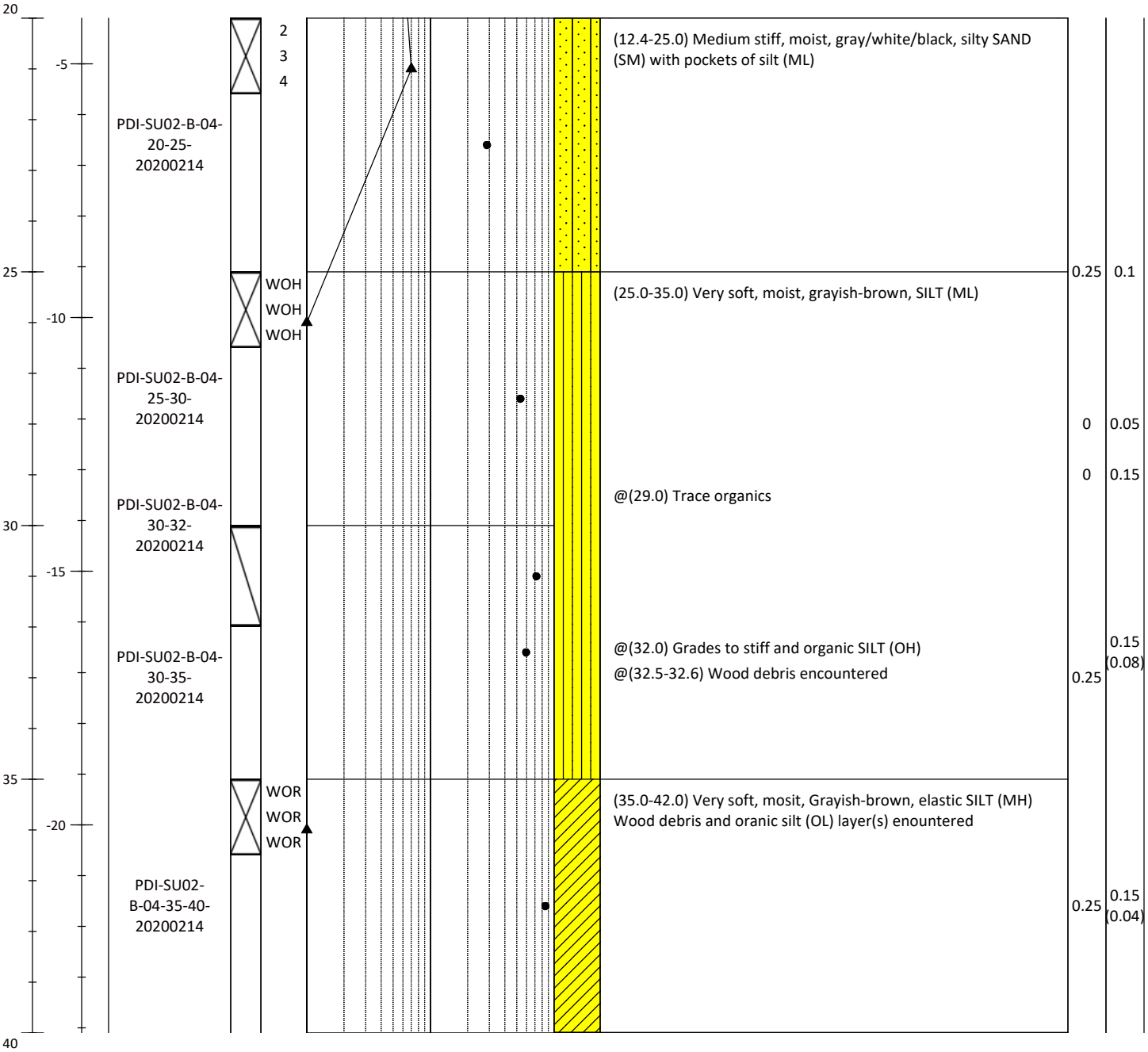
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304778** E/LONG: **1004480**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.94**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304778** E/LONG: **1004480**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.94**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40	-25		WOH WOH WOH WOH			(35.0-42.0) Very soft, mosit, Grayish-brown, elastic SILT (MH) Wood debris and oranic silt (OL) layer(s) enountered		
45	-30					End of Boring at 42 FT		
50	-35							
55	-40							
60								

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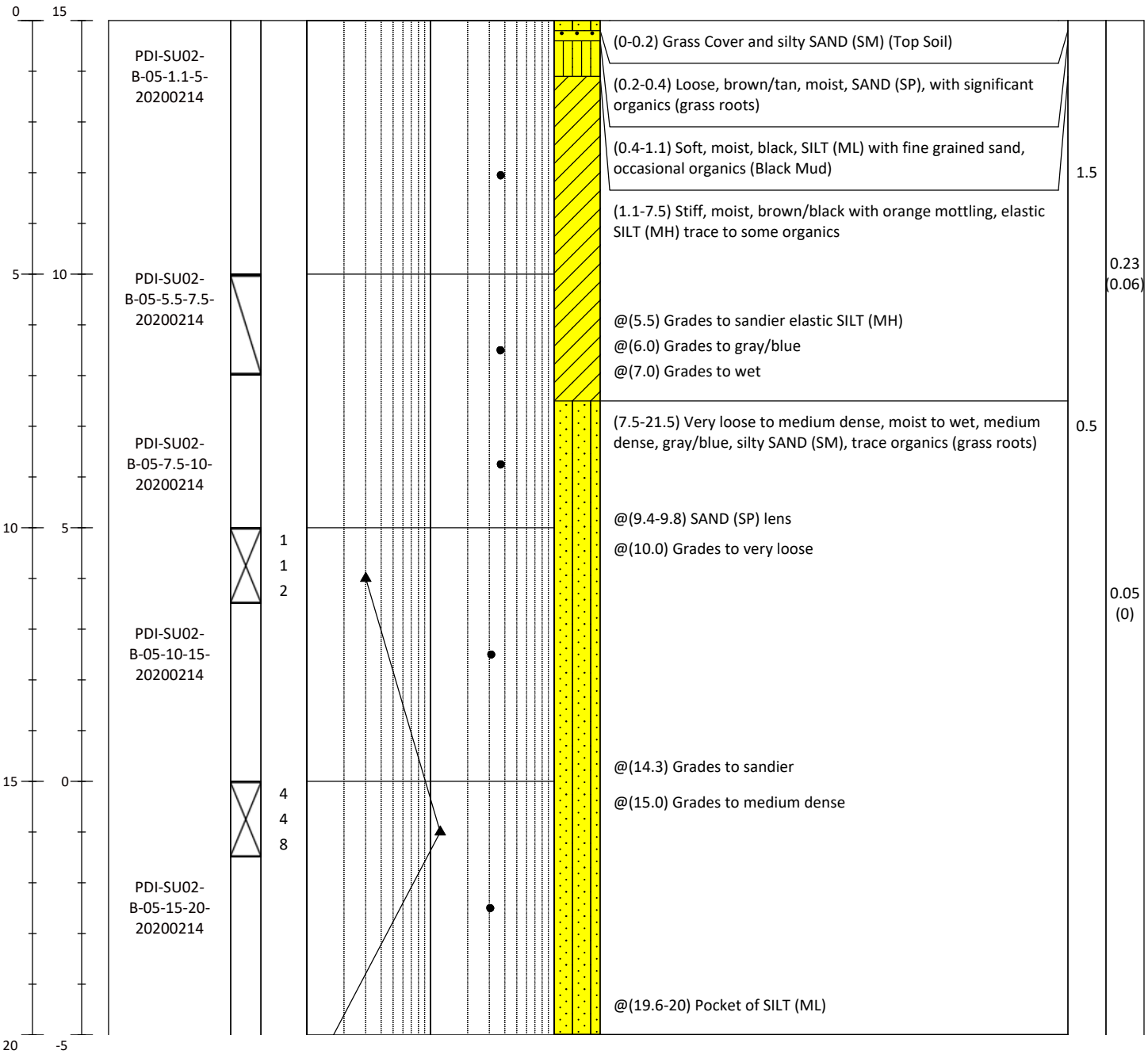
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305051** E/LONG: **1004272**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.01**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305051** E/LONG: **1004272**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.01**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20	-5		1 WOH 1			(7.5-21.5) Very loose to medium dense, moist to wet, medium dense, gray/blue, silty SAND (SM), trace organics (grass roots)		
						(21.5-25.0) No Recovery. Sampler drops to 25 FT		
25	-10		WOH WOH WOH			(25.0-35.0) Very soft, olive-brown, elastic SILT (MH) trace organics (grass roots), occasional pockets of SILT (ML)	0	
30	-15	PDI-SU02-B-05-25-35-20200214						0.01
35	-20	PDI-SU02-B-05-35-37-20200214				(35.0-41.5) Very soft, moist, gray, SILT (ML), trace to some organics (wood fibers)		
		PDI-SU02-B-05-35-40-20200214				@(36.3-37.5) Grades to substantial organics (wood fibers)	0.5	0.15 (0.05)
40	-25							

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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305051** E/LONG: **1004272**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-14-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **15.01**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40	-25		WOR			(35.0-41.5) Very soft, moist, gray, SILT (ML), trace to some organics (wood fibers)		
			WOR					
			WOR			End of Boring at 41.5 FT		
45	-30							
50	-35							
55	-40							
60	-45							

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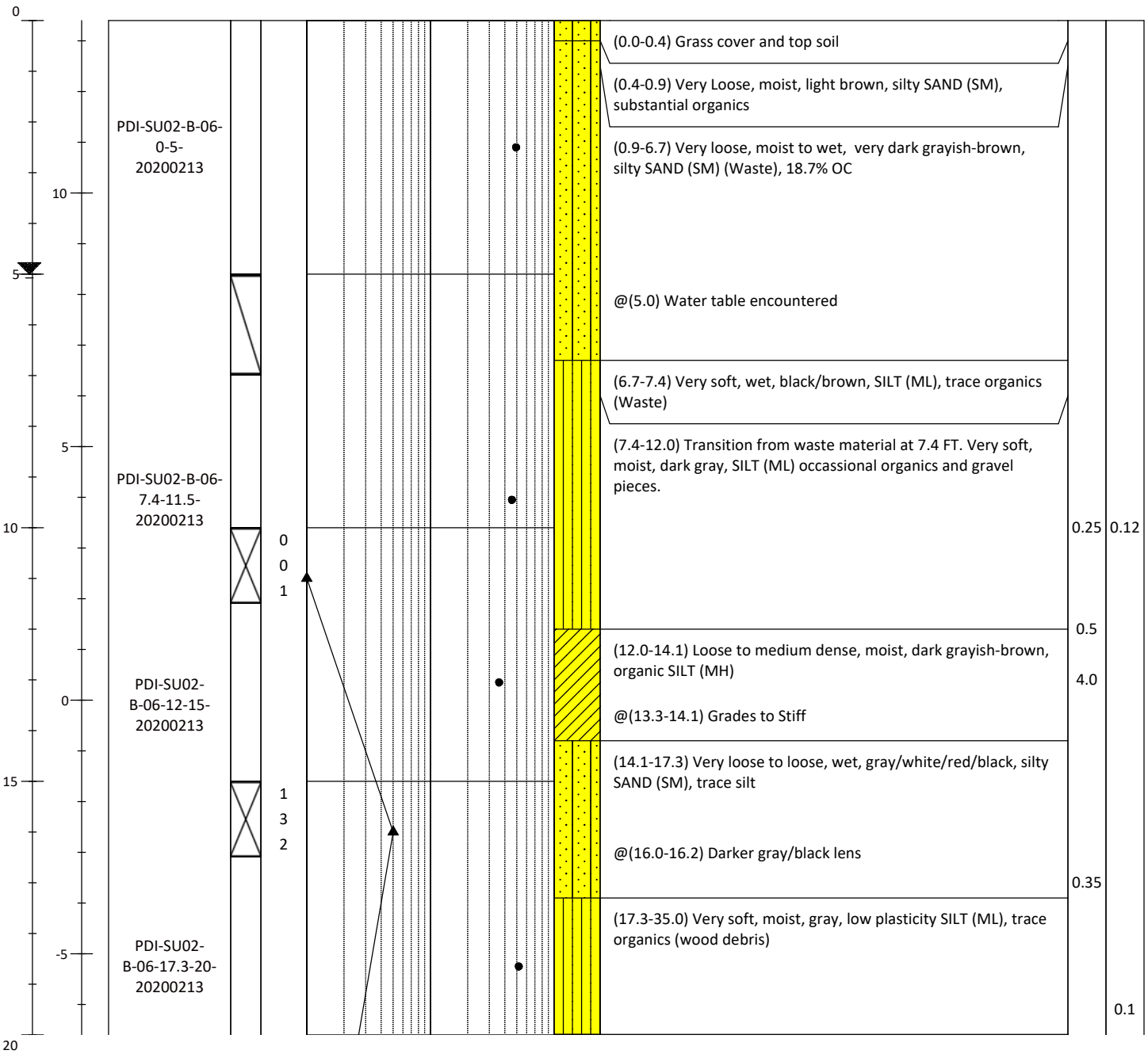
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B6

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305061** E/LONG: **1003508**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **5.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **13.41**



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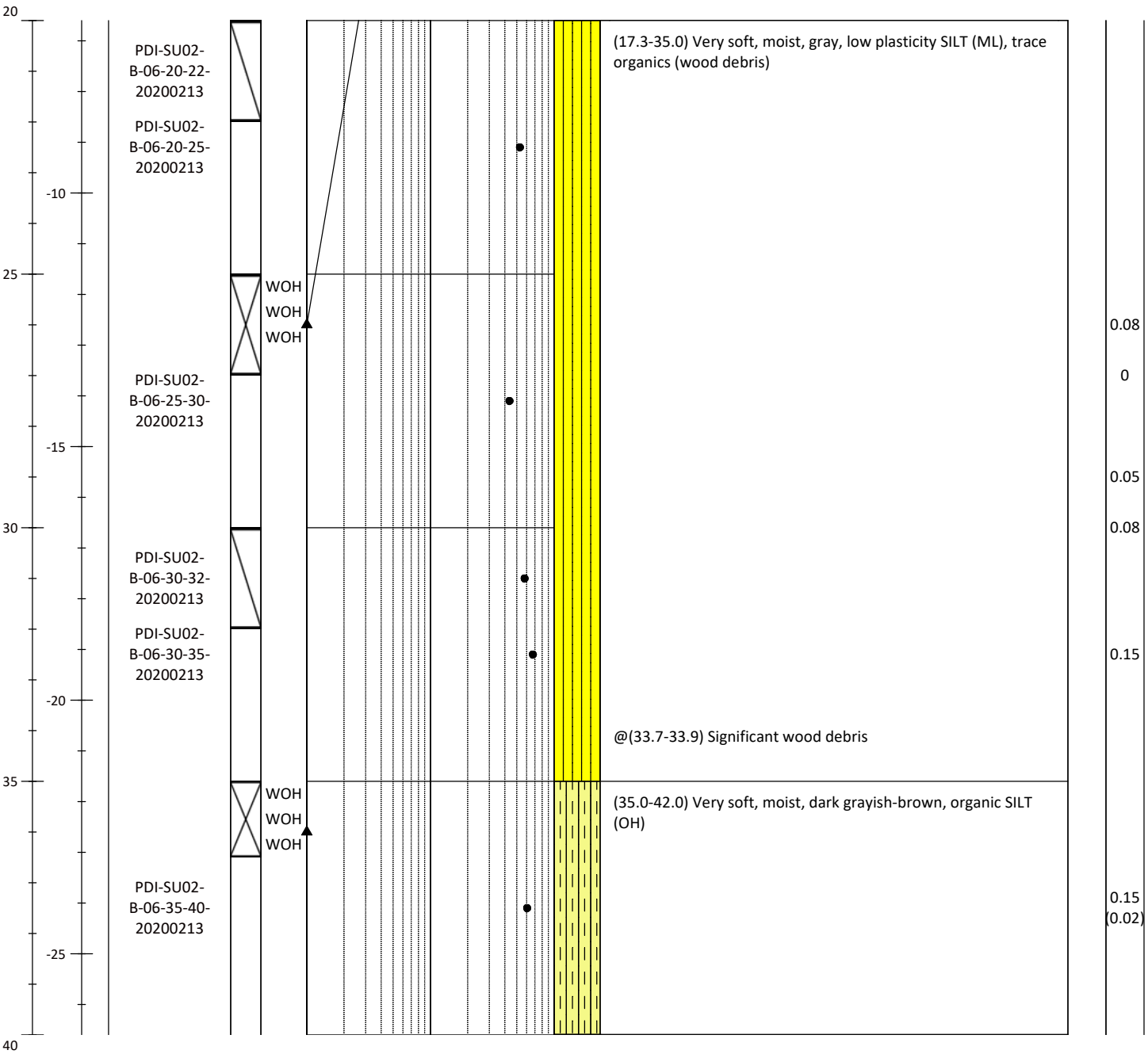
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B6

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305061** E/LONG: **1003508**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **5.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **13.41**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B6

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **305061** E/LONG: **1003508**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **5.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **13.41**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40			WOH WOH WOH WOH			(35.0-42.0) Very soft, moist, dark grayish-brown, organic SILT (OH)		
	-30					End of Boring at 42 FT		
45								
	-35							
50								
	-40							
55								
	-45							
60								

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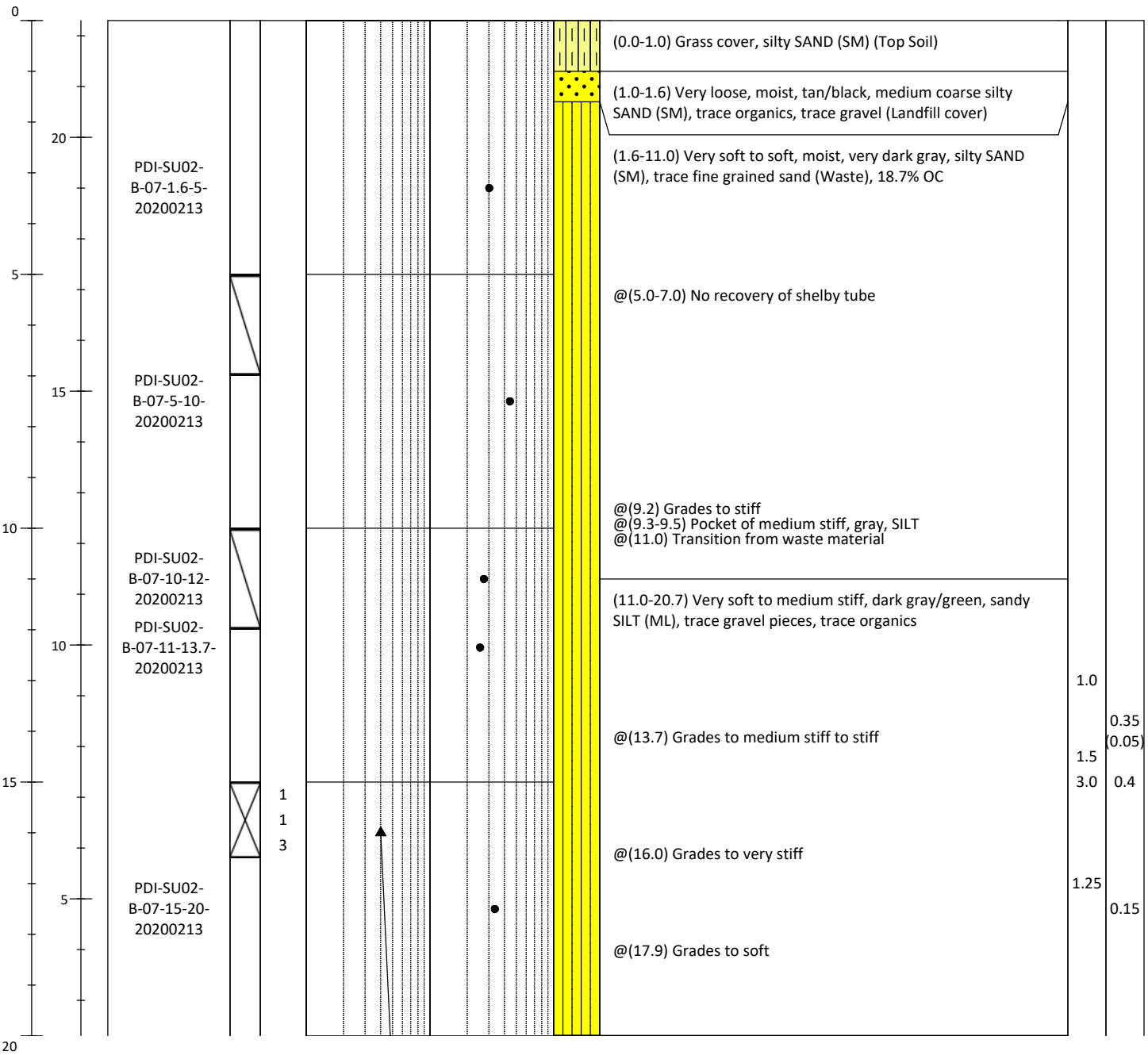
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304908** E/LONG: **1003611**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.31**



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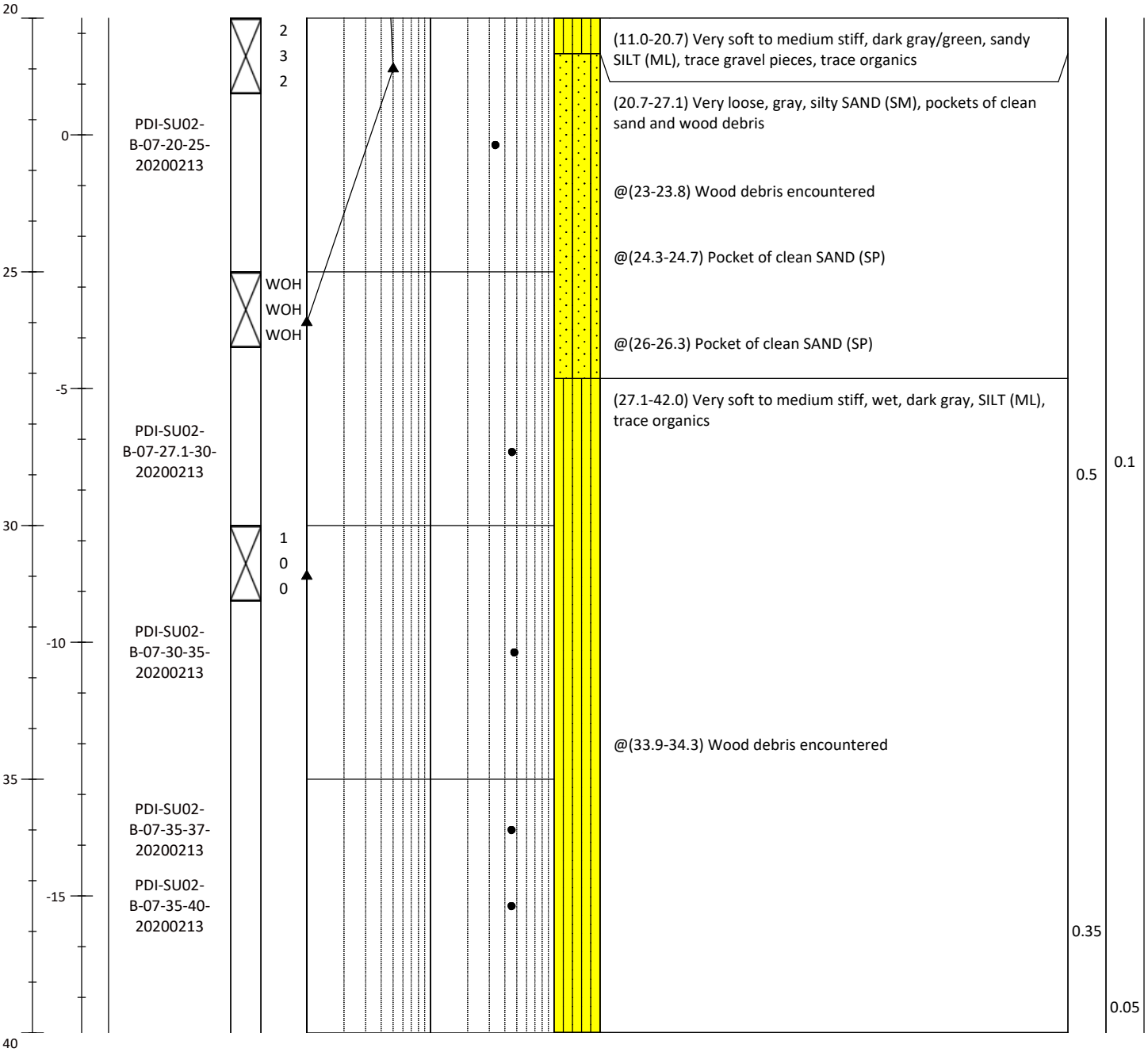
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304908** E/LONG: **1003611**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.31**



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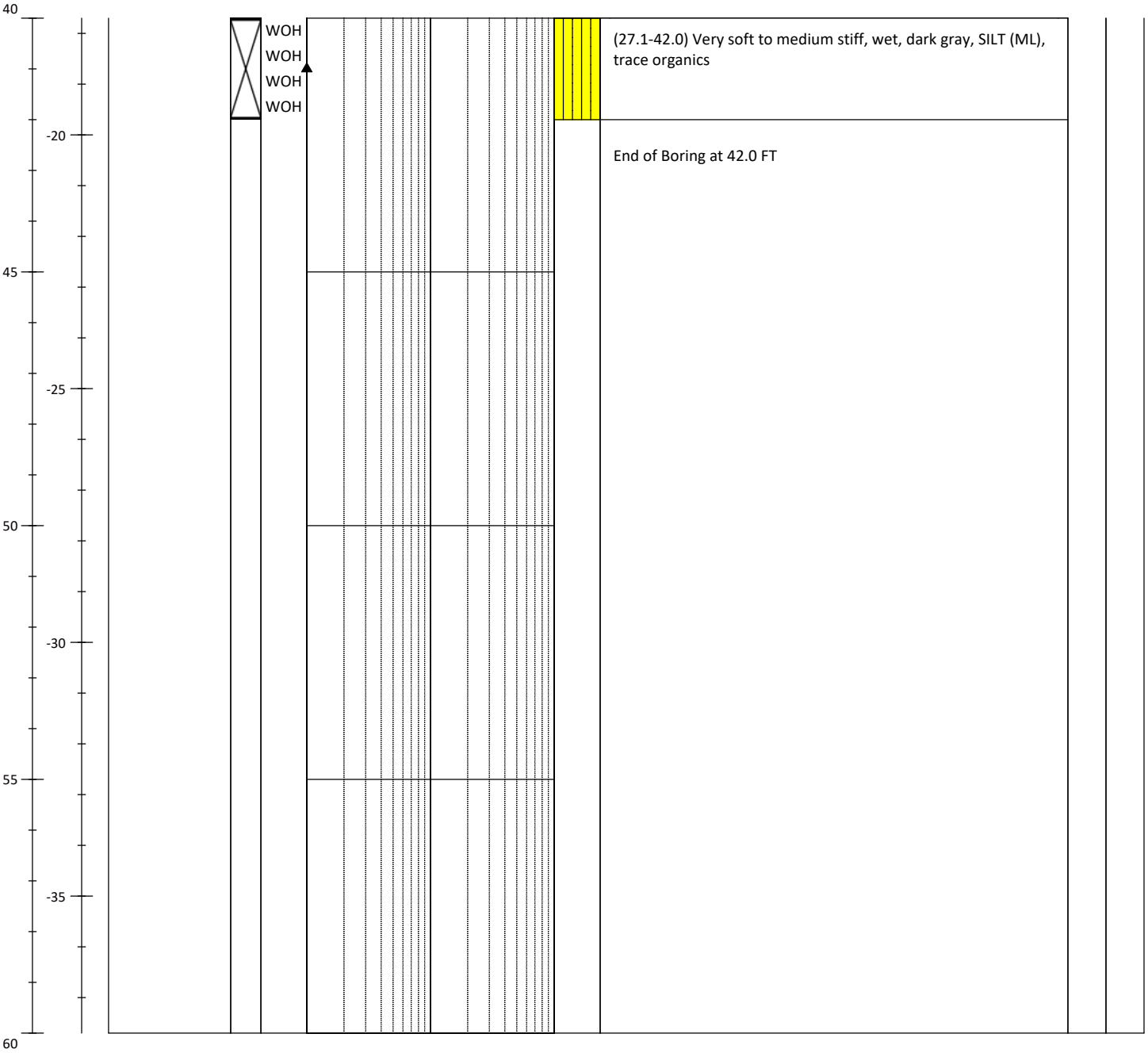
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU02-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **304908** E/LONG: **1003611**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-13-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.31**



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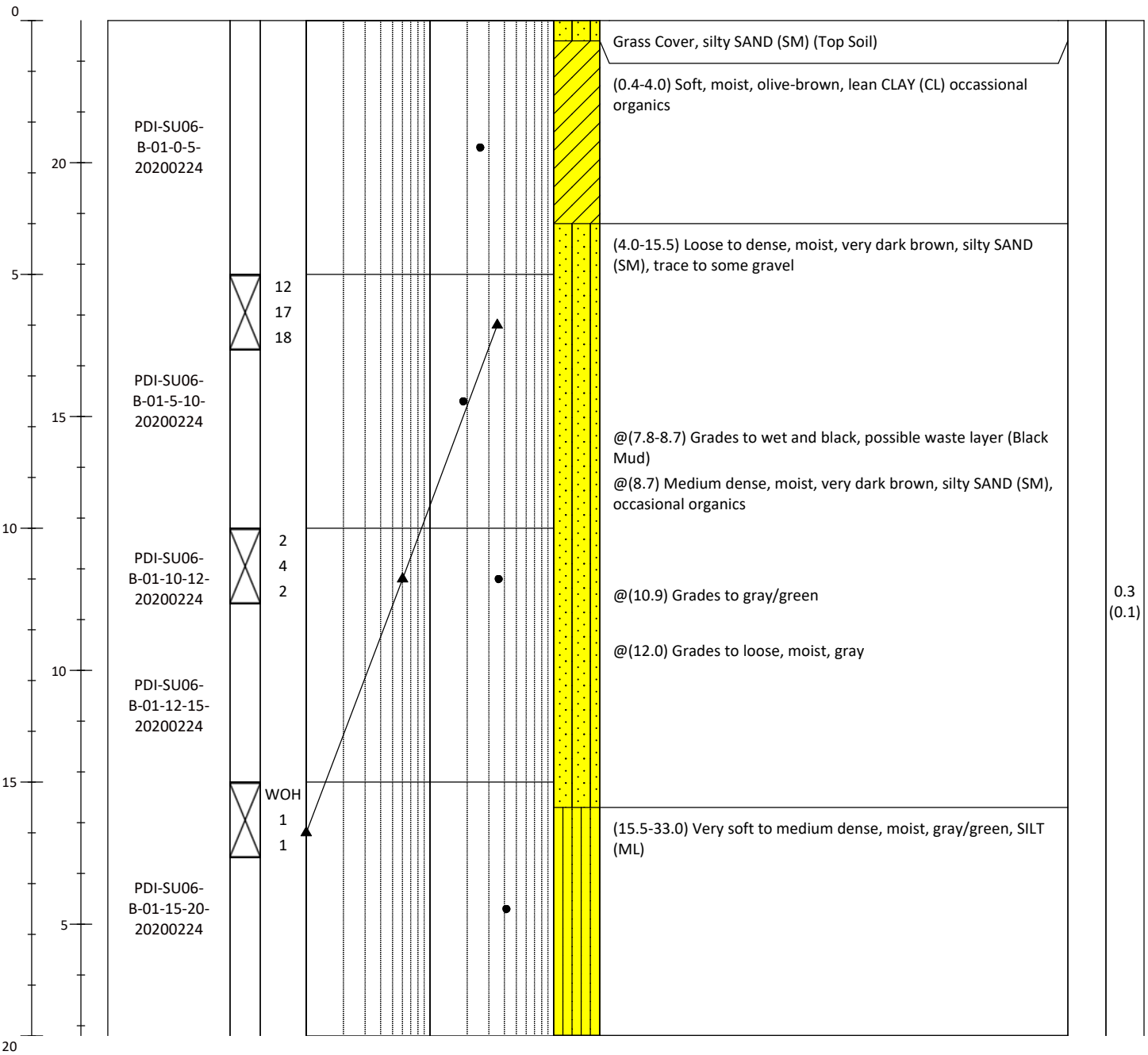
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302427** E/LONG: **1008367**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **50.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.77**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302427** E/LONG: **1008367**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **50.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.77**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description	PP (TSF)	TV (TSF)
20			WOR			(15.5-33.0) Very soft to medium dense, moist, gray/green, SILT (ML)		
			WOR					
		PDI-SU06-B-01-20-25-20200224	WOR			@(21.1-21.6) Pocket of clean SAND (SP), non-impacted		
0								
						@(24.0) Grades to stiff		
25		PDI-SU06-B-01-25-27-20200224						
		PDI-SU06-B-01-26-28-20200224						0.65 (0.1)
-5								
		PDI-SU06-B-01-28-30-20200224				@(28.0) Grades to medium dense, moist, gray		
30			1					
		PDI-SU06-B-01-30-33-20200224	4					
			10					
-10								
		PDI-SU06-B-01-33-35-20200224				(33.0-40.0) Loose to medium dense, moist, gray/white/red, medium coarse silty SAND (SM)		
35			2					
			4					
			6					
		PDI-SU06-B-01-35-40-20200224						
-15								
40								

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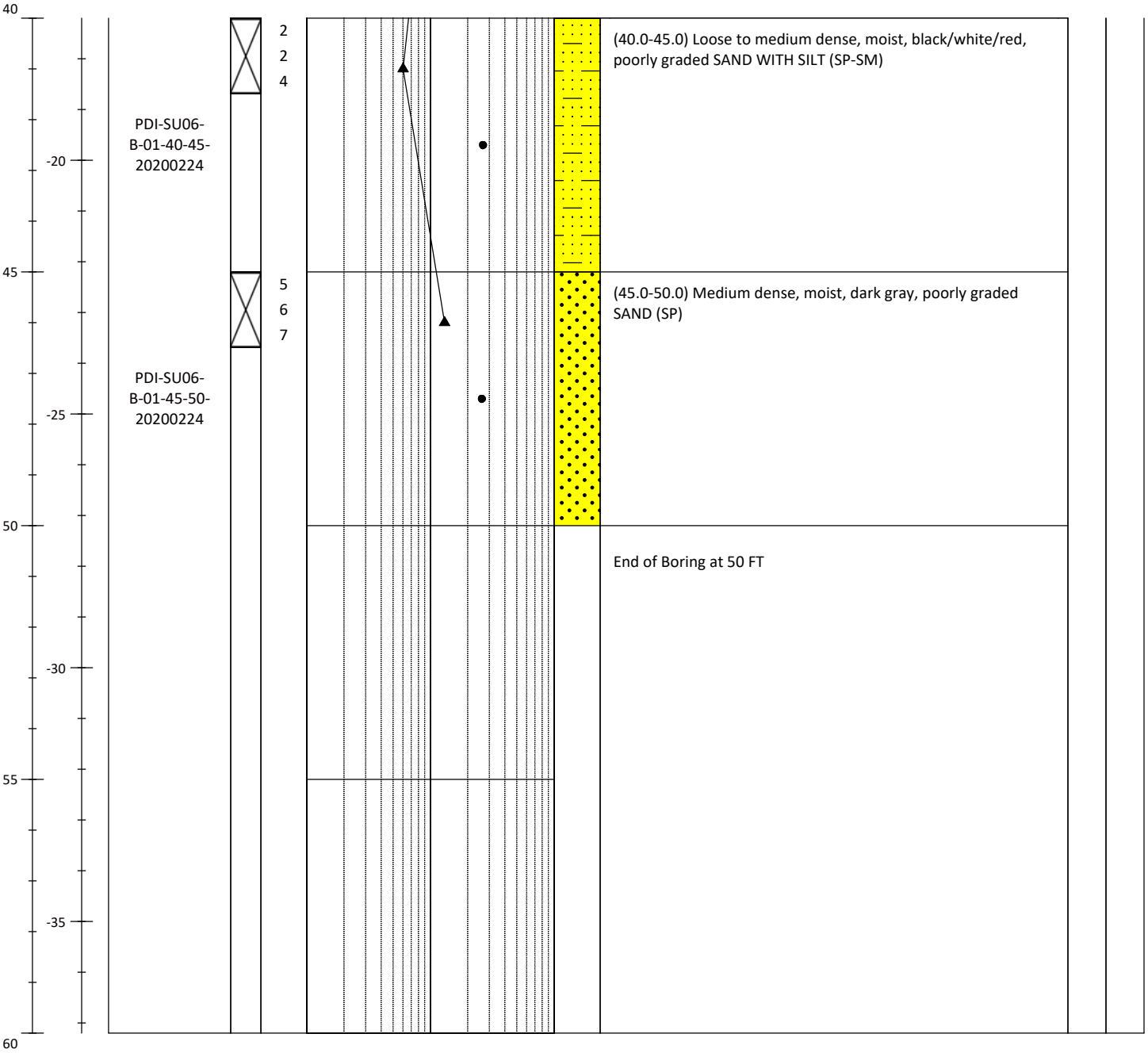
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302427** E/LONG: **1008367**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **50.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.77**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B02

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302704** E/LONG: **1008605**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **51.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.44**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
0	20	PDI-SU06-B-02-0-5-20200222				(0.0-0.1) Grass cover (0.1-3.9) Very loose to loose, wet, silty SAND (SM), organics (grass roots)		
5	15		1 1 1			(3.9-4.5) Very loose to Loose, moist, black/tan, silty SAND (SM) with gravel (4.5-5.2) Very soft, wet, brown, SILT (ML), trace organics (small sticks) (5.2-10.0) Very soft, moist, black, SILT (ML), fine gray laminations (Waste).		
10	10	PDI-SU06-B-02-7-9.5-20200222						
		PDI-SU06-B-02-10-15-20200222	WOH 5 5			(10.0-24.0) Loose to medium dense, moist, very dark gray, silty SAND (SM) (Waste)	0.5	0.13
15	5		WOH WOR WOR					
20								

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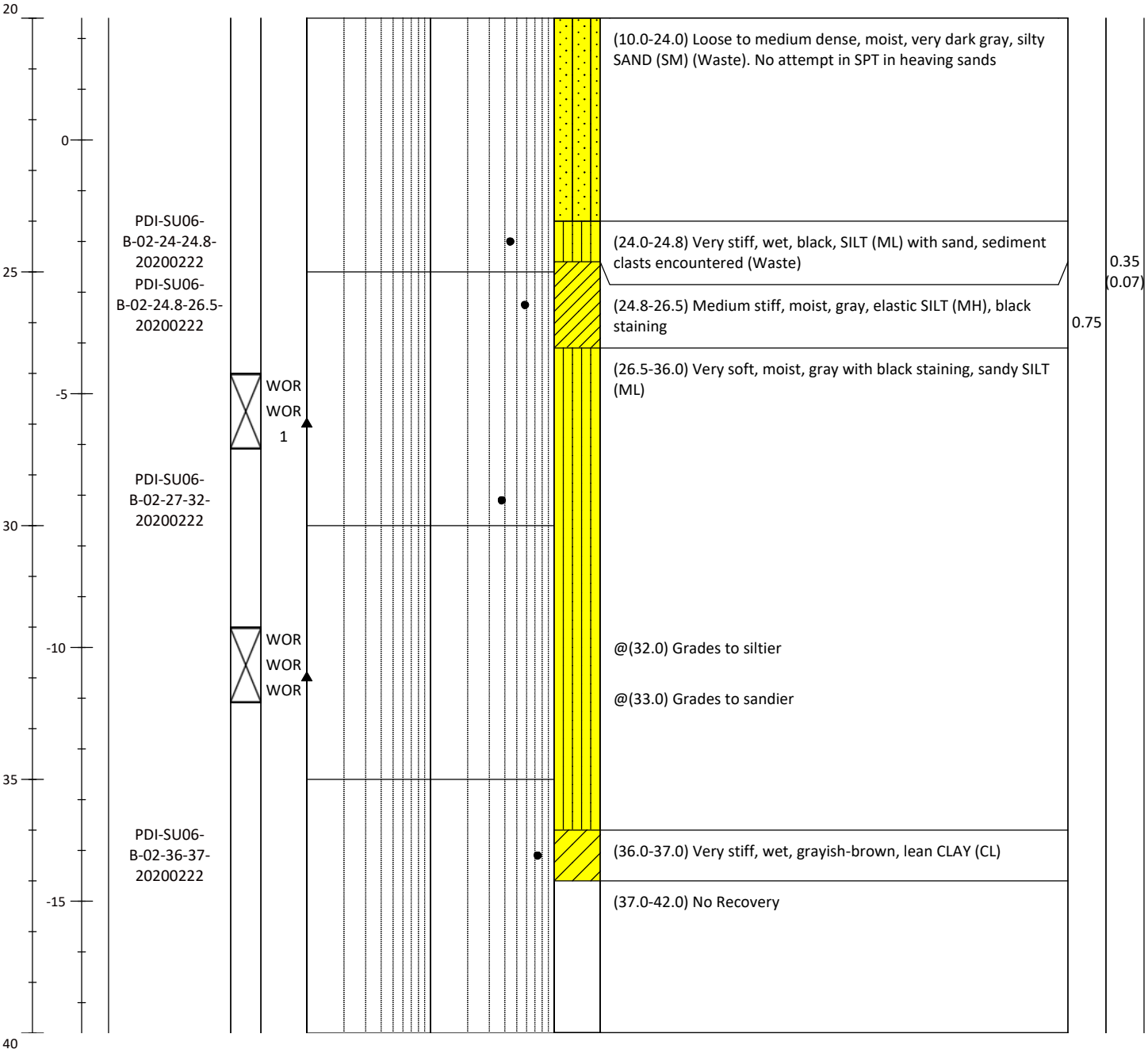
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B02

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302704** E/LONG: **1008605**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **51.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.44**



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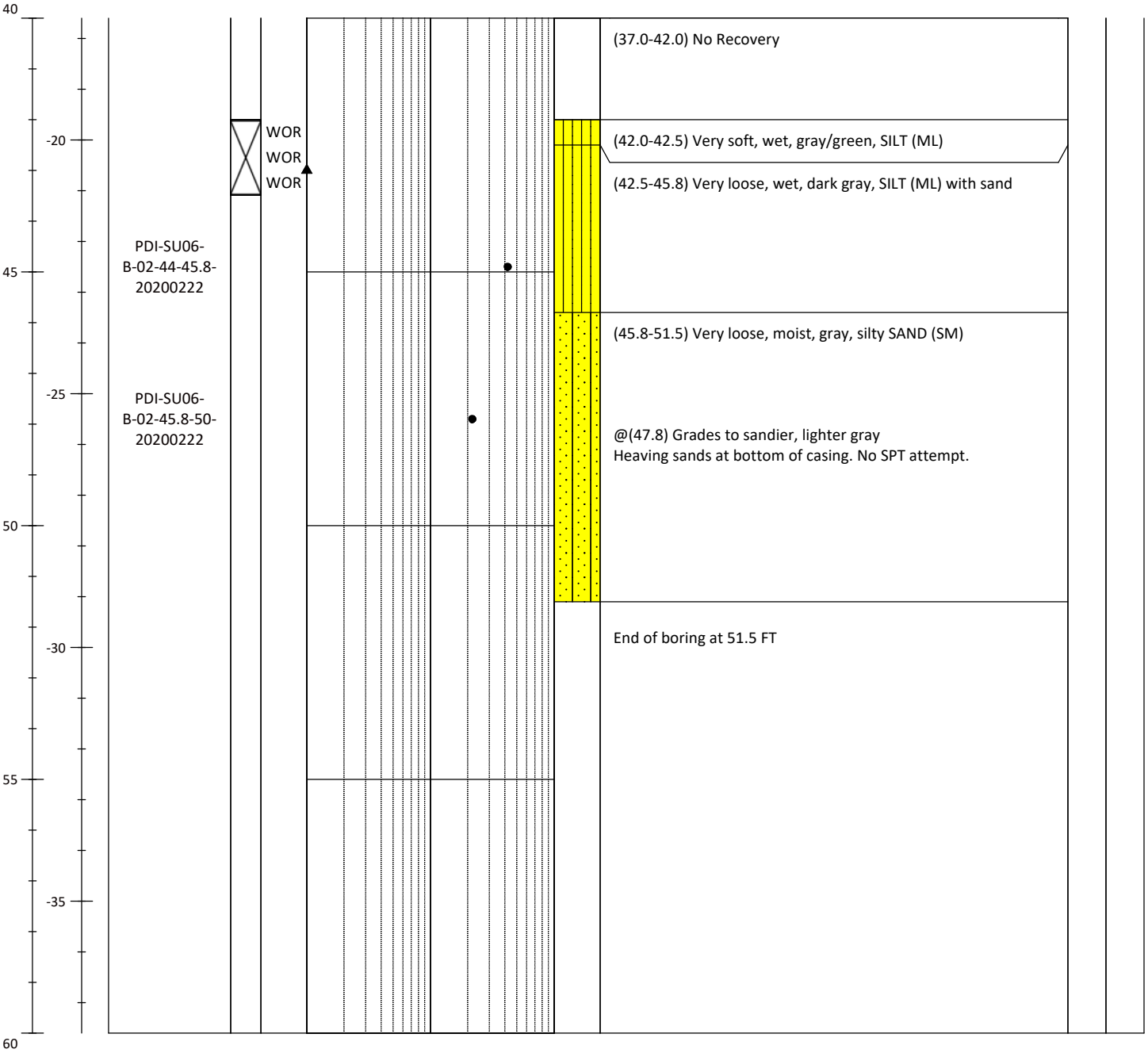
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B02

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302704** E/LONG: **1008605**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **51.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): --
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.44**



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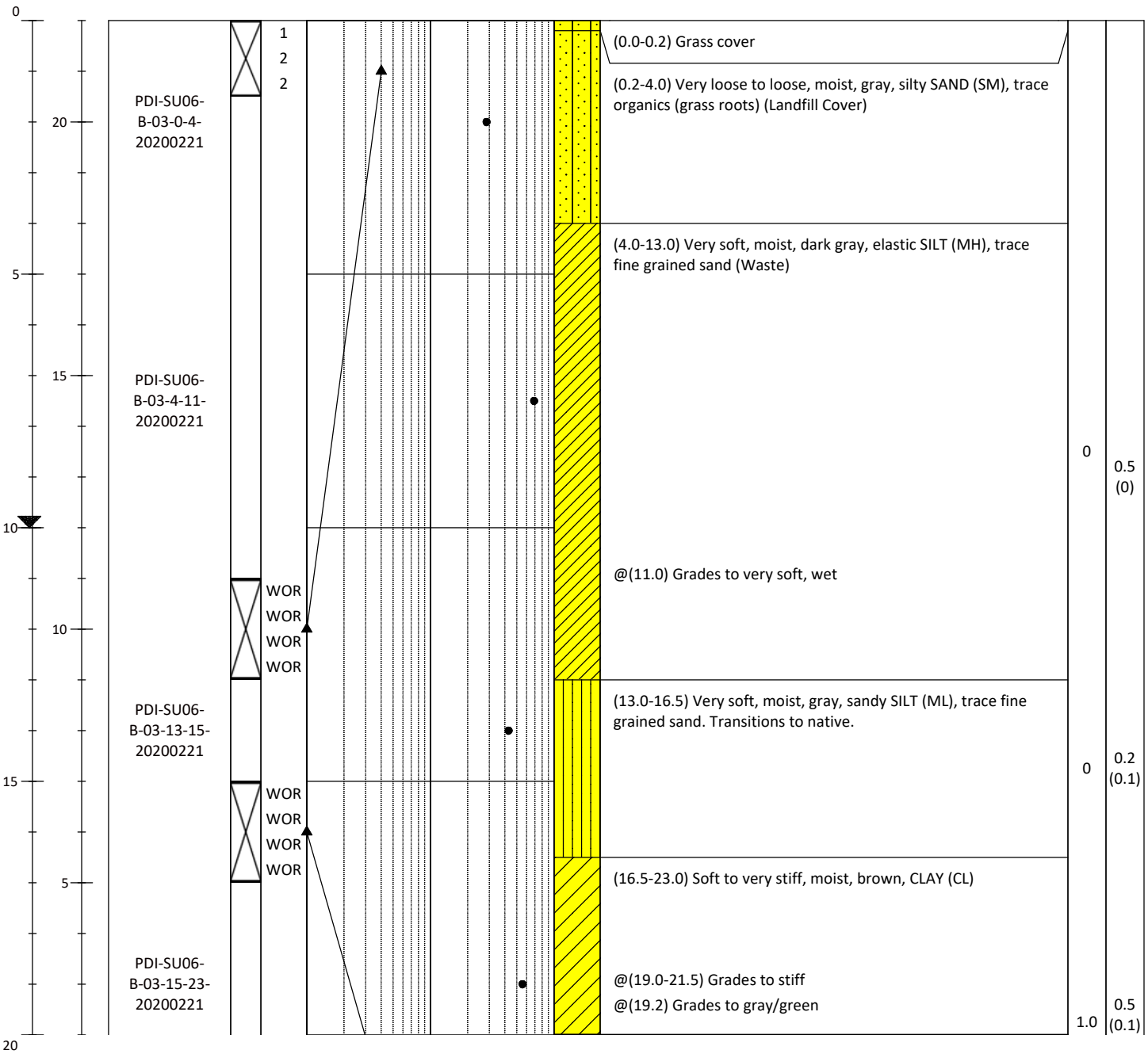
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302961** E/LONG: **1008845**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.01**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302961** E/LONG: **1008845**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.01**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20								
	0					(16.5-23.0) Soft to very stiff, moist, brown, CLAY (CL) @(20.5-21.2) Contains orange mottling @(21.5) Grades to very stiff		
		PDI-SU06-B-03-23-25-20200221	4 7 8			(23.0-35.0) Stiff to very stiff, moist, gray, sandy SILT (ML)		
25	-5							
30								
	-10	PDI-SU06-B-03-30-35-20200221						
35						(35.0-40.0) No Recovery. Possible heaving sands.		
	-15							
40								

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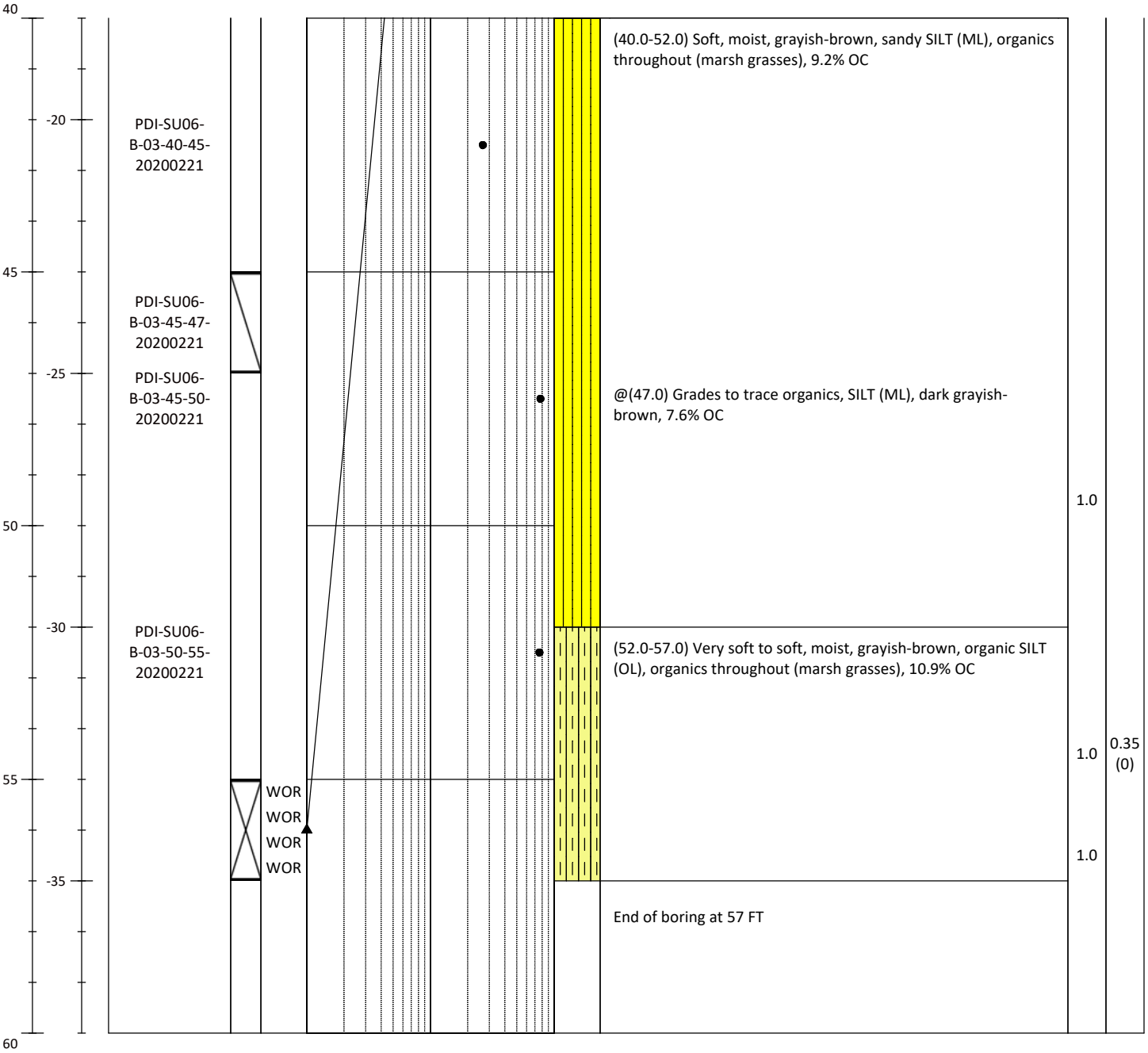
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302961** E/LONG: **1008845**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.01**



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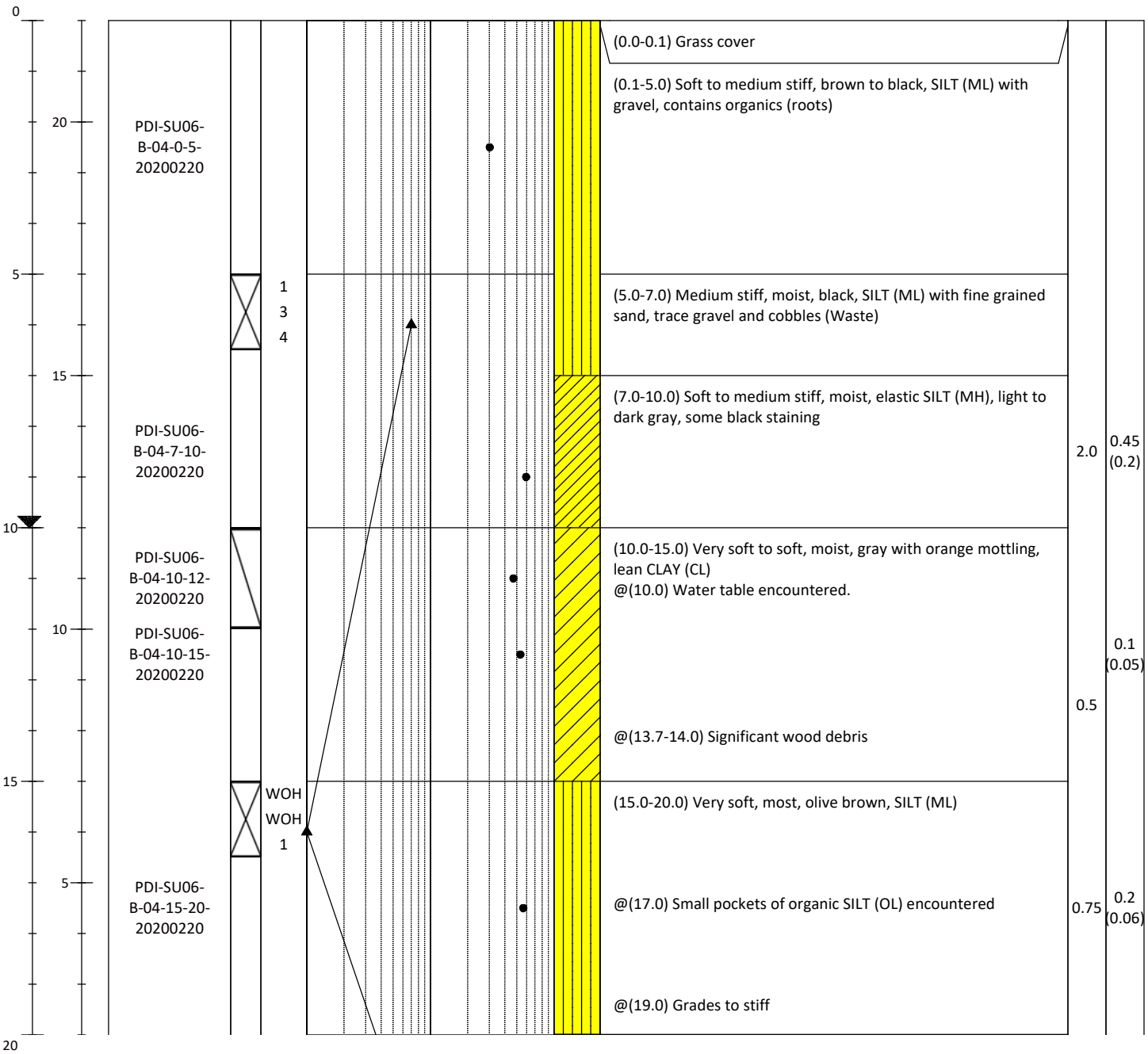
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302858** E/LONG: **1009068**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20,21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **21.97**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302858** E/LONG: **1009068**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20,21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **21.97**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
20			2			(20.0-43.0) Very loose to loose, moist, gray, fine grained silty SAND (SM)		
			2					
			3					
	0	PDI-SU06-B-04-20-25-20200220						
25			4					
			5					
			6					
	-5	PDI-SU06-B-04-25-30-20200220						
30			1					
			2					
			1					
	-10	PDI-SU06-B-04-30-35-20200220						
35			WOR			@(38.0) Grades to loose, moist, gray, interbedding/pockets of sand and silt		
			WOR					
			WOR					
	-15							
40								

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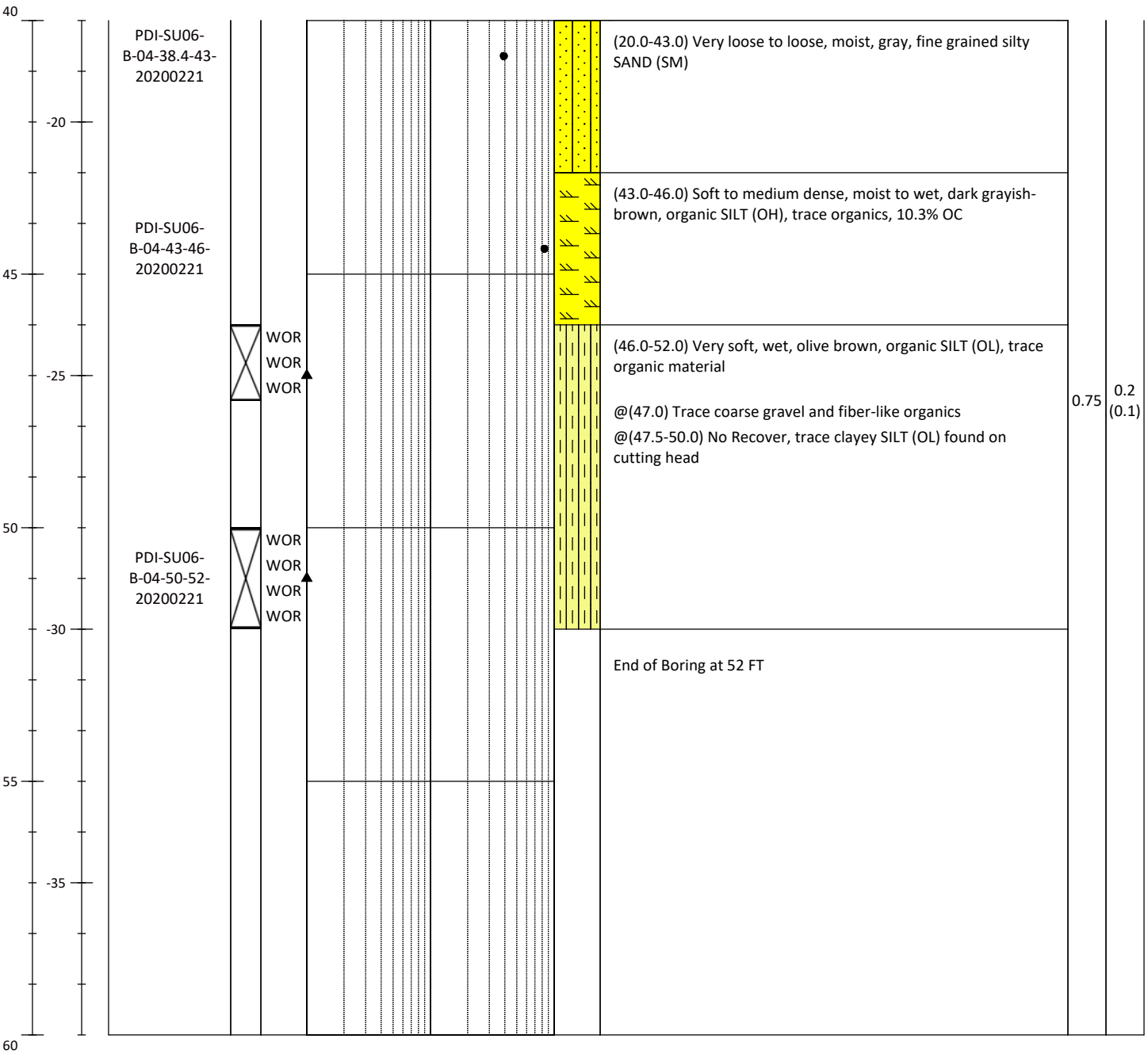
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302858** E/LONG: **1009068**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20,21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **21.97**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302321** E/LONG: **1008717**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.74**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
0	20	PDI-SU06-B-05-3.6-5-20200224	3 3 7			(0.0-0.3) Grass cover (0.3-3.6) Very loose to loose, dark gray, moist to wet, SAND (SP), occassional organics (Waste)		
5	15	PDI-SU06-B-05-5-10-20200224	WOH WOH 1			(3.6-15.4) Very loose to loose, moist, black, fine grained, silty SAND (SM), fine gray interbedded layers (Waste) @(5.4) Grades to wet and occasional pockets of SILT (ML)		
10	10	PDI-SU06-B-05-10-15-20200224				@(10.0) Water table encountered		
15	5	PDI-SU06-B-05-15-20-20200224	WOR WOR WOR			@(15.4-16.2) Very soft, black, PEAT (PT), contains sticks and grasses (16.2-25.0) Soft to medium stiff, moist, gray/green, Clay (CL)	0.5	0.4
20								

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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302321** E/LONG: **1008717**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.74**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20		PDI-SU06-B-05-20-22-20200224				(16.2-25.0) Soft to medium stiff, moist, gray/green, Clay (CL)		
		PDI-SU06-B-05-20-25-20200224				@(22.2) Grades to very stiff		
25	0	PDI-SU06-B-05-25-27-20200224				(25.0-35.5) Very soft, moist, gray, fine grained sandy SILT (ML)	4.0	0.8 (0.1)
		PDI-SU06-B-05-25-30-20200224						
30	-5		WOR					
			WOR					
			WOR			@(32.0) Grades soft to medium stiff, wet, gray		
		PDI-SU06-B-05-32-34.2-20200224						
		PDI-SU06-B-05-34.2-35.5-20200224				@(34.2) Grades to very soft, wet, gray		
35	-10		7			(35.5-38.0) Medium dense, moist, red/white/gray, silty SAND (SM)		
			10					
			7					
		PDI-SU06-B-05-37-38-20200224						
		PDI-SU06-B-05-38-40-20200224				(38.0-41.0) Very soft, light gray, moist, SILT (ML) ocasional organics (wood chips and grasses)		
40	-15							

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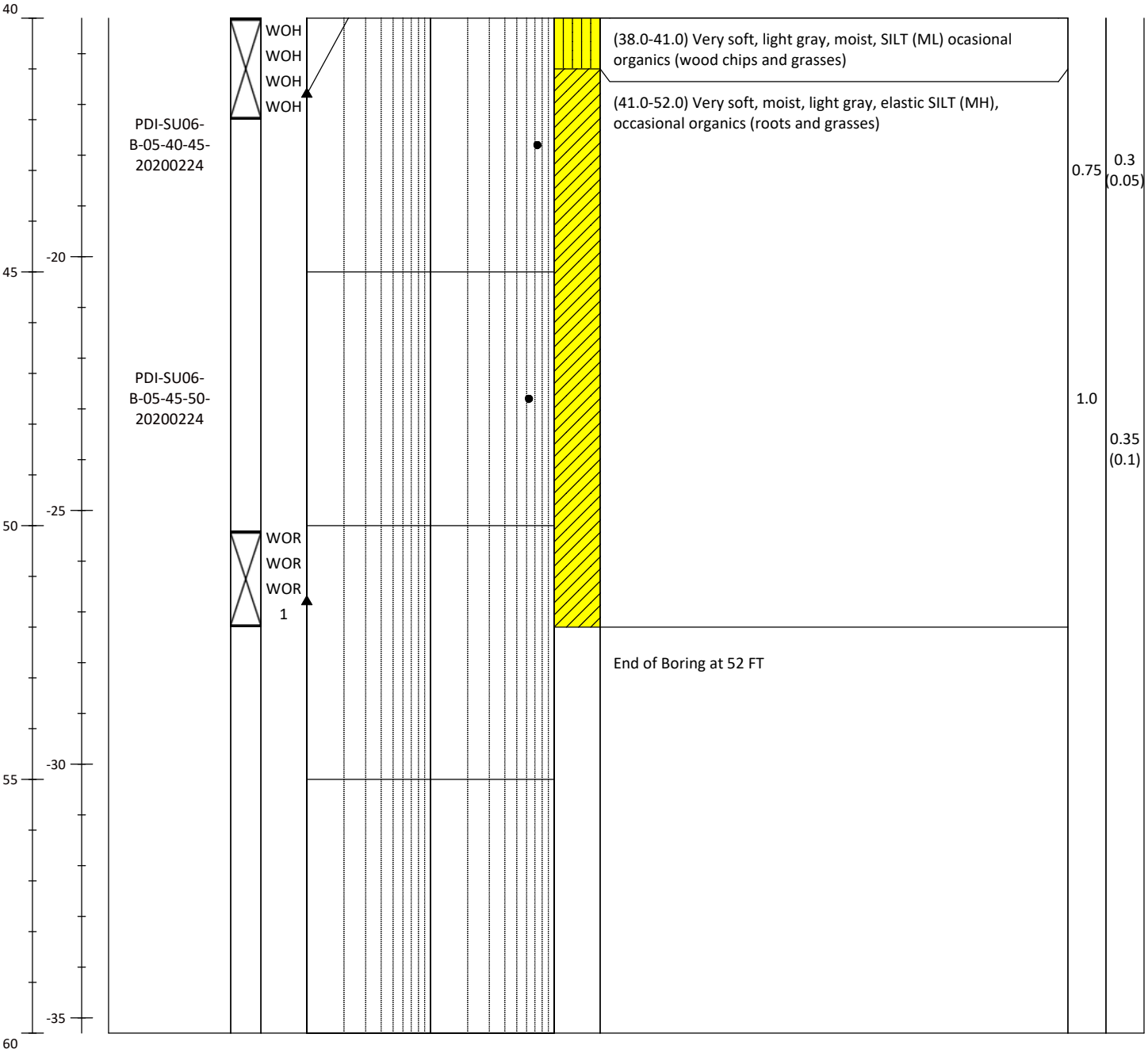
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B5

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302321** E/LONG: **1008717**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-24-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.74**



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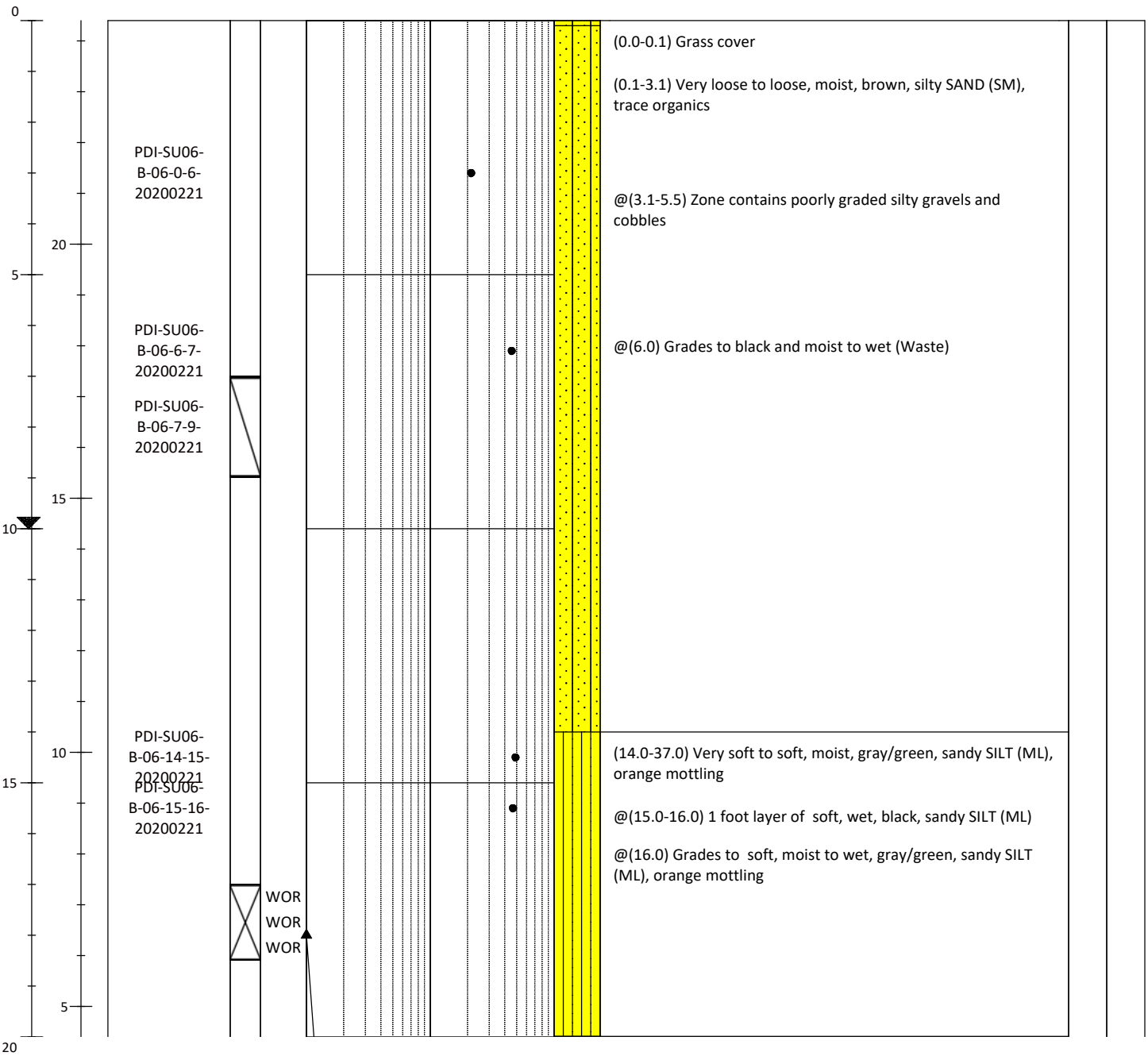
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B06

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302606.85** E/LONG: **1008781.39**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.41**



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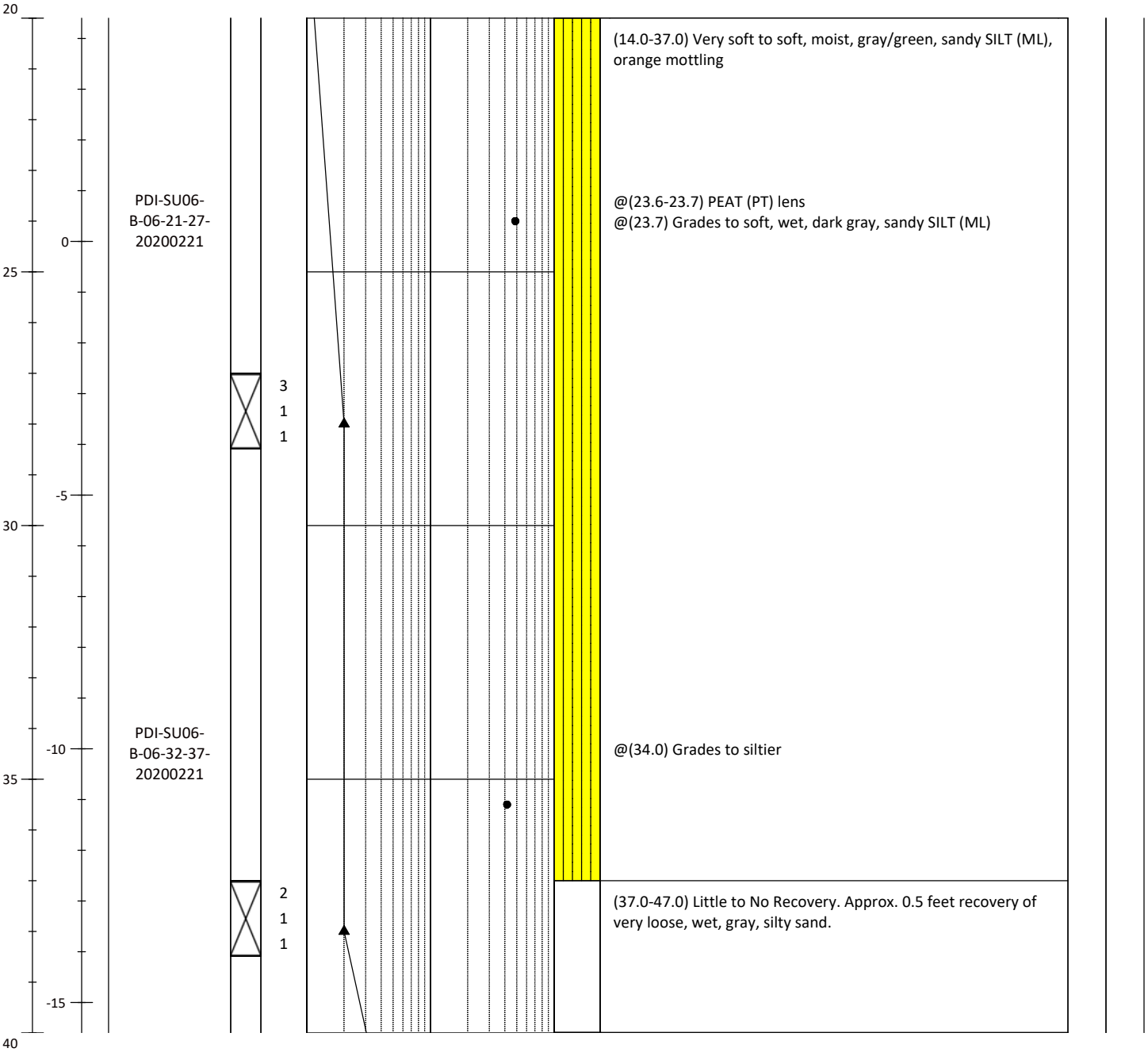
▲ SPT N-Value
● Moisture Content (%)

Notes: @(30.0) Driller reports heaving sand conditions, @(37.0) Artesian well conditions encountered, @(37.0-47.0) 0.5 FT recovery due to heave and washout generated by groundwater conditions, @(57-58.5) No SPT attempt due to heaving sands

Soil Boring Log
SU06-B06

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302606.85** E/LONG: **1008781.39**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.41**



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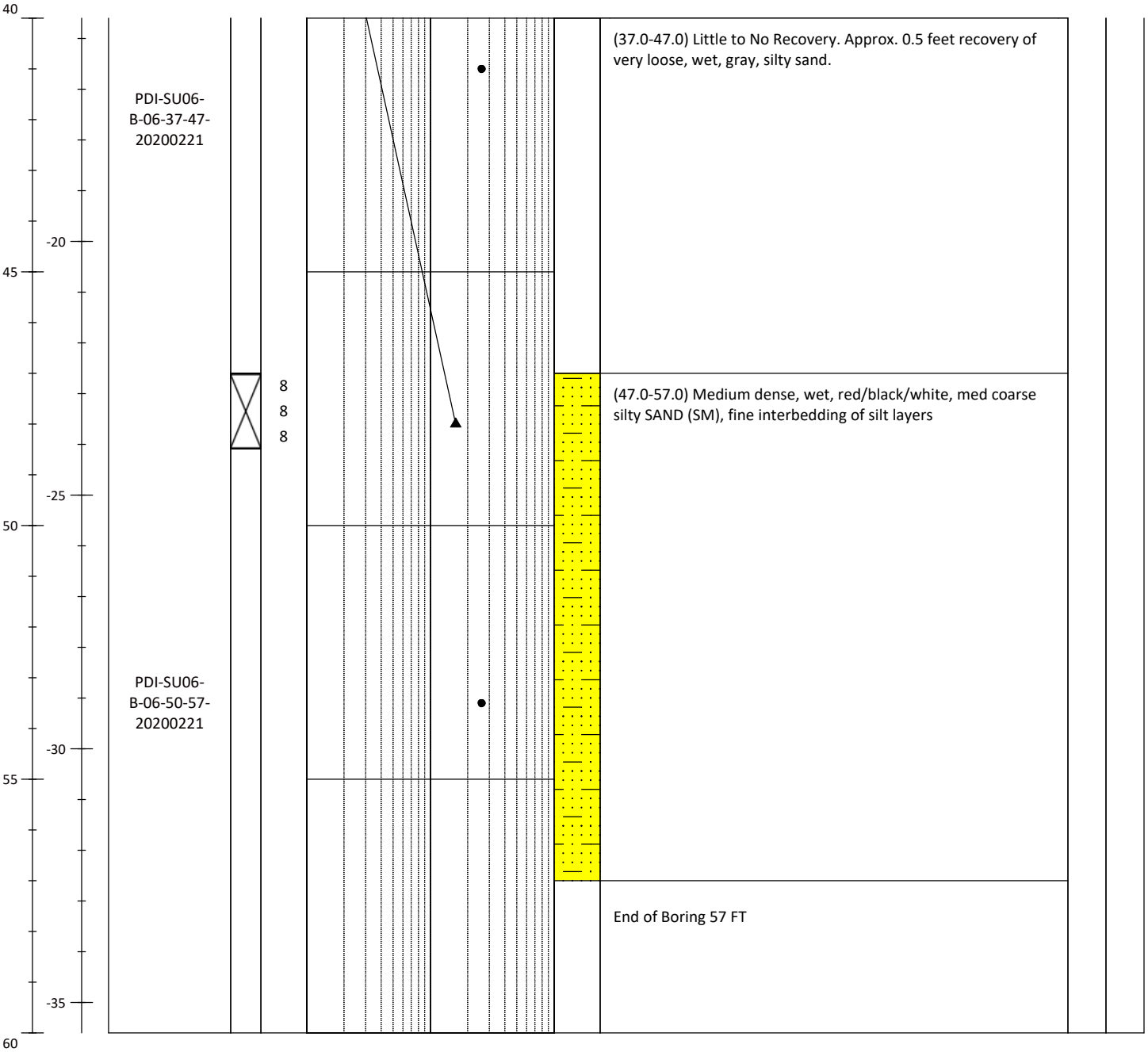
▲ SPT N-Value
● Moisture Content (%)

Notes: @(30.0) Driller reports heaving sand conditions, @(37.0) Artesian well conditions encountered, @(37.0-47.0) 0.5 FT recovery due to heave and washout generated by groundwater conditions, @(57-58.5) No SPT attempt due to heaving sands

Soil Boring Log
SU06-B06

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302606.85** E/LONG: **1008781.39**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-21-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.41**



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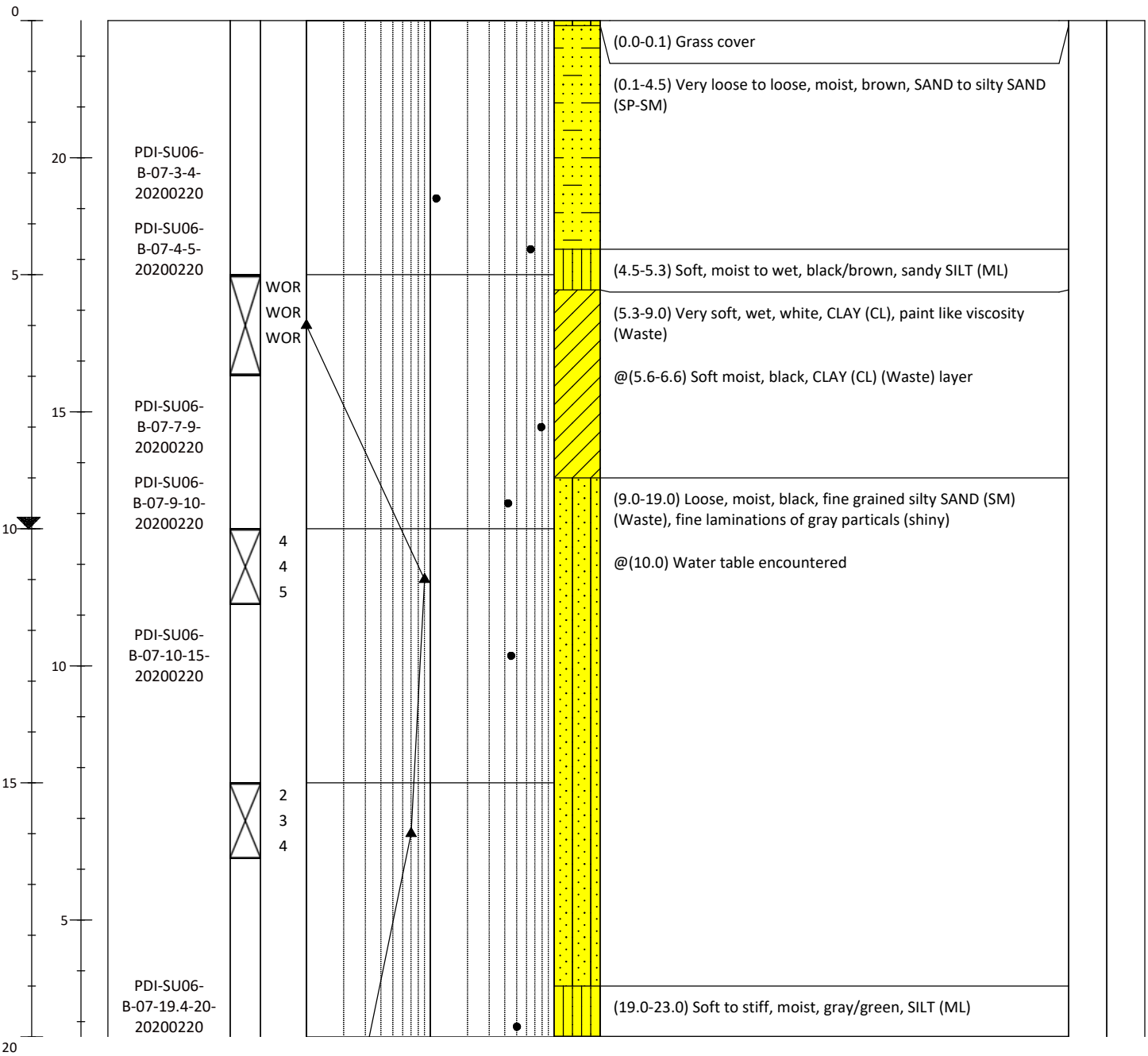
▲ SPT N-Value
● Moisture Content (%)

Notes: @(30.0) Driller reports heaving sand conditions, @(37.0) Artesian well conditions encountered, @(37.0-47.0) 0.5 FT recovery due to heave and washout generated by groundwater conditions, @(57-58.5) No SPT attempt due to heaving sands

Soil Boring Log
SU06-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302640** E/LONG: **1009142**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **56.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.73**



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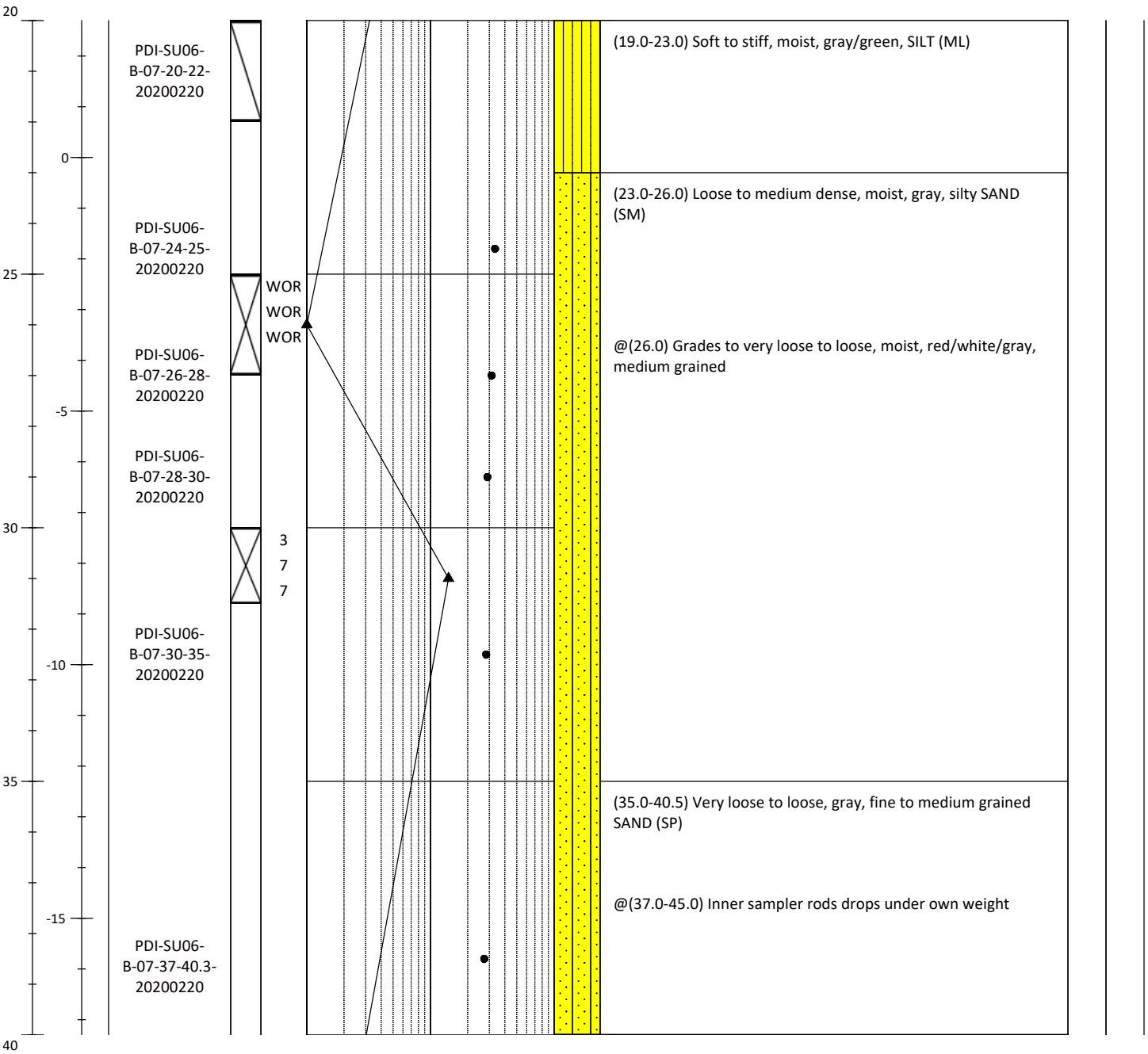
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302640** E/LONG: **1009142**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **56.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.73**



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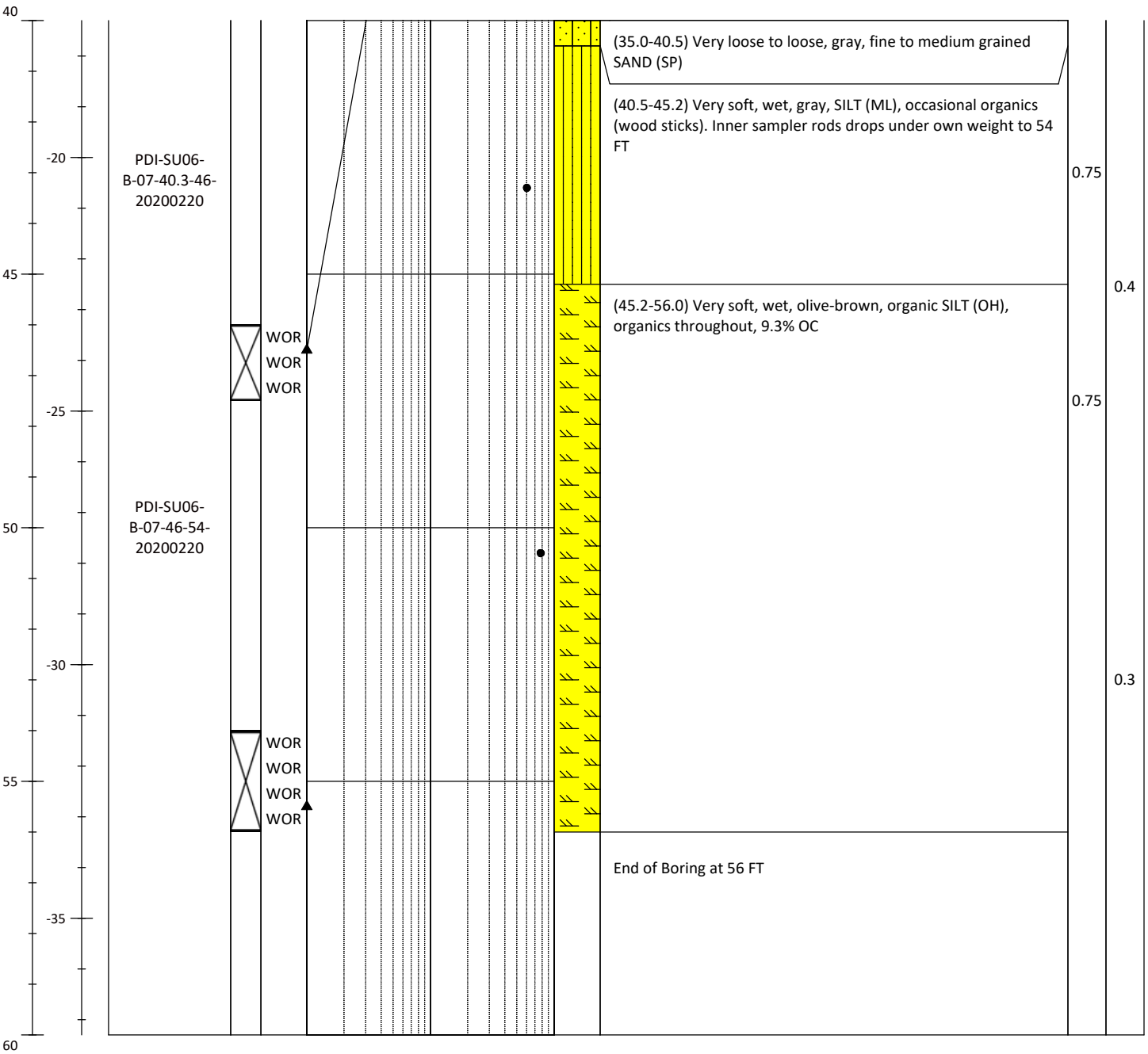
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B7

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302640** E/LONG: **1009142**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-20-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **56.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.73**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B8

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302473.83** E/LONG: **1008676**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **53.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.33**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
0	20	PDI-SU06-B-08-0-5-20200222		●		(0.0-0.2) Very loose, wet, gray, SAND (SP), occasional organics (grasses and roots) (0.2-21.0) Very soft, wet, black, elastic SILT (MH), fine gray laminations (Waste)		
5	15							
10	10	PDI-SU06-B-08-0-21-20200222	WOR WOR WOR			@(11.5) Grades to sandier		
15	5	PDI-SU06-B-08-10-17-20200222		●		@(14.0) Grades to loose to medium dense, very dark gray, sandy elastic SILT (MH), 37.8% OC		
20		PDI-SU06-B-08-17-19-20200222					2.5	0.8

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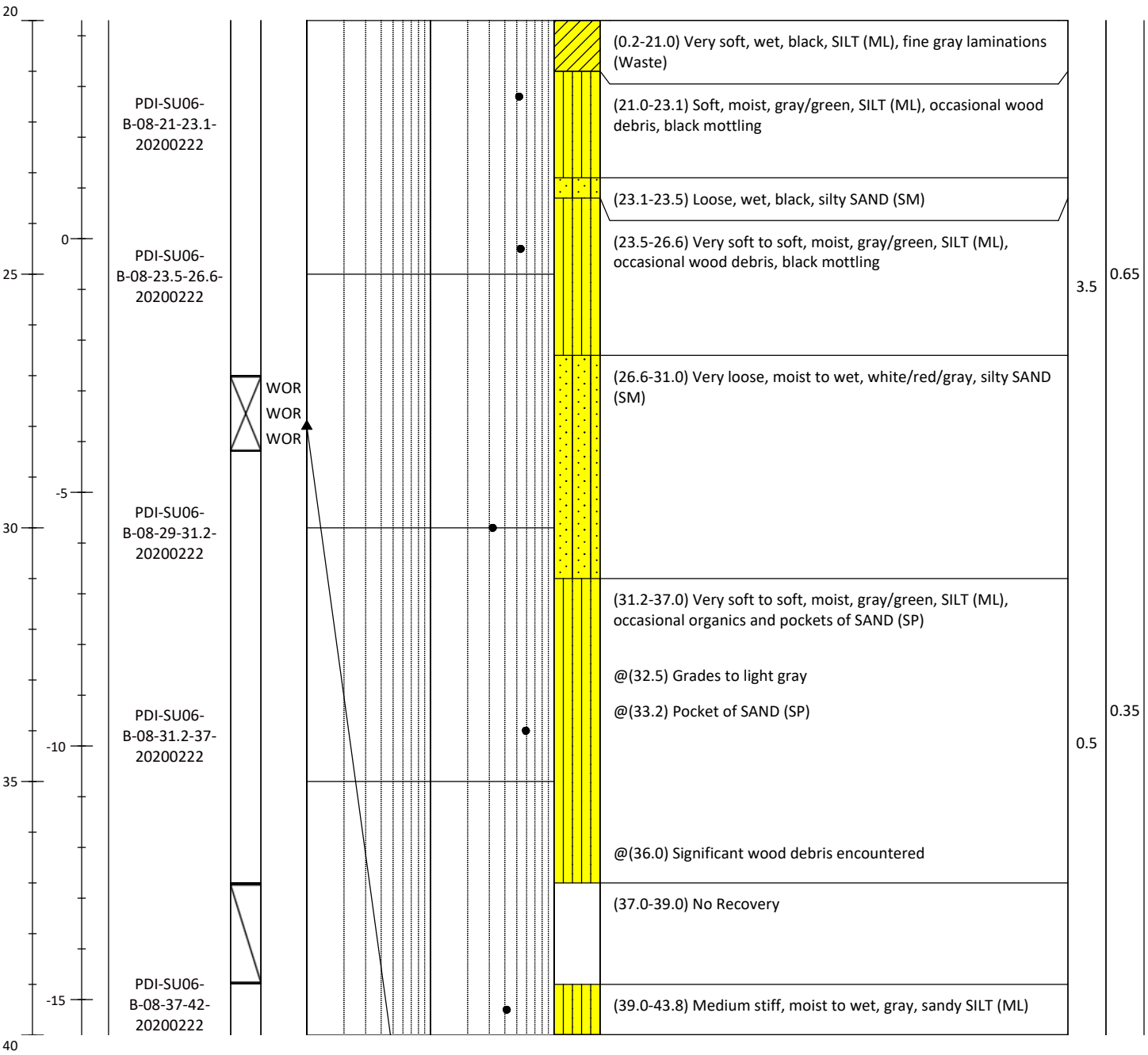
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B8

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302473.83** E/LONG: **1008676**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **53.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.33**



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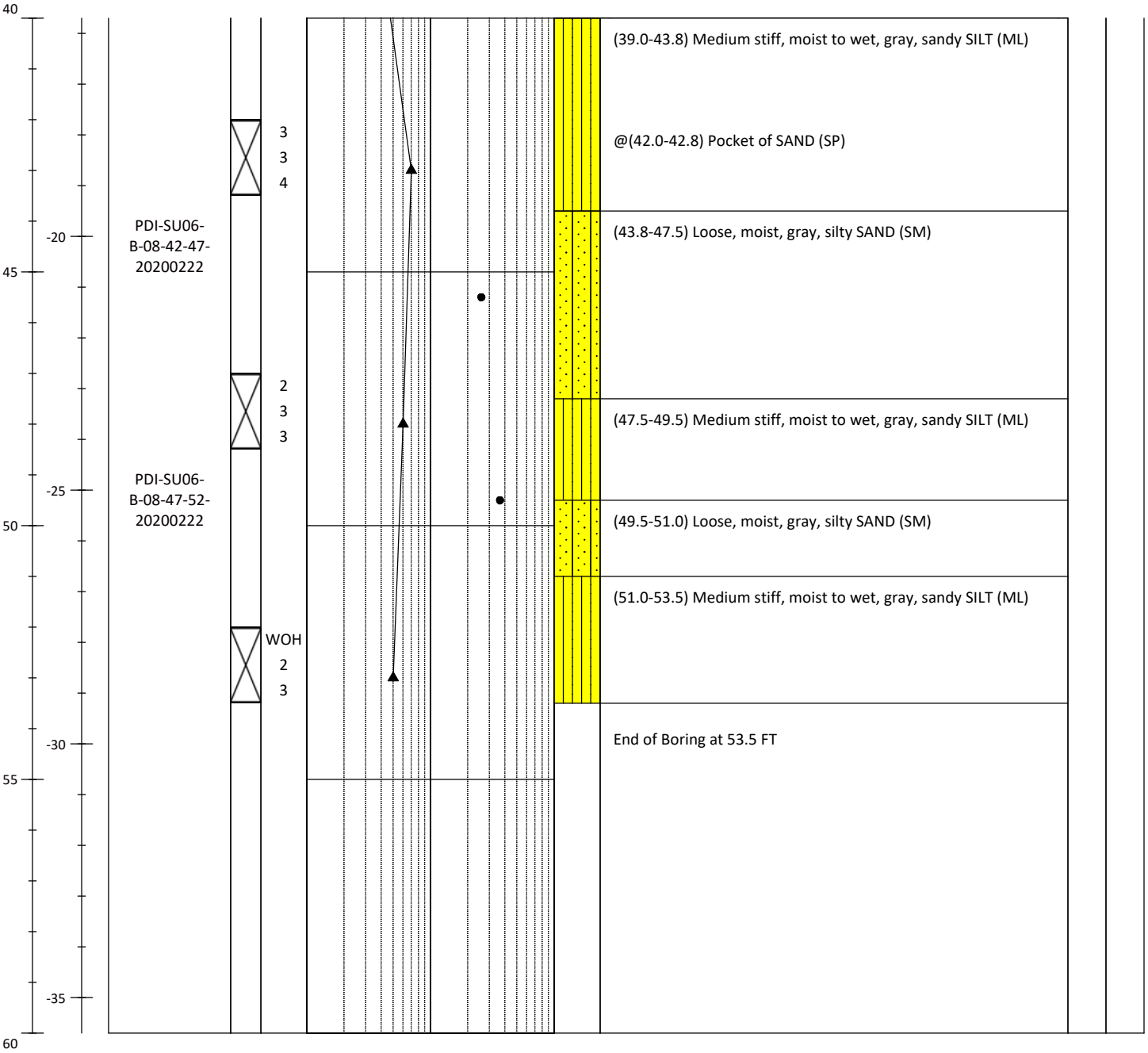
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B8

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302473.83** E/LONG: **1008676**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-22-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **53.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **24.33**



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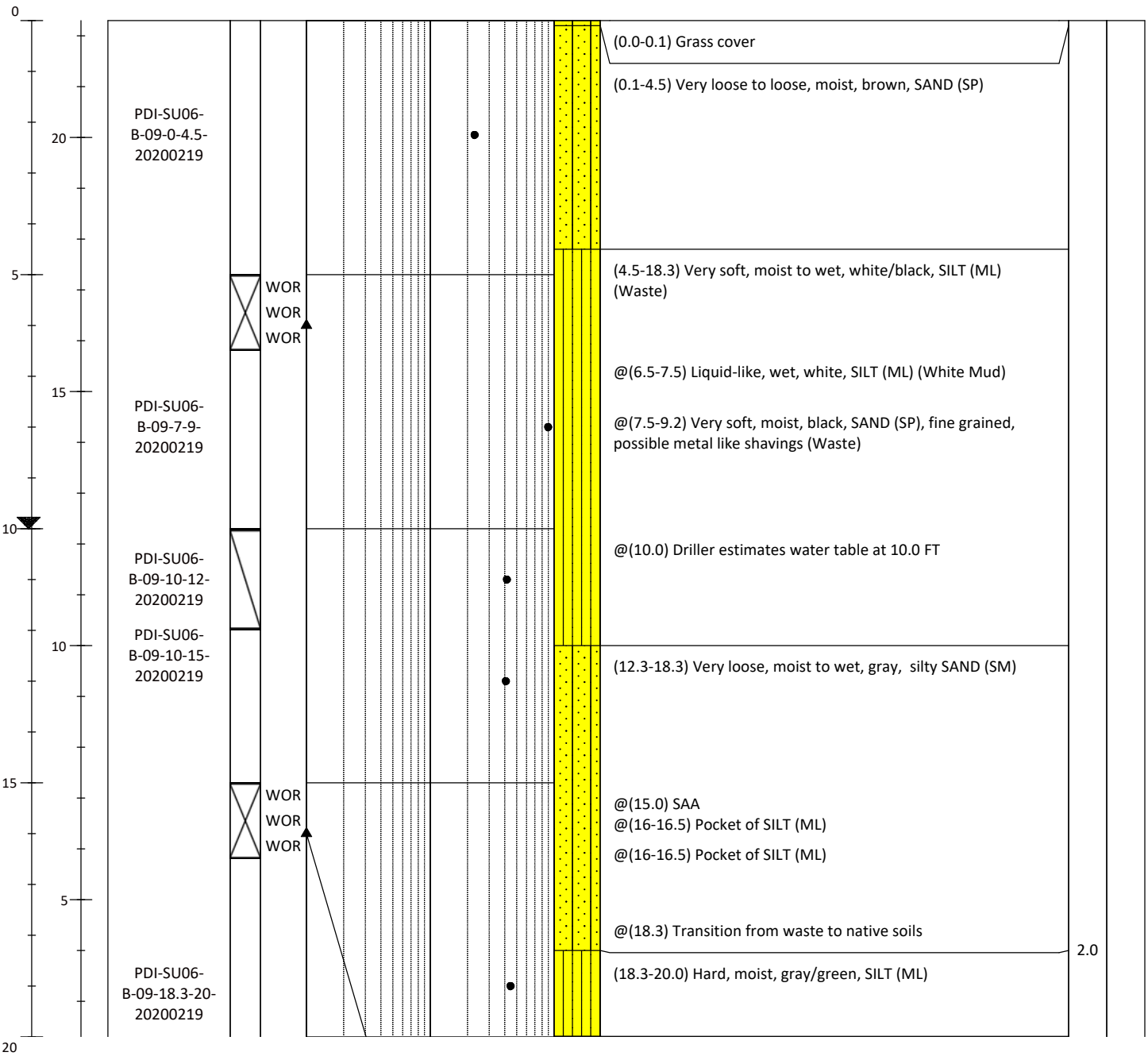
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU06-B9

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302747.27** E/LONG: **1008950.04**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.26**



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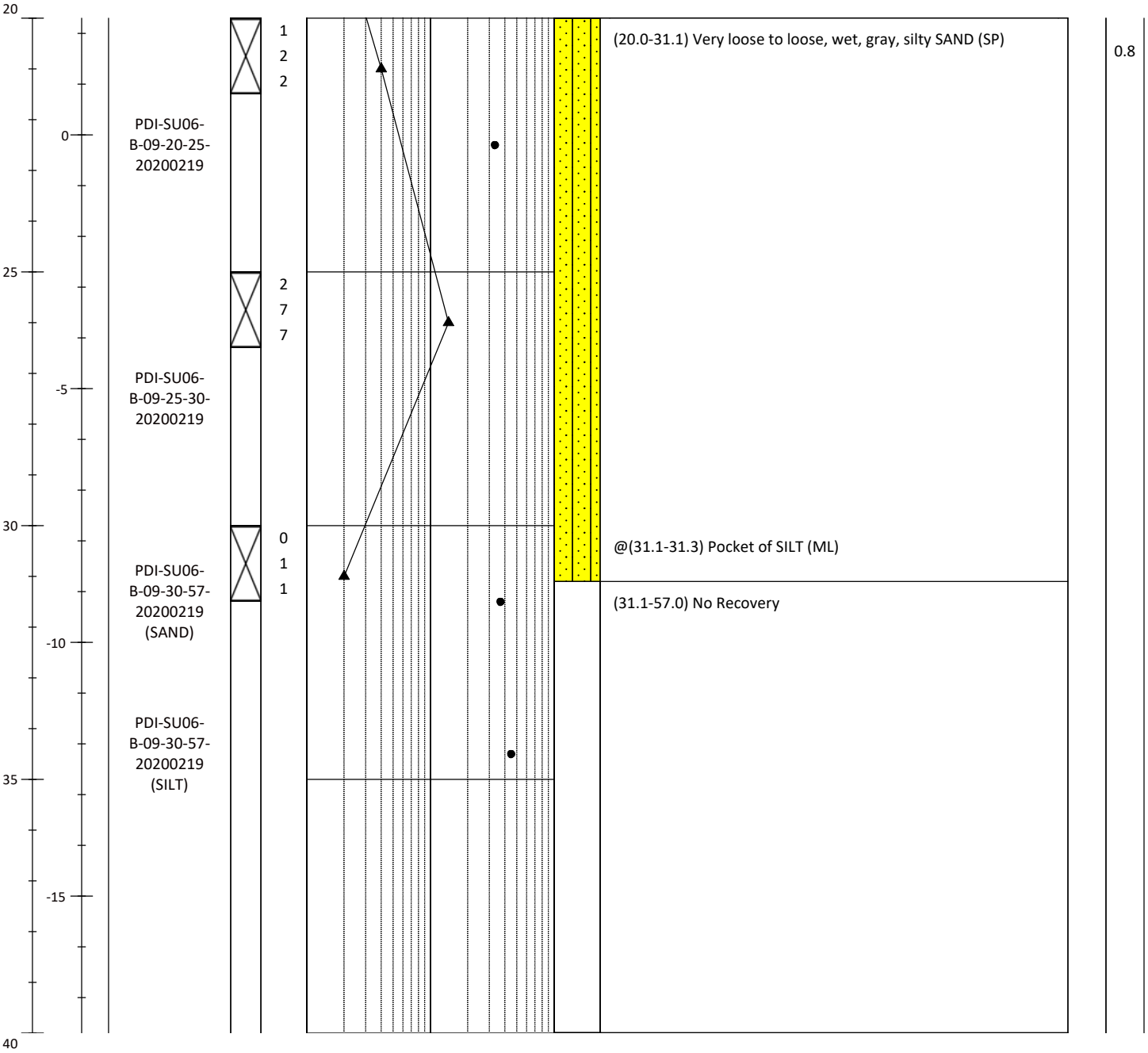
▲ SPT N-Value
● Moisture Content (%)

Notes: At 35 FT the outer casing sank under it's own weight to 40 FT, and the inner rod sank to 70 FT before retrieval was possible. Photos taken, actual depths are unknown.
Photos indicated approximately 5.5 FT of silty SAND (SW-SM) over approximately 6.0 FT over SILT (ML)

Soil Boring Log
SU06-B9

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302747.27** E/LONG: **1008950.04**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.26**



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▲ SPT N-Value
● Moisture Content (%)

Notes: At 35 FT the outer casing sank under it's own weight to 40 FT, and the inner rod sank to 70 FT before retrieval was possible. Photos taken, actual depths are unknown.
Photos indicated approximately 5.5 FT of silty SAND (SW-SM) over approximately 6.0 FT over SILT (ML)

Soil Boring Log
SU06-B9

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302747.27** E/LONG: **1008950.04**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **57.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **10.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **22.26**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40	-20					(31.1-57.0) No Recovery		
45	-25							
50	-30							
55	-35					End of Boring at 57 FT		
60								

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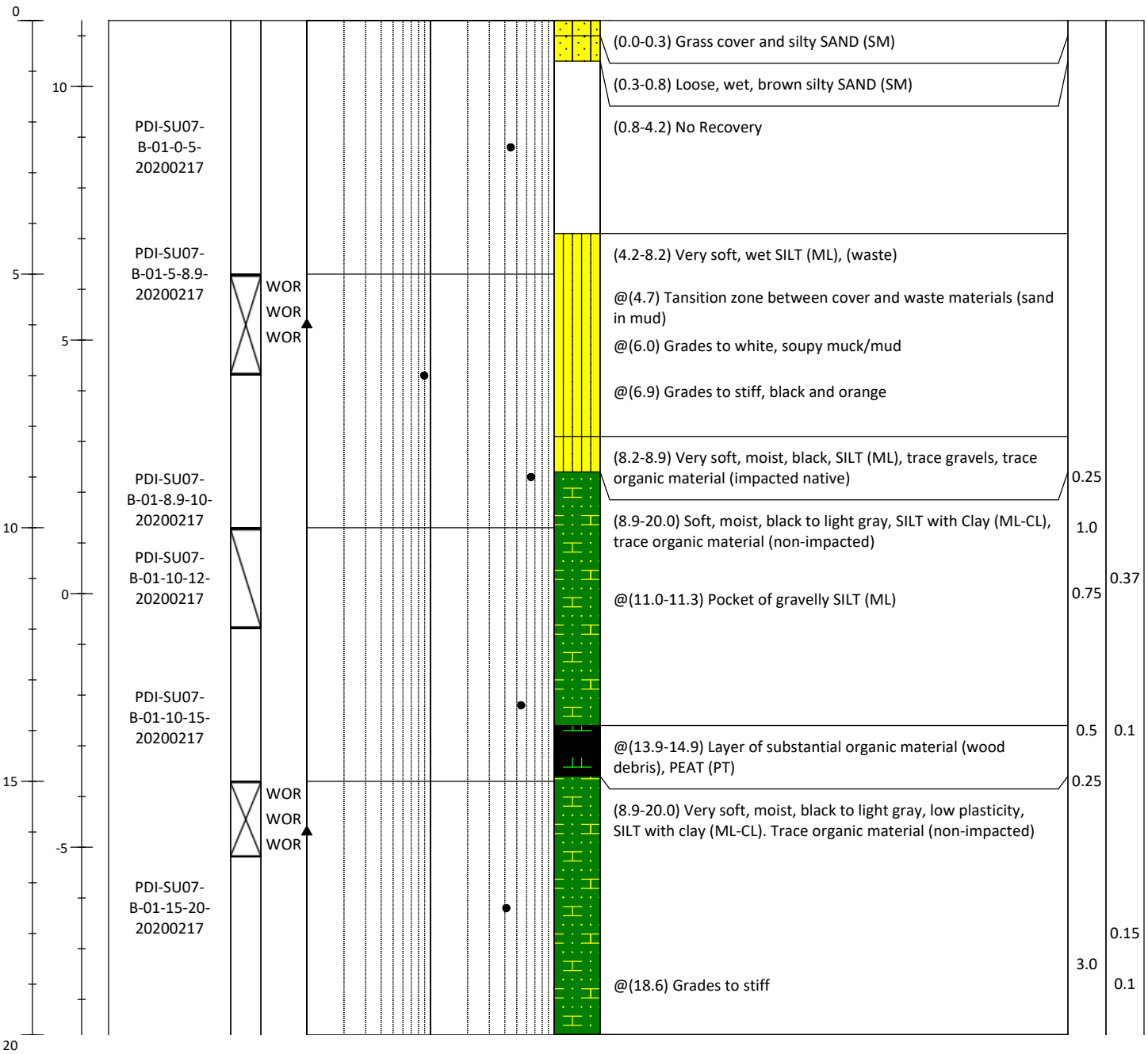
▲ SPT N-Value
● Moisture Content (%)

Notes: At 35 FT the outer casing sank under it's own weight to 40 FT, and the inner rod sank to 70 FT before retrieval was possible. Photos taken, actual depths are unknown.
Photos indicated approximately 5.5 FT of silty SAND (SW-SM) over approximately 6.0 FT over SILT (ML)

Soil Boring Log
SU07-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303449** E/LONG: **1009265**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.30**



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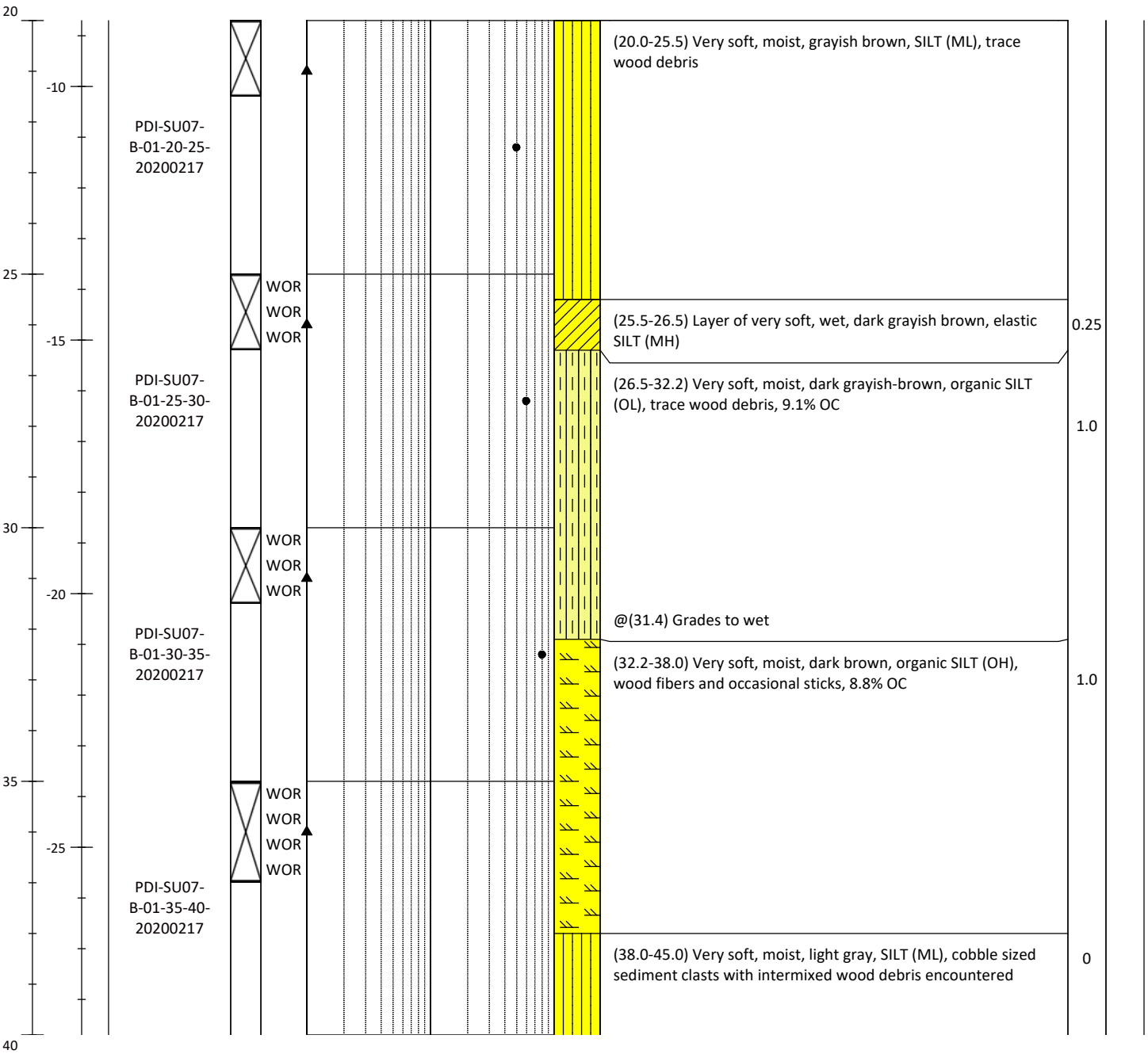
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303449** E/LONG: **1009265**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.30**



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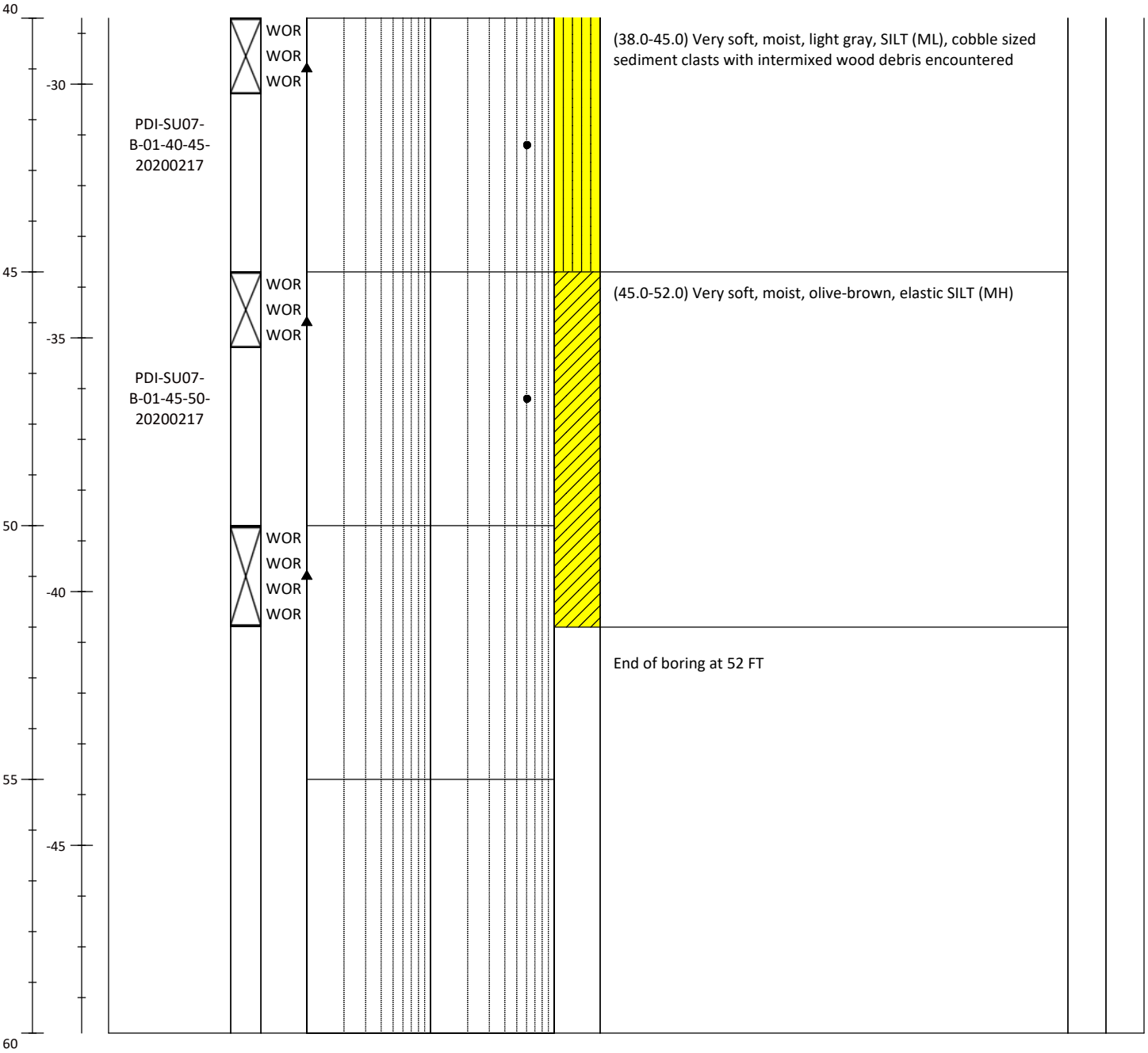
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303449** E/LONG: **1009265**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **52.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.30**



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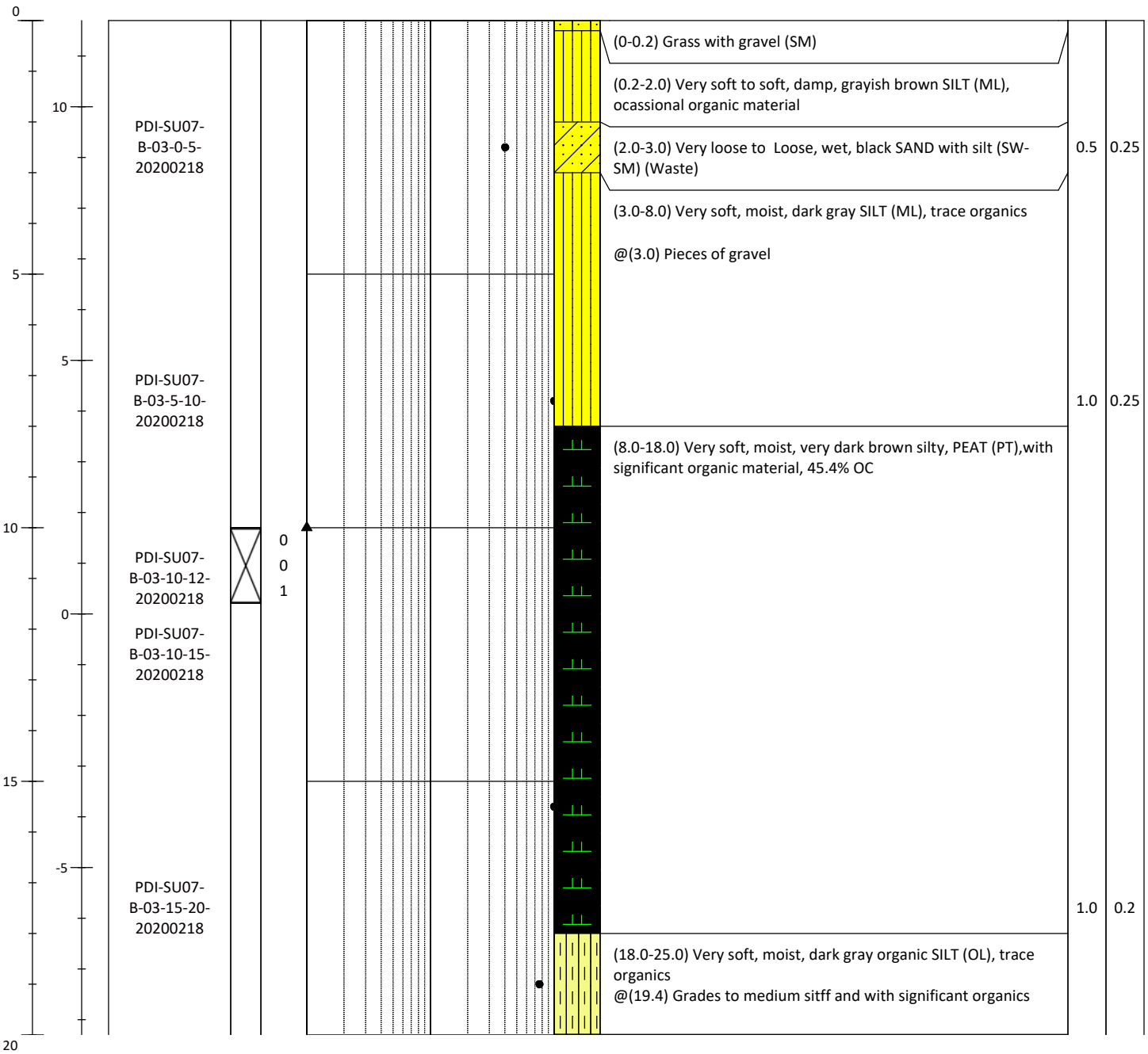
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302938** E/LONG: **1009505**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.70**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302938** E/LONG: **1009505**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.70**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20								
	-10	PDI-SU07-B-03-20-25.3-20200218				(18.0-25.0) Very soft, moist, dark gray organic SILT (OL), trace organic material	0.5	0.2
25						(25.0-30.0) Soft to medium stiff, moist, dark gray CLAY (CH), trace organic material		
	-15	PDI-SU07-B-03-25.3-30-20200218					1.0	0.4
						@(28.6-29) Layer of wood debris		
30			WOR			(30.0-42.0) Very soft, moist, olive-brown, elastic SILT (MH)		
		PDI-SU07-B-03-30-32-20200218	WOR					
	-20	PDI-SU07-B-03-30-35-20200218	WOR				0.25	0.06
35						@(35.5) Grades to medium stiff		
	-25	PDI-SU07-B-03-35-40-20200218					0.25	0.13
40								

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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B2

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302938** E/LONG: **1009505**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.70**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) 1 2 5 10 20 50 100	Lithology	Soil Description Samples and descriptions are in recovered depths. Classification scheme: USCS	PP (TSF)	TV (TSF)
40						(30.0-42.0) Very soft, moist, olive-brown, elastic SILT (MH)		
	-30					End of boring at 42 FT		
45								
	-35							
50								
	-40							
55								
	-45							
60								

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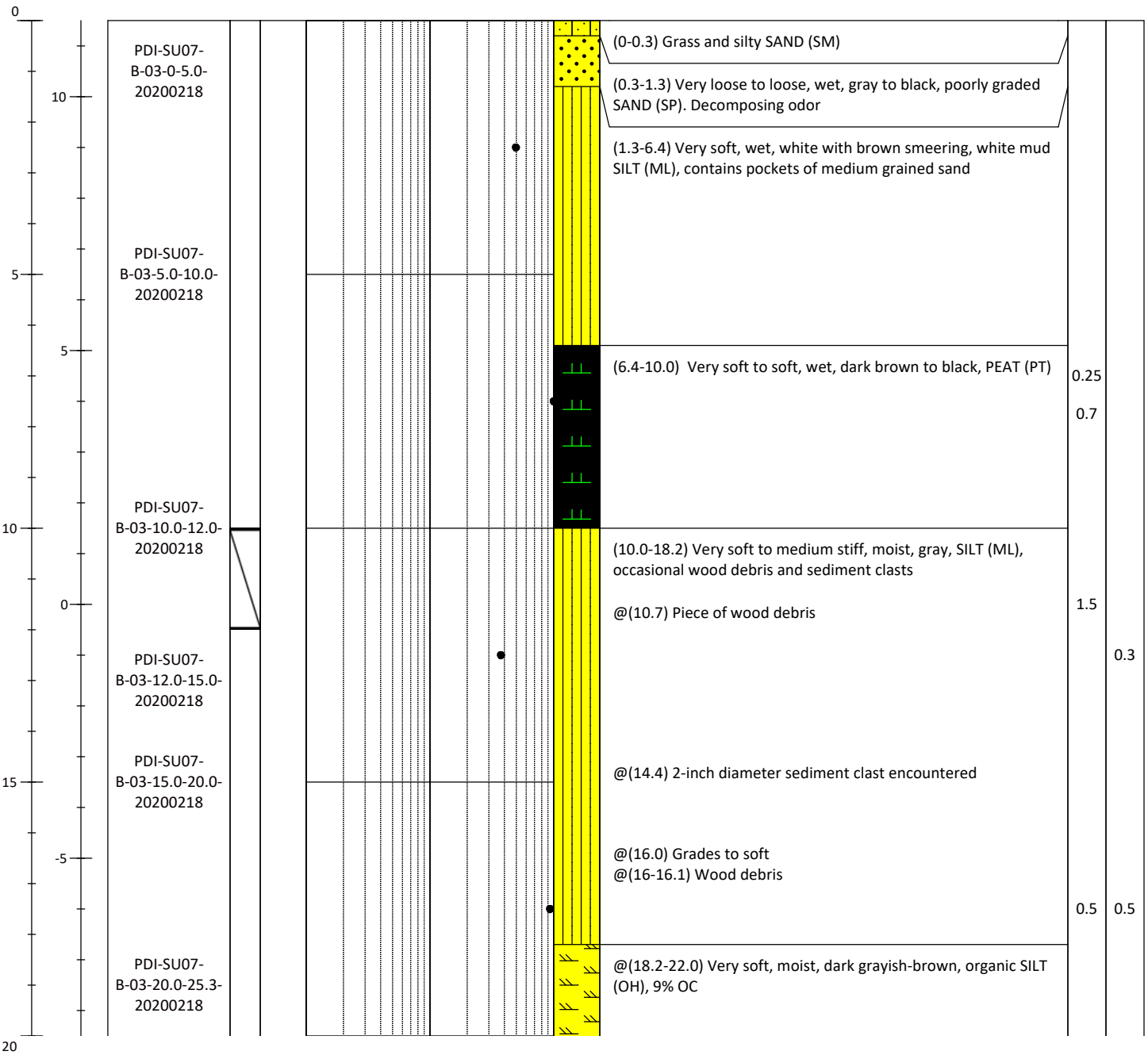
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302980** E/LONG: **1009189**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.45**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302980** E/LONG: **1009189**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.45**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20	-10					@(18.2-22.0) Very soft, moist, dark grayish-brown, organic SILT (OH), 9% OC		
25	-15	PDI-SU07-B-03-25.3-30.0-20200218				(22.0-30.0) Very soft to medium stiff, moist, dark grayish-brown, SILT (ML), occasional wood debris and sediment clasts, 13.2% OC @(23.5-23.9) Wood piece encountered @(25.3-26.0) Grades to sandier @(26.9-29.0) Grades to stiff, sandy SILT (ML)	0.3 0.7	0.07 0.1
30	-20	PDI-SU07-B-03-30.0-32.0-20200218 PDI-SU07-B-03-32.0-35.0-20200218				(30.0-32.0) Very soft to soft, moist to wet, very dark brown, organic SILT (OH), 10.2% OC		
35	-25	PDI-SU07-B-03-35.0-40.0-20200218				(32.0-42.0) Grades to very soft to soft, moist, dark gray, elastic SILT (MH)	0.25 0.5	0.15 0.15
40								

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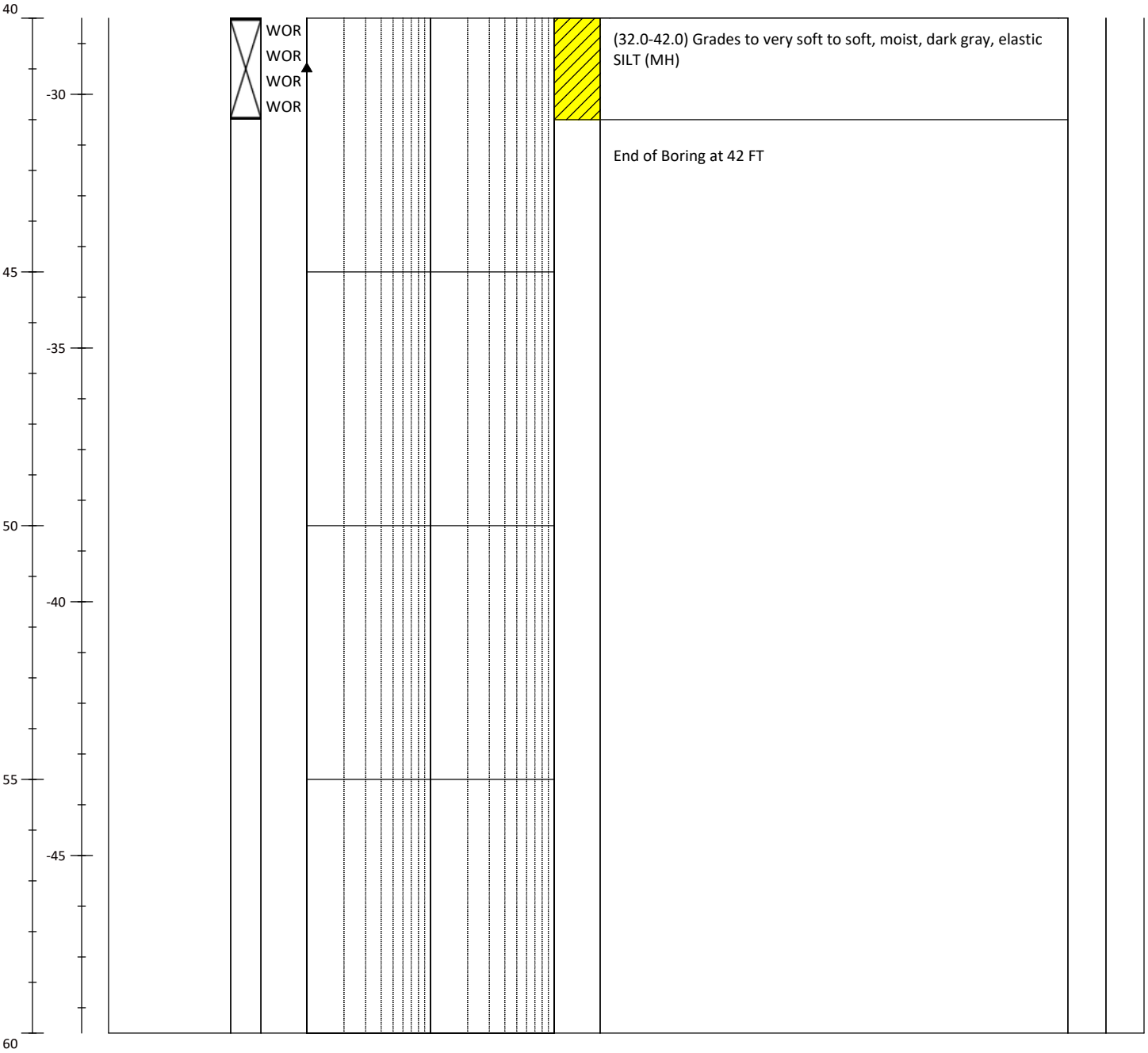
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B3

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302980** E/LONG: **1009189**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **42.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.45**



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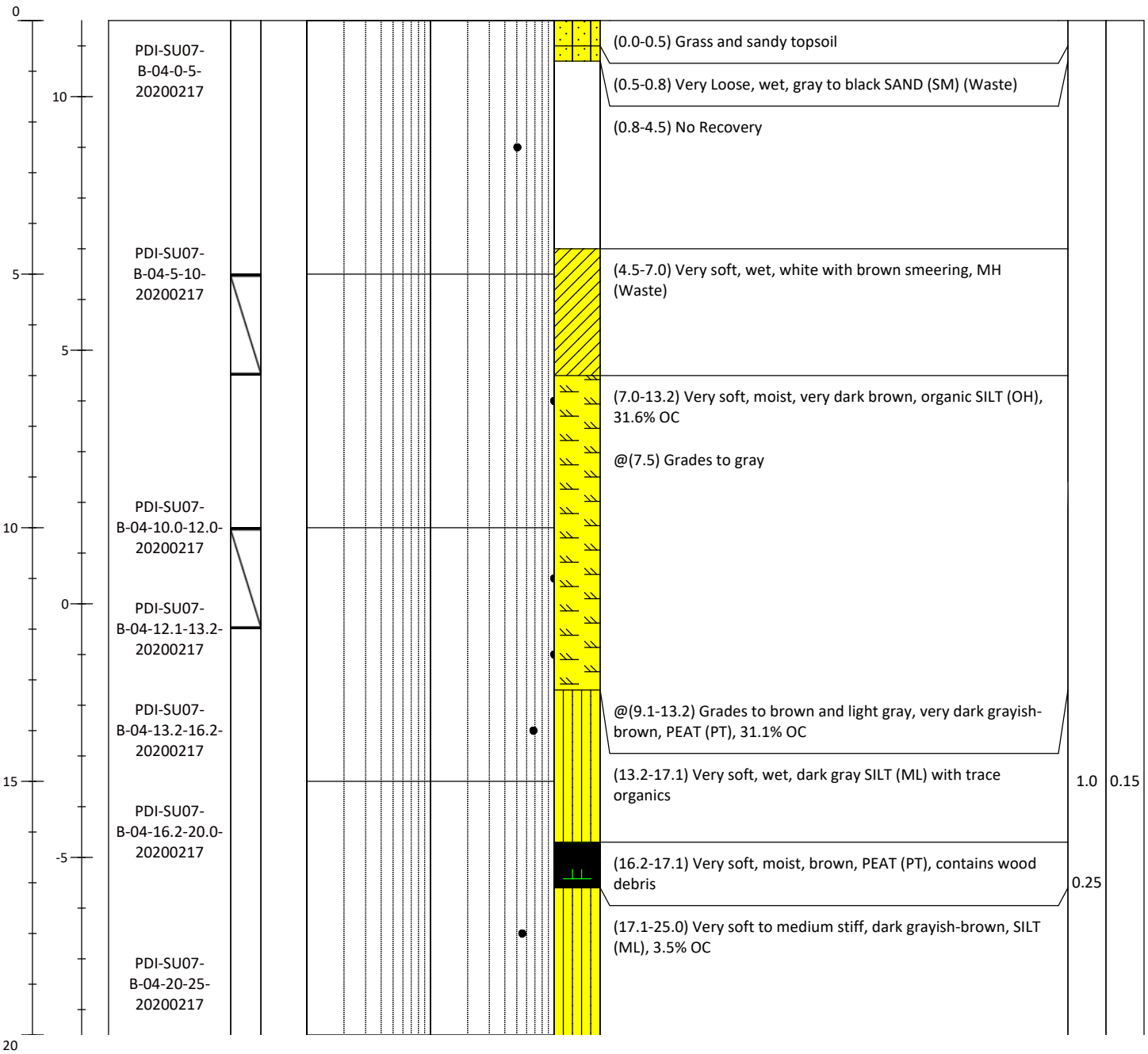
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303178.19** E/LONG: **1009301.93**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17,18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **62.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.53**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303178.19** E/LONG: **1009301.93**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17,18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **62.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.53**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
20			0			(17.1-25.0) Very soft to medium stiff, dark grayish-brown SILT (ML), 3.5% OC	1.0	
	-10		1					
			1					
25		PDI-SU07-B-04-25-30-20200217					1.25	
						(25.0-30.0) Very soft to soft, wet, dark grayish-brown, organic SILT (OL), 7.1% OC	2.0	
	-15						0	
							1.5	
30		PDI-SU07-B-04-30-32-20200217				(30.0-35.0) Very soft to soft, wet, dark brown, silty CLAY (CL)		
	-20	PDI-SU07-B-04-32-35-20200217					0.25	
35		PDI-SU07-B-04-35-40-20200217				(35.0-40.0) Very soft, wet, dark grayish-brown, organic SILT (OH)		
	-25						0.75	
40		PDI-SU07-B-04-40-42-20200218						

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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303178.19** E/LONG: **1009301.93**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17,18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **62.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.53**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
40			WOR			(40.0-62.0) Very soft, wet, dark to very dark grayish-brown, SILT (ML) with interbedded layers of organic SILT (OL) throughout		
	-30		WOR				0.25	
			WOR					
			WOR					
45		PDI-SU07-B-04-45-50-20200218						
	-35					@(47.0) Grades to soft and siltier, dark grayish-brown, organic SILT (OL), 10% OC	0.75	
						@(49.0) Lens of organic wood fibers		
50		PDI-SU07-B-04-50-52-20200218						
	-40	PDI-SU07-B-04-52-55-20200218				@(52.0) Significant wood debris, dark grayish-brown, oranic SILT (OH), 6.9% OC	0.5	
55		PDI-SU07-B-04-55-60-20200218						
	-45						0.5	
60								

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1201 Third Avenue, Suite 2600
Seattle, WA 98101

▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU07-B4

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **303178.19** E/LONG: **1009301.93**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-17,18-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **62.0**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **0.0**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **11.53**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
60								
	-50		1 1 3			(40.0-62.0) Very soft, wet, dark to very dark grayish-brown, organic SILT (OL)		
						End of Boring at 62 FT		

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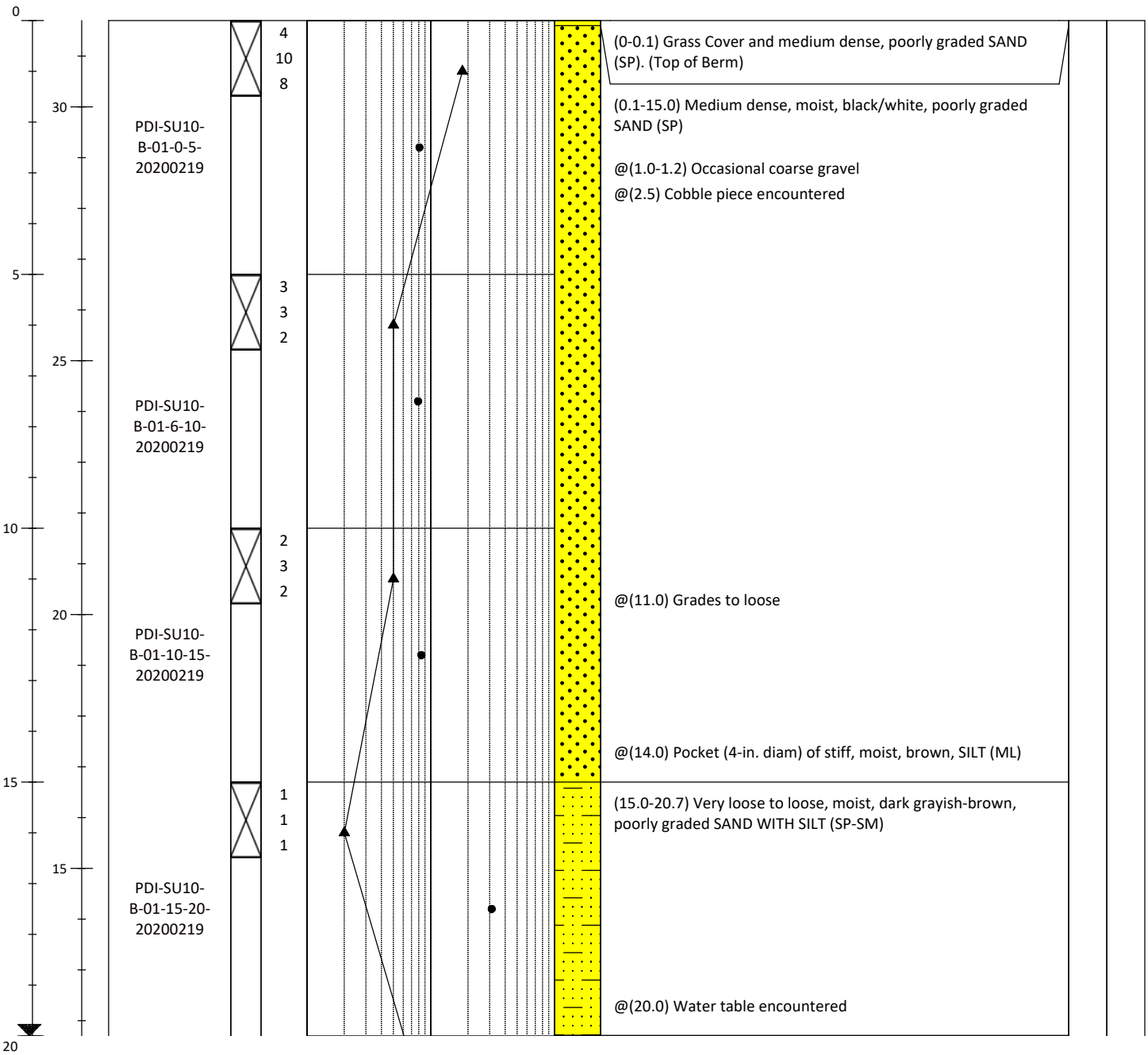
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU10-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302942** E/LONG: **1007141**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **20**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **31.72**



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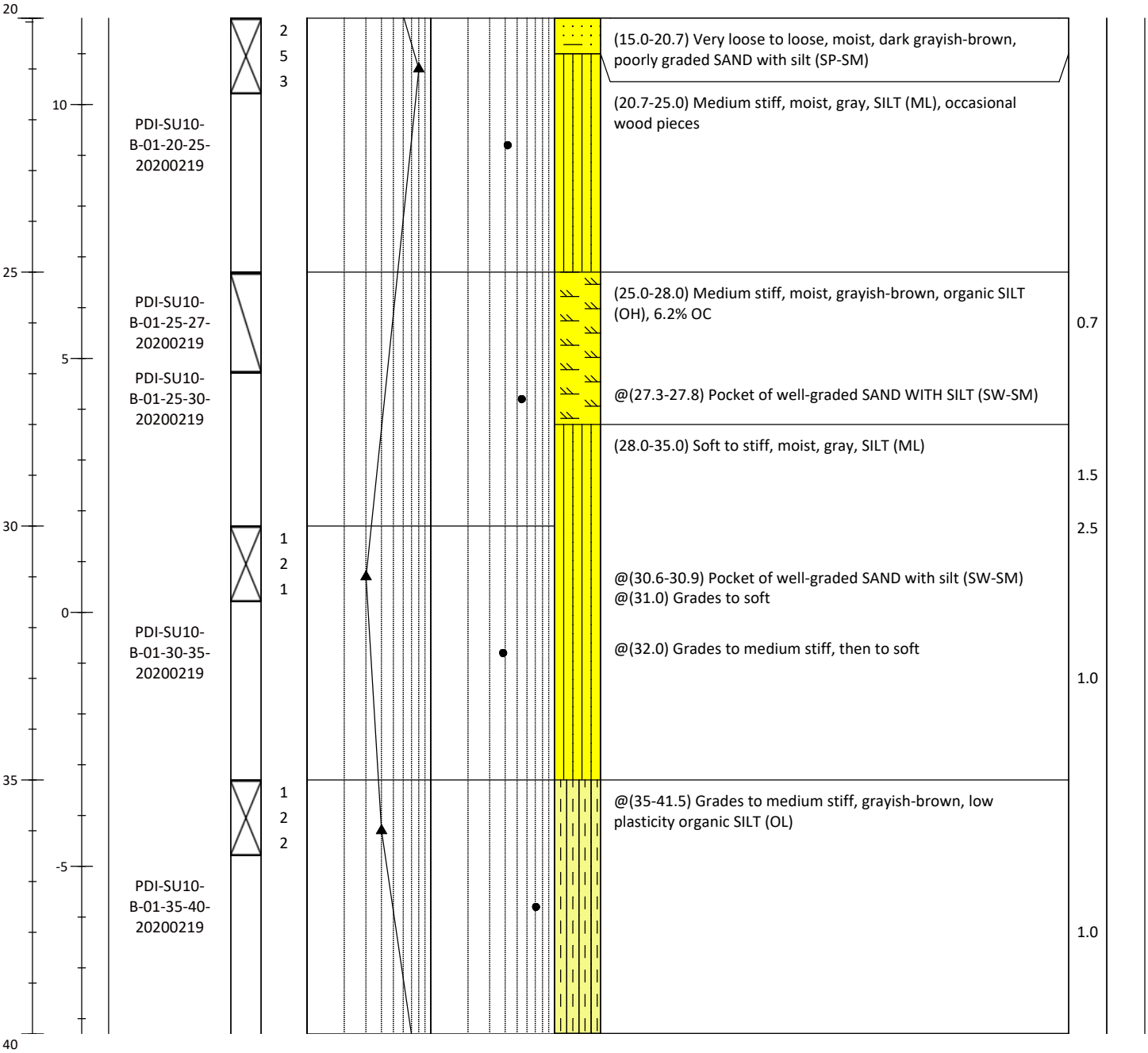
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU10-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302942** E/LONG: **1007141**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **20**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **31.72**



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▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
SU10-B1

Project #: 200730-01.02	Project: Former Reynolds Metal Reduction Plant - Longview	Location: Longview, Washington
Client: Millennium Bulk Terminals - Longview, LLC		N/LAT: **302942** E/LONG: **1007141**
Contractor: Yellow Jacket Drilling	Logged By: Garrett Timm	Collection Date: **2-19-2020**
Method: Rotary Sonic	Horiz. Datum: Washington State Plane Feet	Total Depth (ft): **41.5**
Hammer: 140-lb Auto Hammer	Vert. Datum: NAVD88	Observed Water Table Depth (ft): **20**
Hammer Efficiency (%): UNKNOWN	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Ground Surface Elevation (ft): **31.72**

Depth (ft)	Elevation (ft)	Samples	Values Less Than 1	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description (Samples and descriptions are in recovered depths. Classification scheme: USCS)	PP (TSF)	TV (TSF)
40			2			@(35-41.5) Grades to medium stiff, grayish-brown, low plasticity organic SILT (OL)		
	-10		2					
			6			End of Boring at 41.5 FT		
45								
	-15							
50								
	-20							
55								
	-25							
60								

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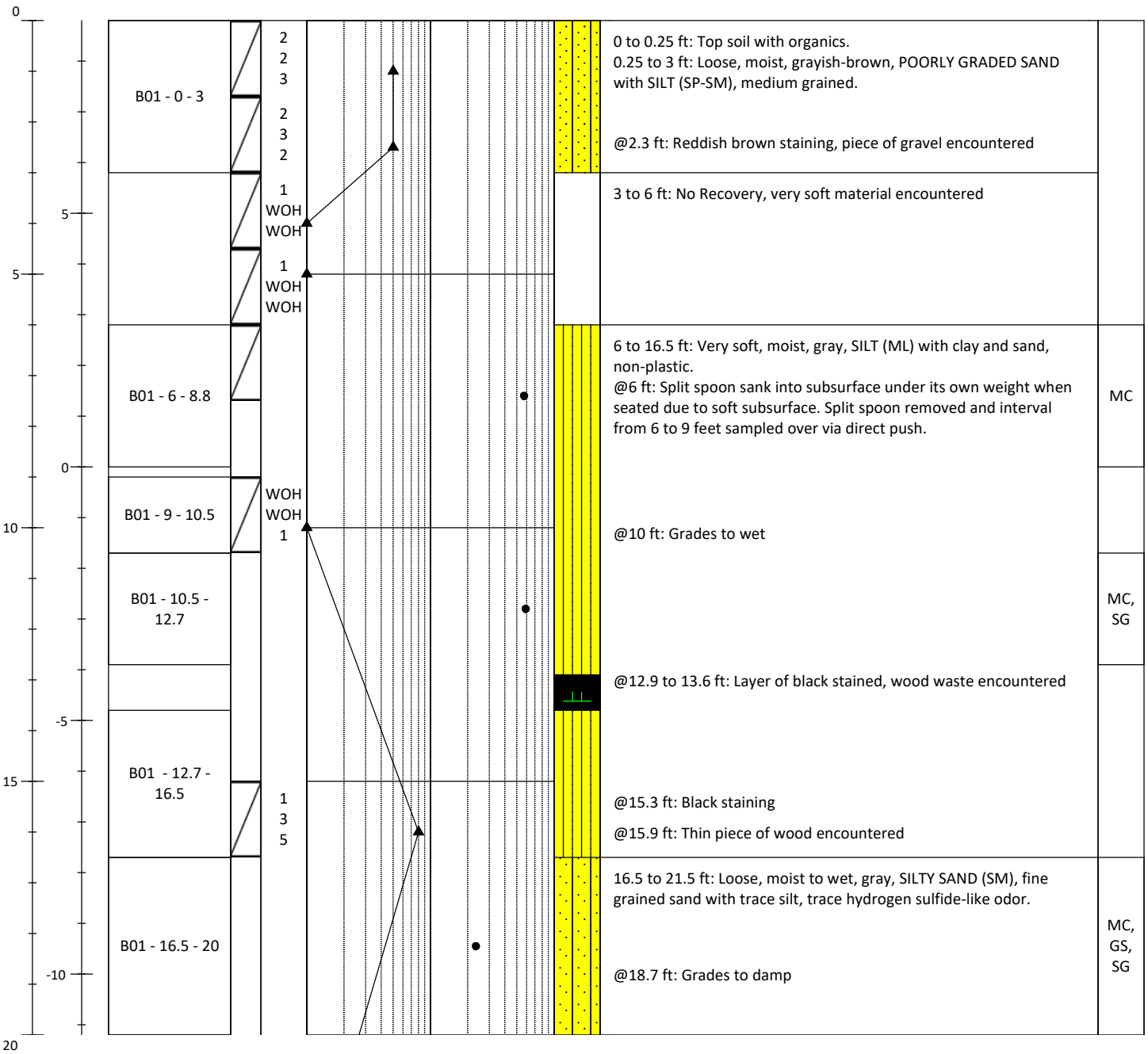
▲ SPT N-Value
● Moisture Content (%)

Notes:

Soil Boring Log
PDI3-B01

Project #: 210002-01.03	Project: Alcoa - NWA Longview	Location: Longview, Washington
Client: NWA Alcoa	Logged By: Sam Giannakos	N/LAT: **303086.55** E/LONG: **1008919.67**
Contractor: Cascade Environmental	Horiz. Datum: Washington State Plane Feet	Collection Date: **2/22/22**
Method: Direct Push	Vert. Datum: NAVD88	Total Depth (ft): **50**
Hammer: 140-lb Auto Hammer	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Observed Water Table Depth (ft): **X**
Hammer Efficiency (%): UNKNOWN	2-inch Dual Tube Liner	Ground Surface Elevation (ft): **8.8**



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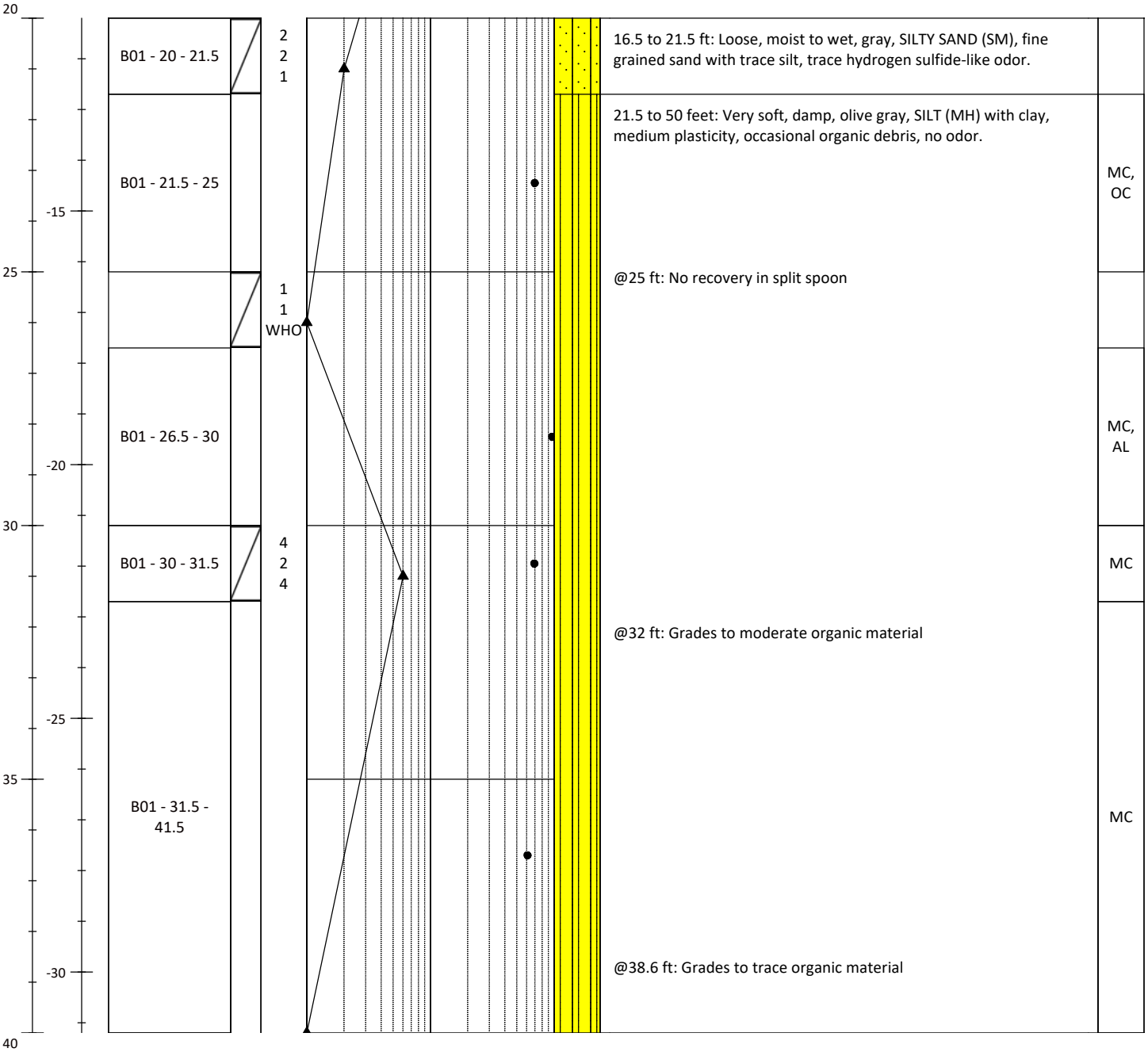
▲ SPT N-Value
• Moisture Content (%)
Split Spoon

Notes: 1) Boring PDI3-B01 was terminated at 40.5 feet on 2/22/22. Cascade returned to the location on 2/23/22 to drill to 40 feet below ground surface and sample from 40 to 50 feet below ground surface.
2) MC: Moisture Content, GS: Grain Size, AL: Atterberg Limits, SG: Specific Gravity, OC: Organic Content
3) WOR: Weight of Rod. WOH: Weight of Hammer

Soil Boring Log
PDI3-B01

Project #: 210002-01.03	Project: Alcoa - NWA Longview	Location: Longview, Washington
Client: NWA Alcoa	Logged By: Sam Giannakos	N/LAT: **303086.55** E/LONG: **1008919.67**
Contractor: Cascade Environmental	Horiz. Datum: Washington State Plane Feet	Collection Date: **2/22/22**
Method: Direct Push	Vert. Datum: NAVD88	Total Depth (ft): **50**
Hammer: 140-lb Auto Hammer	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Observed Water Table Depth (ft): **X**
Hammer Efficiency (%): UNKNOWN	2-inch Dual Tube Liner	Ground Surface Elevation (ft): **8.8**



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▲ SPT N-Value
• Moisture Content (%)
⊘ Split Spoon

Notes: 1) Boring PDI3-B01 was terminated at 40.5 feet on 2/22/22. Cascade returned to the location on 2/23/22 to drill to 40 feet below ground surface and sample from 40 to 50 feet below ground surface.
2) MC: Moisture Content, GS: Grain Size, AL: Atterberg Limits, SG: Specific Gravity, OC: Organic Content
3) WOR: Weight of Rod. WOH: Weight of Hammer

Soil Boring Log
PDI3-B01

Project #: 210002-01.03	Project: Alcoa - NWA Longview	Location: Longview, Washington
Client: NWA Alcoa	Logged By: Sam Giannakos	N/LAT: **303086.55** E/LONG: **1008919.67**
Contractor: Cascade Environmental	Horiz. Datum: Washington State Plane Feet	Collection Date: **2/22/22**
Method: Direct Push	Vert. Datum: NAVD88	Total Depth (ft): **50**
Hammer: 140-lb Auto Hammer	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Observed Water Table Depth (ft): **X**
Hammer Efficiency (%): UNKNOWN	2-inch Dual Tube Liner	Ground Surface Elevation (ft): **8.8**

Depth (ft)	Elevation (ft)	Sample Name	Sample Type	Blow Counts	Uncorrected Standard Penetration Resistance (blows per foot) and Moisture Content (%) (1 2 5 10 20 50 100)	Lithology	Soil Description	Lab Test
40		B01 - 31.5 - 41.5		2 WOH 1			21.5 to 50 feet: Very soft, damp, olive gray, SILT (MH) with clay, medium plasticity, occasional organic debris, no odor.	MC
45	-35	B01(2) - 41.5 - 50			•		@47.6 to 48.3 ft: Wood fibers encountered	MC, SG
50	-40						End of Boring at 50 feet.	
55	-45							
60	-50							

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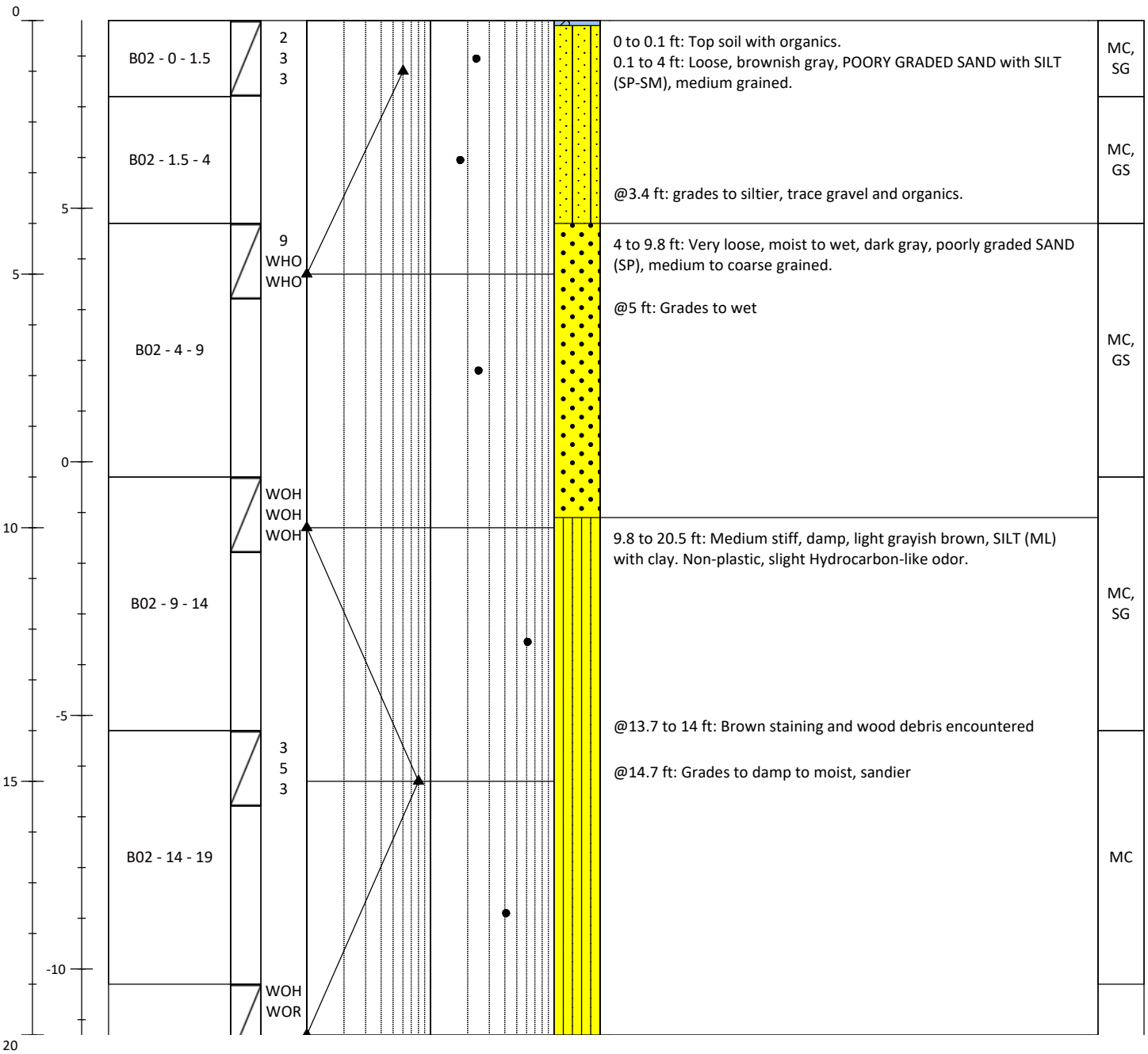
▲ SPT N-Value
• Moisture Content (%)
▨ Split Spoon

Notes: 1) Boring PDI3-B01 was terminated at 40.5 feet on 2/22/22. Cascade returned to the location on 2/23/22 to drill to 40 feet below ground surface and sample from 40 to 50 feet below ground surface.
2) MC: Moisture Content, GS: Grain Size, AL: Atterberg Limits, SG: Specific Gravity, OC: Organic Content
3) WOR: Weight of Rod. WOH: Weight of Hammer

Soil Boring Log
PDI3-B02

Project #: 210002-01.03	Project: Alcoa - NWA Longview	Location: Longview, Washington
Client: NWA Alcoa	Logged By: Sam Giannakos	N/LAT: **303191.03** E/LONG: **1008776.88**
Contractor: Cascade Environmental	Horiz. Datum: Washington State Plane Feet	Collection Date: **2/23/22**
Method: Direct Push	Vert. Datum: NAVD88	Total Depth (ft): **30.5**
Hammer: 140-lb Auto Hammer	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Observed Water Table Depth (ft): **X**
Hammer Efficiency (%): UNKNOWN	2-inch Dual Tube Liner	Ground Surface Elevation (ft): **8.7**



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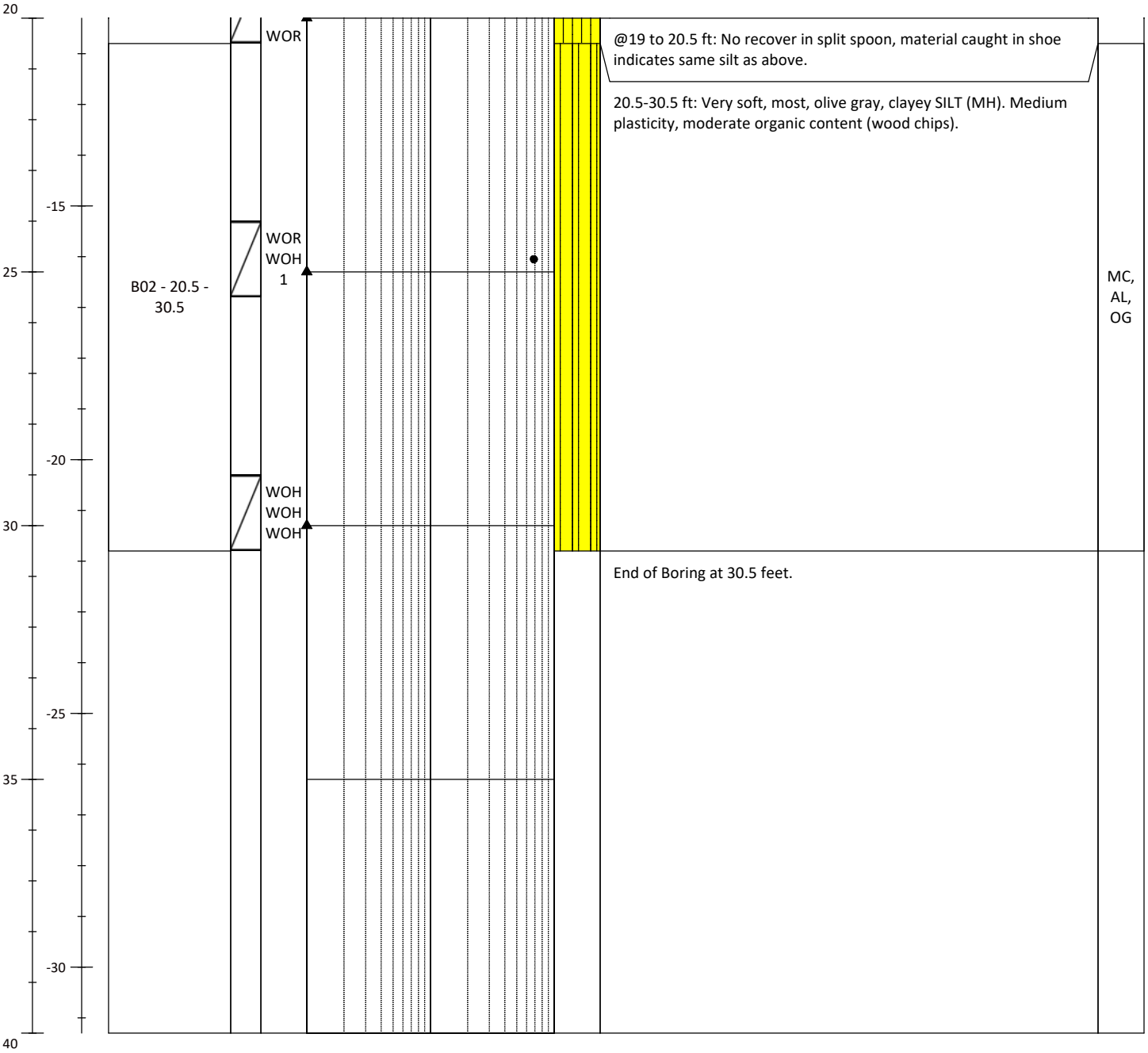
▲ SPT N-Value
• Moisture Content (%)
Split Spoon

Notes: West of Berth Road, directly south of power lines.
MC: Moisture Content, GS: Grain Size, AL: Atterberg Limits, SG: Specific Gravity, OC: Organic Content

Soil Boring Log
PDI3-B02

Project #: 210002-01.03	Project: Alcoa - NWA Longview	Location: Longview, Washington
Client: NWA Alcoa	Logged By: Sam Giannakos	N/LAT: **303191.03** E/LONG: **1008776.88**
Contractor: Cascade Environmental	Horiz. Datum: Washington State Plane Feet	Collection Date: **2/23/22**
Method: Direct Push	Vert. Datum: NAVD88	Total Depth (ft): **30.5**
Hammer: 140-lb Auto Hammer	Sampler(s): 2-inch OD/1.375-inch ID Split Spoon	Observed Water Table Depth (ft): **X**
Hammer Efficiency (%): UNKNOWN	2-inch Dual Tube Liner	Ground Surface Elevation (ft): **8.7**



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▲ SPT N-Value
● Moisture Content (%)
▨ Split Spoon

Notes: West of Berth Road, directly south of power lines.
MC: Moisture Content, GS: Grain Size, AL: Atterberg Limits, SG: Specific Gravity, OC: Organic Content

Attachment A4
Laboratory Reports

HWA GeoSciences Inc.

HWA GeoSciences Inc. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 43 - 46

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU06-B-04 43-46

HWA Project Number: 2012-113 T500 **Sample Description:** CL - Dark Grayish Brown

Date Sampled: _____ **By:** _____ **Date Tested:** 3-2-2020 **By:** JP-NW

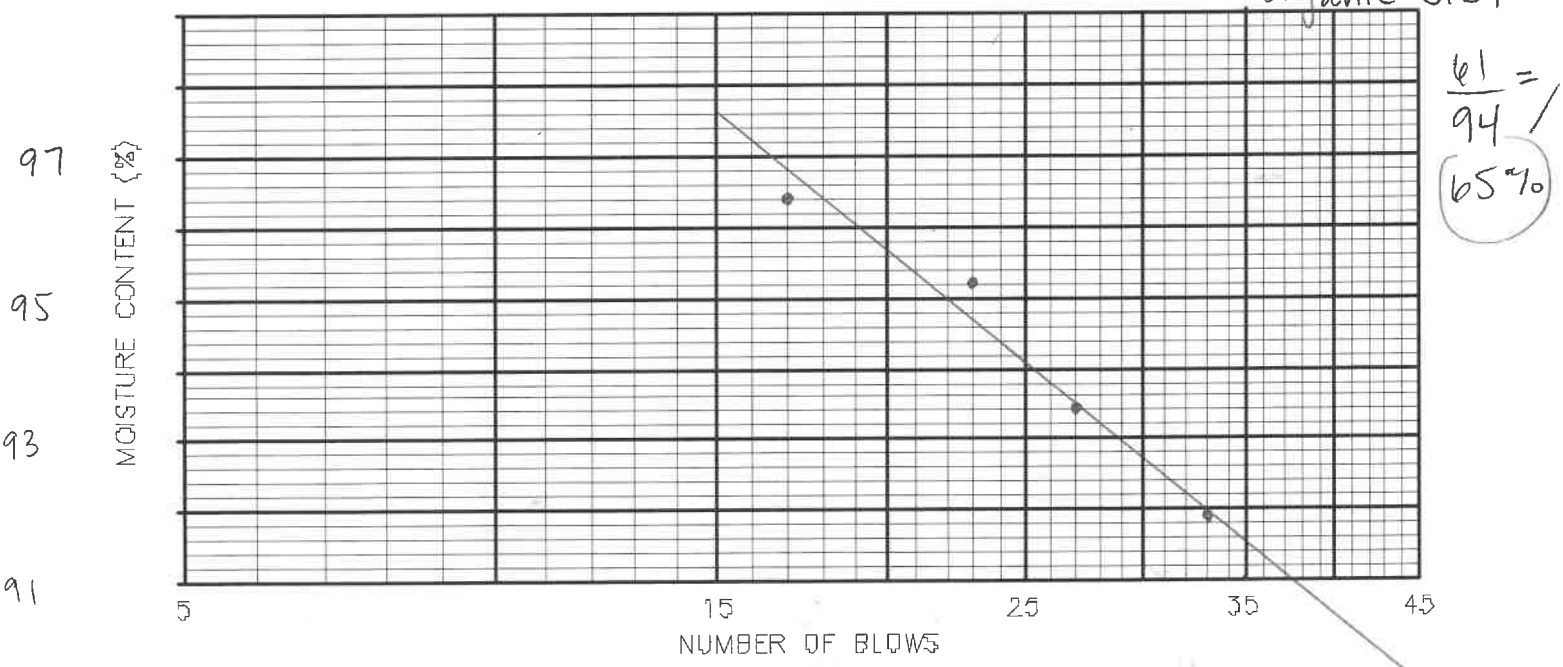
Oven used:_____ Balance used:_____ Liquid limit device: L00 Grooving tool: L00013-

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	33	27	23	17	25
Tare Number	128	510	601	524	528	512	536	128
Tare Weight	22.45	13.57	13.78	13.70	13.74	13.74	13.72	22.43
Wet Weight + Tare	88.09	19.76	19.92	21.49	22.21	21.47	21.97	32.10
Dry Weight + Tare	58.20	17.08	17.34	17.76	18.12	17.70	17.92	28.45
Dry Weight	28.45	19.78	18.72	19.25	20.25	199.7	19.22	
Weight of Water								
Moisture Content	93.6	76.4	72.5	91.9	93.4	95.2	96.4	60.6

Liquid Limit = 94 **Plastic Limit =** 74 **Plasticity Index =** 20 **Classification=** OH organic SILT

61 / 94 = 65%



Request #: 17
ST:1

Reviewed By: _____

HWA GEOSCIENCES INC.

HWA GEOSCIENCES INC. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 46 - 54

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU06-B-07 46-54

HWA Project Number: 2012-113 T500 **Sample Description:** ML olive Brown

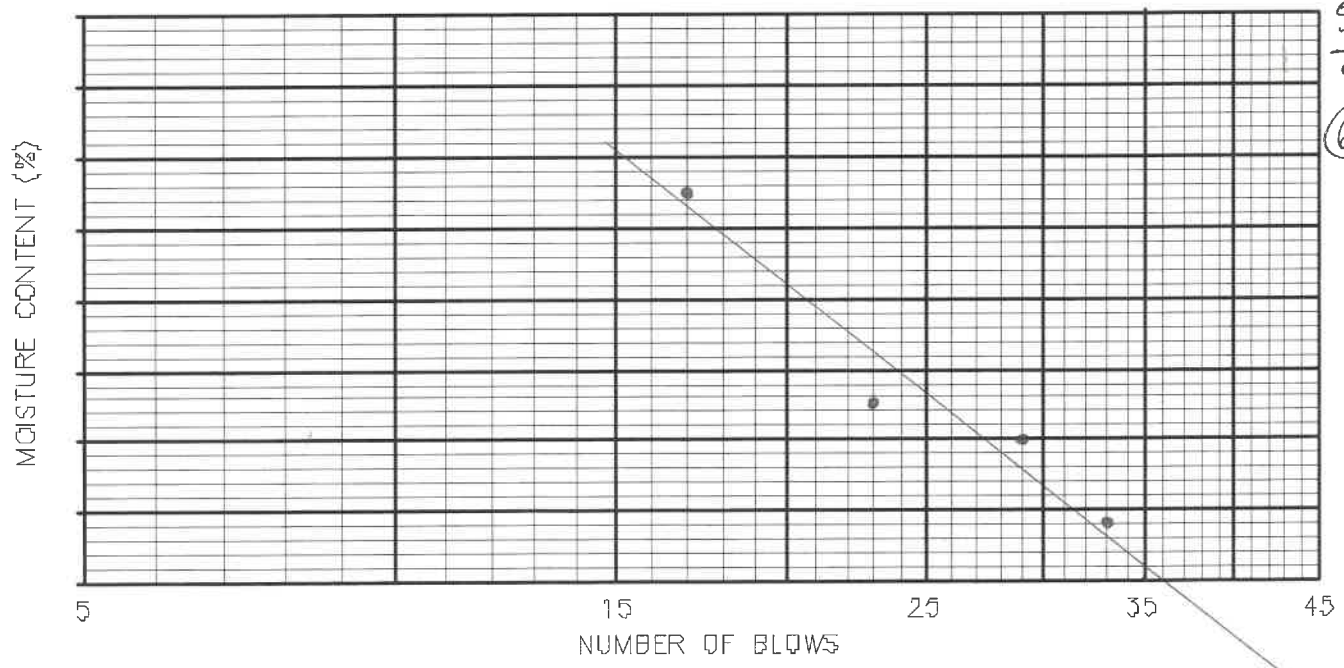
Date Sampled: _____ **By:** _____ **Date Tested:** 4/13/12 **By:** IW

Oven used:_____ Balance used:_____ Liquid limit device: L00 Grooving tool: L00013-

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	33	29	23	17	25
Tare Number	103	408	432	515	631	620	509	509
Tare Weight	22.21	14.49	14.44	13.62	13.80	13.86	13.53	13.50
Wet Weight + Tare	78.47	21.07	22.37	17.79	19.98	20.19	19.15	21.20
Dry Weight + Tare	53.86	18.87	19.70	15.84	17.07	17.20	16.45	18.49
Dry Weight								
Weight of Water								
Moisture Content	77.8	50.2	50.8	87.8	89.0	89.5	92.5	54.3

Liquid Limit = 90 **Plastic Limit =** 50 **Plasticity Index =** 40 **Classification=** OH



54/90 = 60%

Request #: **18**
ST:1

Reviewed By: _____

HWA GeoSciences Inc.

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Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 35 - 40

% Organic Odor

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU07-B-01 35-40

HWA Project Number: 2012-113 T500 **Sample Description:** DK Brown / organics MH/OH?

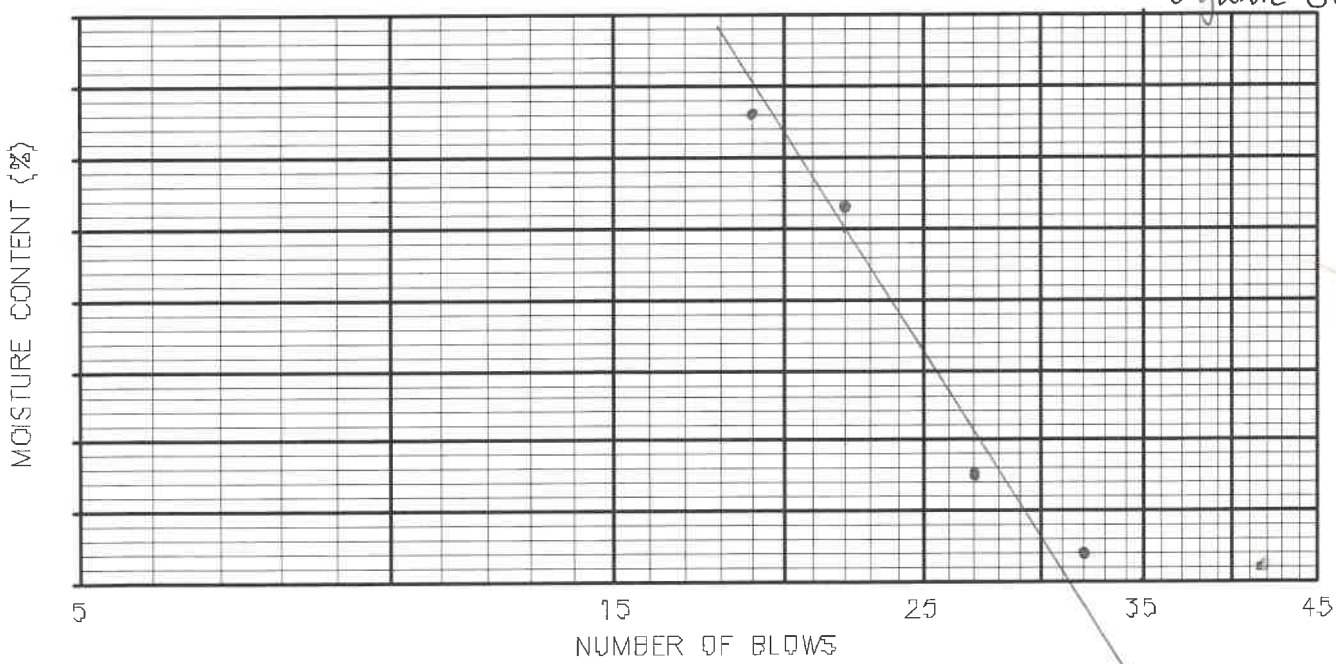
Date Sampled: _____ **By:** _____ **Date Tested:** 4/9 **By:** RW

Oven used: _____ Balance used: 400 Liquid limit device: L00367 Grooving tool: L00013-71

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	32	27	23	19	25
Tare Number	145	611	S44	Strong	609	417	428	239
Tare Weight	22.20	13.89	13.71	13.76	13.76	14.63	14.30	18.97
Wet Weight + Tare	58.55	20.31	20.91	21.99	22.92	23.33	24.47	25.39
Dry Weight + Tare	46.50	17.66	17.89	17.58	17.99	18.58	18.89	22.73
Dry Weight								
Weight of Water								
Moisture Content	98.6	70.3	72.2	115.4	116.5	120.3	121.6	70.7

Liquid Limit = 118 **Plastic Limit =** 71 **Plasticity Index =** 47 **Classification=** OH organic SILT



71 / 118 = 60%

Request #: 22
ST:1

Reviewed By: _____

HWA GeoSciences Inc.

HWA GeoSciences Inc. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 15 - 20

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU07-B-03 15-20

HWA Project Number: 2012-113 T500 **Sample Description:** ML dark greyish brow

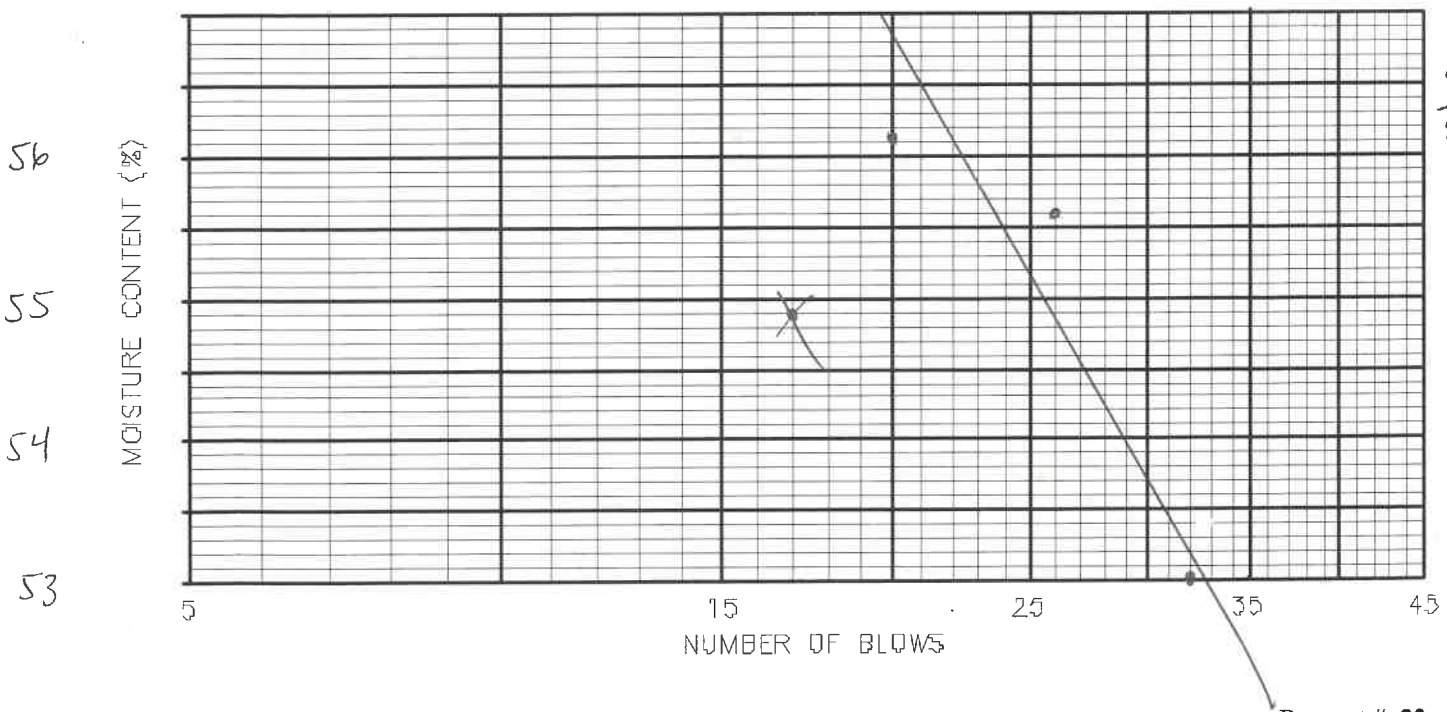
Date Sampled: _____ **By:** _____ **Date Tested:** 4/9 **By:** GB

Oven used: _____ Balance used: 446 Liquid limit device: L00 447 Grooving tool: L00013- 75

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	32	26	20	17	25
Tare Number	216	402	423	511	530	525	542	301
Tare Weight	26.50	14.54	14.45	13.56	13.70	13.71	13.66	22.25
Wet Weight + Tare	117.30	21.39	21.21	25.40	24.78	24.40	24.95	29.54
Dry Weight + Tare	73.46	19.36	19.20	21.30	20.82	20.56	20.95	27.45
Dry Weight								
Weight of Water								
Moisture Content	93.4	42.1	42.3	53.0	55.6	56.1	54.9	40.2

Liquid Limit = 55 **Plastic Limit =** 42 **Plasticity Index =** 13 **Classification=** CH



40/55 = 73%

Request #: 22
ST:1

Reviewed By: _____

HWA GEOSCIENCES INC.

HWA GEOSCIENCES INC. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 30 - 32

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU07-B-03 30-32

HWA Project Number: 2012-113 T500 **Sample Description:** V. dk brn, ML w/ orgs

Date Sampled: _____ **By:** _____ **Date Tested:** 3/20/12 **By:** IV

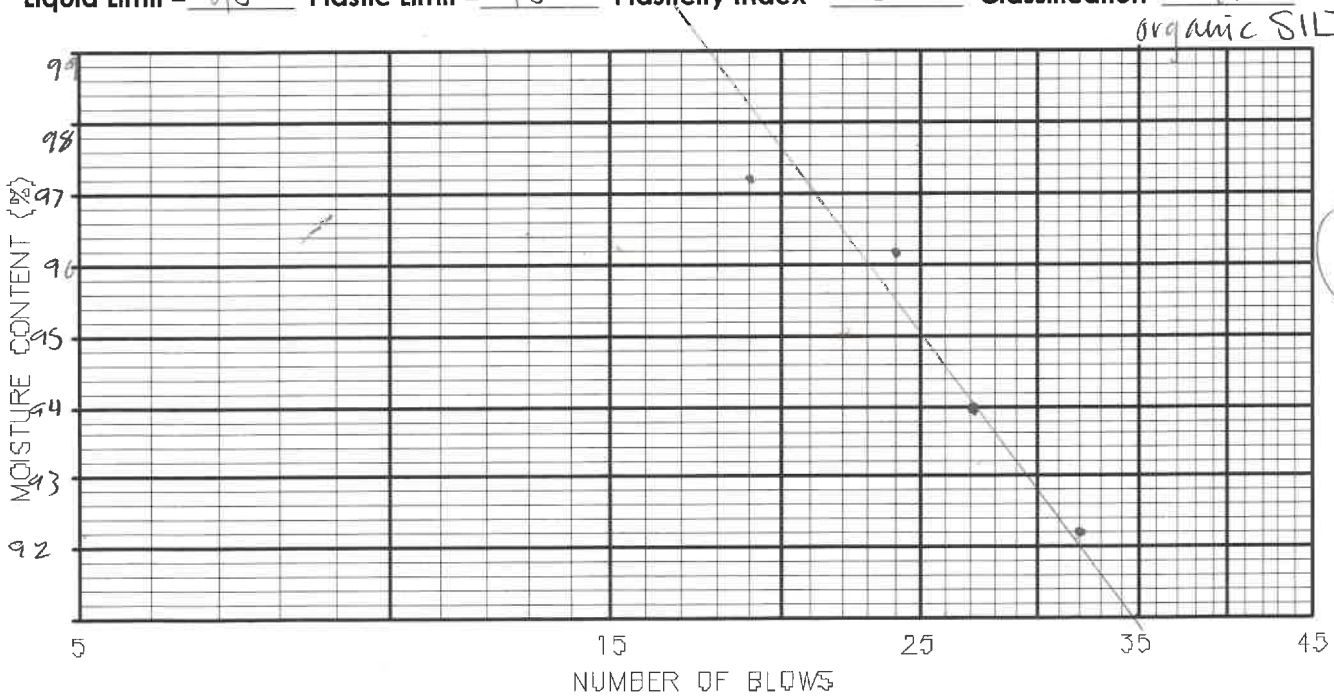
Oven used: _____ Balance used: _____ Liquid limit device: L00 Grooving tool: L00013-

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	32	27	24	19	25
Tare Number	Sel	514	511	522	421	443	406	406
Tare Weight	(Orig)	13.55	13.53	15.57	14.70	14.38	14.53	14.51
Wet Weight + Tare		22.19	20.64	21.43	22.73	20.52	20.84	21.36
Dry Weight + Tare		19.49	18.46	17.66	18.84	17.51	17.73	18.77
Dry Weight								
Weight of Water								
Moisture Content		45.5	44.2	92.2	94.0	96.2	97.2	60.8

Liquid Limit = 95 **Plastic Limit =** 45 **Plasticity Index =** 50 **Classification=** OH

organic SILT



61 = 95 / 64%

Request #: 22
ST:3

Reviewed By: _____

Revised 8/10/12

HWA GeoSciences Inc.

HWA GeoSciences Inc. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 5 - 10

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU07-B-04 5-10

HWA Project Number: 2012-113 T500 **Sample Description:** MH, brown

Date Sampled: _____ **By:** _____ **Date Tested:** 4/21 **By:** NW

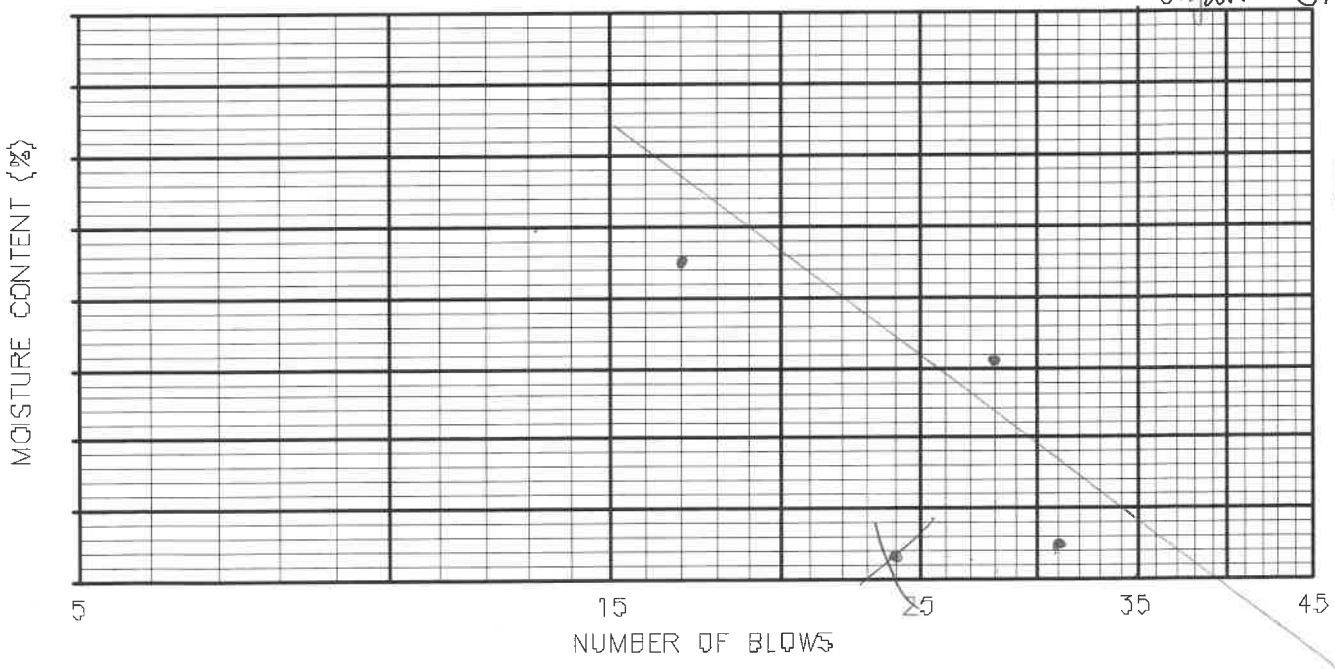
Oven used: #1 Balance used: L00400 (#3) Liquid limit device: L00447 Grooving tool: L00013-71

Test Method: A (multipoint) or B (one point) Prep Method: Wet or Dry

	Natural	Plastic Limit		Liquid Limit 35-30	30-25	25-20	20-15	OD
Number of Blows	N/A	N/A	N/A	31	28	24	17	25
Tare Number	313	617	439	435	446	541	434	543
Tare Weight	22.21	13.79	14.20	14.47	14.24	13.67	14.25	13.73
Wet Weight + Tare	72.55	20.80	20.54	25.38	26.27	24.98	27.28	19.83
Dry Weight + Tare	43.70	17.87	18.12	19.51	19.73	18.90	20.16	17.32
Dry Weight								
Weight of Water								
Moisture Content	134.2	71.8	61.7	116.5	119.1	116.3	120.5	69.9

Liquid Limit = 119 **Plastic Limit =** 67 **Plasticity Index =** 52 **Classification=** OH organic SILT

70 = 119 59%



Request #: 23
ST:1

Reviewed By: _____

HWA GEOSCIENCES INC.

HWA GEOSCIENCES INC. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 35 - 40

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU07-B-04 35-40

HWA Project Number: 2012-113 T500 **Sample Description:** DK. grayish-brn

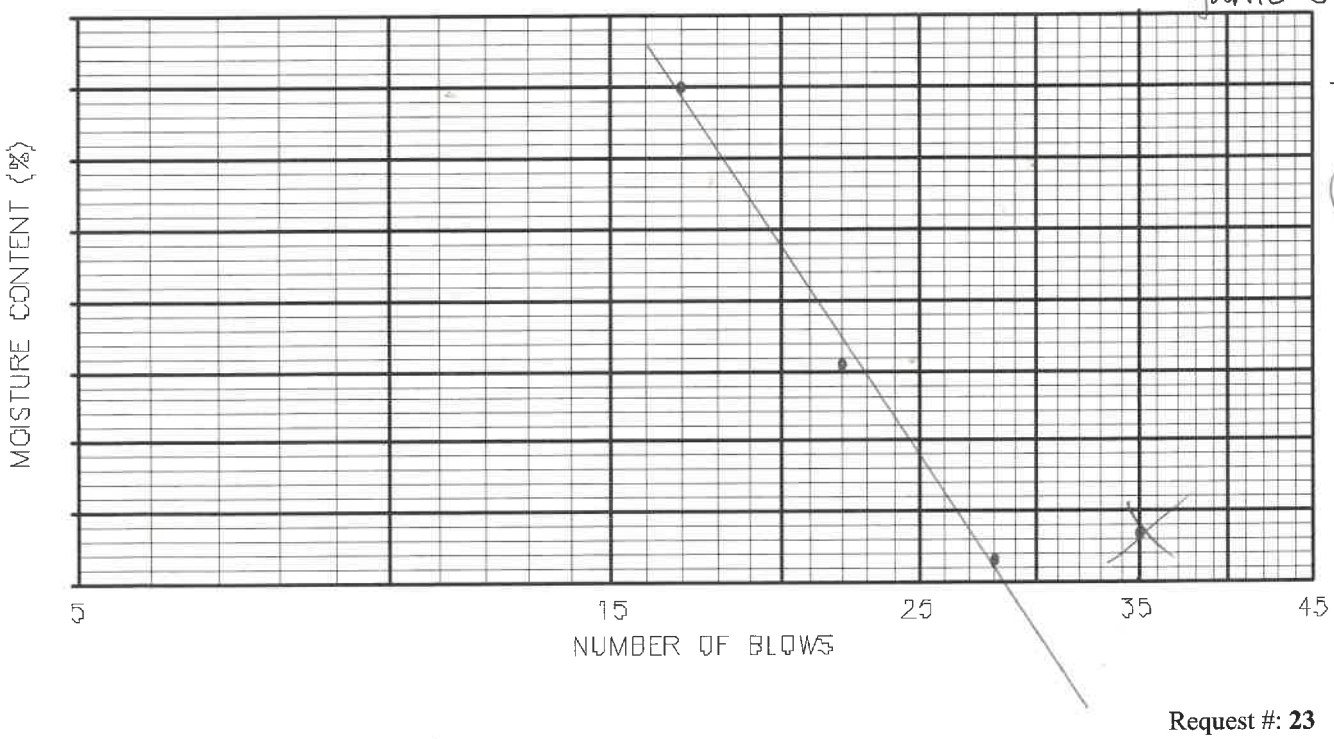
Date Sampled: _____ **By:** _____ **Date Tested:** 11/20/2020 **By:** RM

Oven used:_____ Balance used:_____ Liquid limit device: L00 Grooving tool: L00013-

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	35	28	22	17	25
Tare Number	119	615	605	433	603	621	538	405
Tare Weight	22.76	13.75	13.79	14.30	13.82	13.83	13.66	14.36
Wet Weight + Tare	105.89	19.89	20.34	22.03	20.65	22.78	21.20	19.58
Dry Weight + Tare	67.29	17.32	17.57	18.04	17.13	18.11	17.20	17.43
Dry Weight								
Weight of Water								
Moisture Content	86.7	72.0	73.3	106.7	106.3	109.1	113.0	70.0

Liquid Limit = 108 **Plastic Limit =** 73 **Plasticity Index =** 35 **Classification=** OH organic SILT



70 = 108 65%

Request #: **23**
ST:1

Reviewed By: _____

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Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) **Depth:** _____

Project/Client: Longview **Sample I.D.:** S407-B-04-50-52

HWA Project Number: 2012-113 T500 **Sample Description:** Dark Grayish Brown CL

Date Sampled: _____ **By:** _____ **Date Tested:** 4-10-2012 **By:** JP

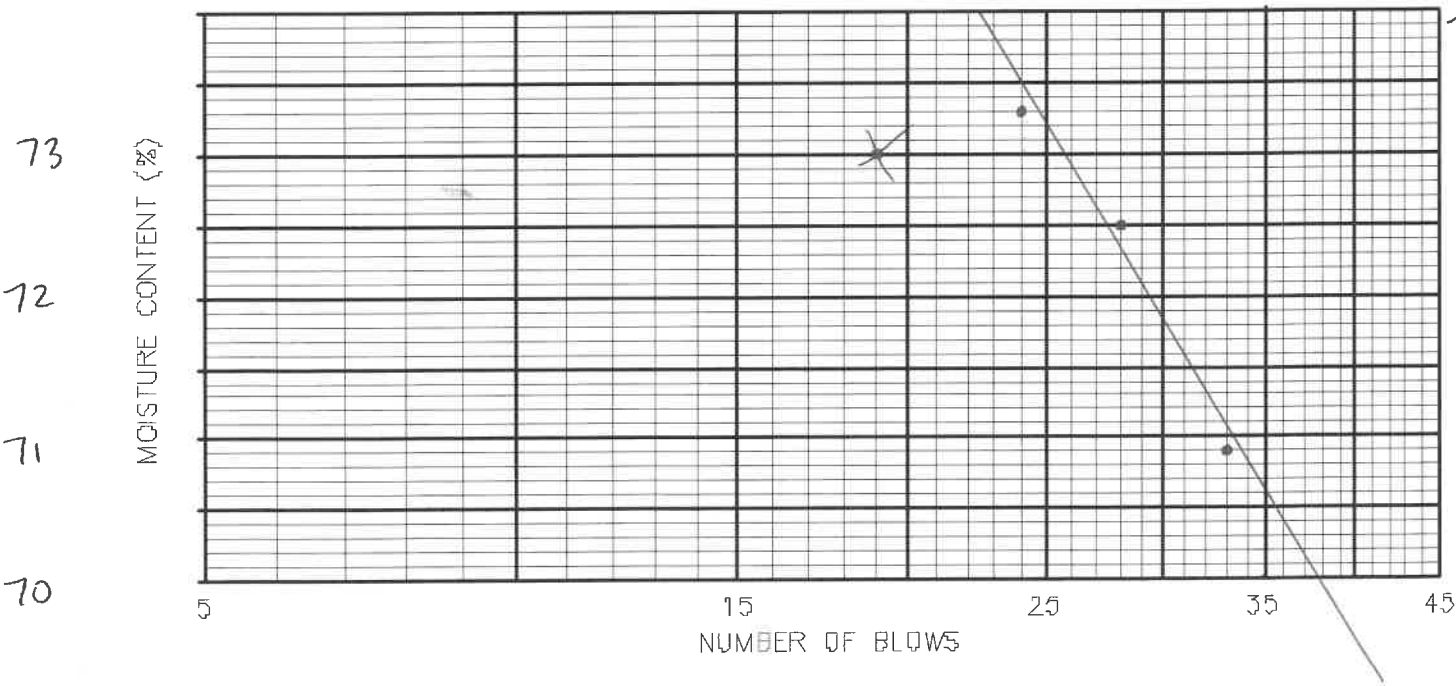
Oven used: _____ Balance used: 1 or 11 Liquid limit device: L00 Grooving tool: L00013-

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	33	23	24	19	25
Tare Number	206A	420	401	406	535	527	517	421
Tare Weight	27.59	14.50	14.56	14.53	13.70	13.71	13.59	14.70
Wet Weight + Tare	48.03	20.86	25.59	21.33	22.03	24.70	24.09	22.65
Dry Weight + Tare	38.29	18.87	22.18	18.51	18.53	20.05	19.66	19.99
Dry Weight								
Weight of Water								
Moisture Content	91.0	45.5	44.8	70.9	72.5	73.3	73.0	50.3

Liquid Limit = 73 **Plastic Limit =** 45 **Plasticity Index =** 28 **Classification=** OH

50/73 = 68%



Reviewed By: _____ **Page** ___ **of** ___

Revised 8/10/12

HWA GeoSciences Inc.

HWA GeoSciences Inc. MATERIALS TESTING LABORATORY

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318) Depth: 25 - 30

Project/Client: Longview / Anchor QEA **Sample I.D.:** SU10-B-01 25-30

HWA Project Number: 2012-113 T500 **Sample Description:** Grayish-brn

Date Sampled: _____ **By:** _____ **Date Tested:** 4/20 **By:** RL

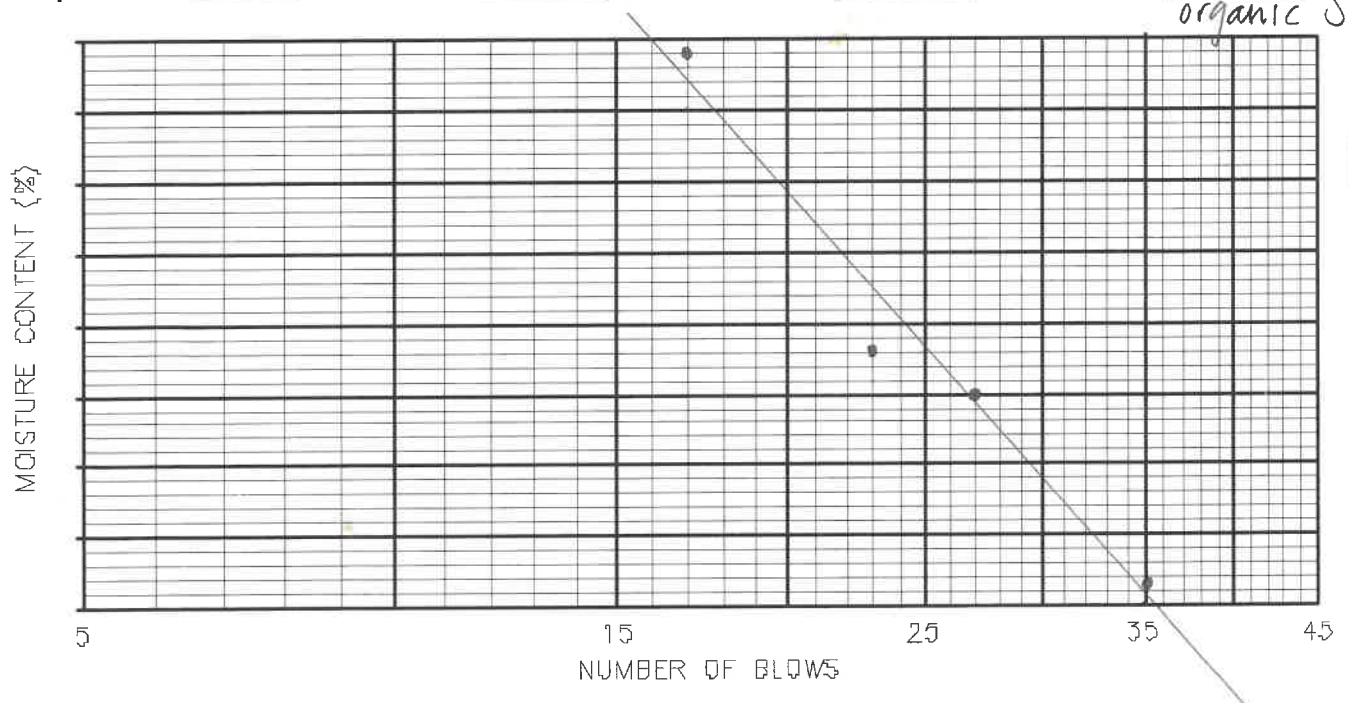
Oven used: _____ Balance used: 445 Liquid limit device: L00 439 Grooving tool: L00013- 71

Test Method: **A** (multipoint) or **B** (one point) Prep Method: **Wet** or **Dry**

	Natural	Plastic Limit		Liquid Limit				OD
Number of Blows	N/A	N/A	N/A	35	27	23	17	25
Tare Number	313	434	617	641	439	446	435	515
Tare Weight	22.21	14.24	13.79	13.66	14.21	14.23	14.48	13.62
Wet Weight + Tare	63.03	20.58	20.84	21.99	21.69	22.29	22.65	18.28
Dry Weight + Tare	48.65	18.73	18.79	18.58	18.56	18.90	19.10	16.68
Dry Weight								
Weight of Water								
Moisture Content	54.4	41.2	41.0	69.3	72.0	72.6	76.8	52.3

Liquid Limit = 73 **Plastic Limit =** 41 **Plasticity Index =** 32 **Classification=** OH organic SILT

52 = 73 71%



Request #: **23**
ST:1

Reviewed By: _____