July 2, 2019

Andrew Smith, Site Manager
Department of Ecology
PO Box 47775
Olympia, Washington 98504-7775

Subject: **Additional Investigation Results Report**
NuStar Vancouver Annex Facility
5420 NW Fruit Valley Road
Vancouver, Washington
0060-001-005

Dear Mr. Smith:

Enclosed, please find the *Additional Investigation Results Report* that has been prepared on behalf of NuStar Terminals Services, Inc. (NuStar) by Cascadia Associates, LLC. (Cascadia). The enclosed report provides a summary of the soil and groundwater investigation and comprehensive groundwater monitoring event conducted at the NuStar Vancouver Annex Facility during first quarter 2019. The results from this investigation are being used to evaluate remedial options for the Feasibility Study.

If you have any questions or would like to discuss this further, please contact me at (503) 906-6577 (ext. 110).

Sincerely,

Stephanie Bosze Salisbury

Stephanie Bosze Salisbury, L.G.
Senior Associate Geologist

Enclosure
Additional Investigation Results Report (electronic via email and 2 hard copies)

cc: Renee Robinson, NuStar Energy, L.P. (electronic deliverable)
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Additional Investigation Results Report

NuStar Vancouver Annex Terminal

5420 NW Fruit Valley Road

Vancouver, Washington

Prepared for:

NuStar Terminals Operations Partnership, L.P.
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Project No. 0060-001-005
July 1, 2019

Cascadia Associates, LLC

Additional Investigation Results Report

NuStar Vancouver Annex Terminal

5420 NW Fruit Valley Road

Vancouver, Washington

Prepared for:

NuStar Terminals Operations Partnership, L.P.

Project No. 0060-001-005

July 1, 2019

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1.0 INTRODUCTION

This *Additional Investigation Results Report* summarizes data collected during a soil and groundwater investigation conducted at the NuStar Terminals Operations Partnership, L.P. (NuStar) Annex Terminal located at 5420 NW Fruit Valley Road, Vancouver, Washington (the Facility). A location map for the Facility is provided on Figure 1; a site plan is provided on Figure 2.

On July 12, 2012, NuStar submitted a draft Feasibility Study (FS) to the Washington State Department of Ecology (Ecology) in accordance with Agreed Order (AO) No. 09-TC-S DE5250 between Ecology and NuStar (Ash Creek, 2012). The technical basis of the FS was the Remedial Investigation (RI) and Risk Assessment (RA) documented in the *Remedial Investigation and Risk Assessment Report* (RI/RA Report) submitted to Ecology in December 2010 (Ash Creek, 2010) and approved by Ecology on June 23, 2011. The draft FS proposed monitored natural attenuation to address residual hydrocarbon constituents in groundwater in the eastern portion of the tank farm. On October 16, 2013, Ecology provided NuStar with comments on the draft FS. In the months following receipt, NuStar held several meetings with Ecology to discuss Ecology's comments on the FS, as well as additional comments that were presented to NuStar in a February 4, 2014 meeting. The meetings culminated in a Final Project Coordinator's Decision (the "Decision") issued by Ecology on August 26, 2014, which established a series of steps for collecting additional data to support submittal of a revised FS. The additional data requested by Ecology included one year of sitewide quarterly groundwater monitoring and additional groundwater investigation near historical borings SB-8 and SB-9 located in the western portion of the terminal. NuStar agreed to the additional investigation and monitoring and collected a series of grab groundwater samples and ultimately installed seven additional monitoring wells (MW-5 through MW-10 and MW-8D). The results indicated the presence of petroleum hydrocarbons in groundwater at concentrations above Washington Model Toxics Control Act (MTCA) Method A Cleanup Levels in two apparently isolated areas in the vicinity of historical borings SB-8 and SB-9. A pilot study was conducted in one of these areas to evaluate the efficacy of injecting chemical oxidants to address the petroleum hydrocarbons. The results of the pilot study were summarized in the Pilot Study Results report (Cascadia, 2019b) that was submitted to Ecology on January 17, 2019.

While evaluating the results from the pilot study, it was apparent that additional delineation of hydrocarbon constituents in soil and groundwater would be beneficial in the western portion of the Facility to evaluate applicable remedial alternatives for the FS. Specifically, additional vertical delineation of residual hydrocarbon constituents in soil and groundwater was needed in certain portions of the western tank farm areas, and lateral delineation was needed to determine whether the dissolved-phase hydrocarbon constituents in groundwater around wells MW-5 and MW-6 were discreet or connected. Additionally, in April 2018, Ecology requested additional soil investigation near the truck loading rack at the Facility to better define the presence and extent of petroleum hydrocarbon constituents in soil.

An Additional Soil and Groundwater Investigation Work Plan (Work Plan) was submitted to Ecology on October 22, 2018, summarizing the methods and procedures for collecting the additional soil and groundwater data. Ecology provided NuStar with comments on the Work Plan on November 15, 2018, and NuStar provided a response to comments in an email on December 5, 2018. Ecology approved the Work Plan scope on December 12, 2018; however, the agency requested that soil and groundwater samples in the vicinity of the truck loading rack and small above-ground storage tank (AST) area also be analyzed for chemicals present in fuel system icing inhibitor (diethylene glycol monomethyl ether[DGME]).

On January 14, 2019, a final Work Plan (Cascadia 2019a) was submitted to Ecology, which included a proposed analysis for evaluating the chemicals present in the icing inhibitor. The Work Plan included a cover letter with responses to Ecology's November 15, 2018 comments as well as responses to Ecology comments provided during a January 3, 2019 telephone call. The additional soil and groundwater investigation was implemented between January 28 and February 5, 2019. Following the investigation, a comprehensive groundwater monitoring event was completed from February 18 through 19, 2019. The methods, procedures, and results for the soil and groundwater investigation and groundwater monitoring are described in this report.

2.0 BACKGROUND

2.1 SITE LOCATION, DESCRIPTION, AND HISTORY

Location. The Facility address is 5420 NW Fruit Valley Road, Vancouver, Washington 98660 (Latitude: N45º 39.70', Longitude: W122º 41.66'), as shown on Figure 1. The Facility is located on Clark County Tax Lot (TL) No. 147360.

Physical Features. Figure 2 is a Site Plan. The Facility is approximately 31 acres and is roughly rectangular, with dimensions of approximately 800 by 1,800 feet. The Facility is located in a mixed industrial-agricultural area and currently includes ASTs containing jet fuel and methanol (seven ASTs ranging in size from 30,000 to 3,000,000 gallons); a covered truck refueling rack with two smaller volume ASTs (an approximately 400-gallon AST which stores anti-static additive [ASA] and a 7,500-gallon AST containing fuel system icing inhibitor [FSII] additive); and several buildings used for equipment storage and offices. A former underground storage tank (UST) associated with a vapor recovery system was also located on the Facility and was removed in 2001. The vapor recovery system and an associated oil/water separator (OWS) remain on-site but are no longer used. The surface of the Facility is comprised of graveled areas and grass fields, with asphalt-paved roads providing access to the fueling areas, ASTs, and office buildings.

Property History. Support Terminals Operating Partnership, L.P. (STOP) purchased the Facility from Cenex Harvest States Cooperative (Cenex) in 2003. In March 2008, NuStar acquired STOP.

The property was developed in 1957 as a truck loading terminal. Records are unclear as to whether the Facility was developed by Cenex. Historically, chemicals and other products stored at the Facility included liquid fertilizers and refined petroleum products such as gasoline, diesel and

kerosene, de-natured alcohol, and petroleum product additives. A transmix tank is present in the western portion of the Facility (Figure 2), and this is typically where waste (such as from tank-bottom cleanouts or the OWS) would be stored prior to off-site disposal or recycling. The transmix tank is no longer in use.

2.2 GEOLOGY AND HYDROGEOLOGY

This section presents the understanding of the geology and hydrogeology as discussed in the RI/RA Report (Ash Creek, 2010).

2.2.1 Geology

Regional Geology. The regional geology is summarized below and is based on reports prepared by Pacific Groundwater Group (PGG; 2001) and AMEC (2002a). The vicinity of the Facility is dominated by three primary units: Recent Alluvial deposits; the Pleistocene Alluvial deposits; and the Troutdale Formation.

The Recent Alluvial deposits are the upper unit with deposits approximately 55 feet thick and consist of fine-grained silt and sand within the areas investigated near Vancouver Lake. The Pleistocene Alluvial deposits are approximately 95 to 115 feet thick and consist of coarse-grained sand and gravel. The Pleistocene Alluvial deposits originate from alluvial deposits from the Columbia River and deposits from the catastrophic Missoula Floods. The Troutdale Formation underlies the Pleistocene Alluvial deposits and can be greater than 1,000 feet thick. It is made up of cemented sandy gravels and semi-consolidated sands, silts, and clays.

Site Geology. During previous Facility investigations performed by others, soil borings have been installed to depths of up to 50 feet below ground surface (bgs) at the Facility. During a 2007 Facility investigation conducted by Ash Creek Associates (Ash Creek, 2007), one boring was completed to a depth of 72 feet bgs. Recent investigations in the western portion of the Facility included installing borings up to depths of 65 feet bgs.

The Recent Alluvial deposits underlying the western portion of the Facility consist of silt and silty clay with some fine sand to depths of approximately 20 to 25 feet bgs. Below 20 to 25 feet bgs, the Recent Alluvial deposits consist of layers of fine- to medium-grained sand to a depth of at least 65 feet bgs. On the eastern portion of the Facility, fine sand or sandy silt with variable layers of sand or silty sand is encountered to a depth of approximately 10 feet bgs. Below 10 feet bgs, the Recent Alluvial deposits in the eastern portion of the Facility consist of layers of fine- to medium-grained sand to a depth of approximately 50 to 60 feet bgs. The Pleistocene Alluvial deposits are encountered below the Recent Alluvial deposits and consist of sand and/or gravel layers of varying thicknesses.

2.2.2 Hydrogeology

Regional Hydrogeology. The regional aquifers, Recent Alluvial Aquifer (RAA); Pleistocene Alluvial Aquifer (PAA); and the aquifers of the Troutdale Formation, follow the regional geology discussed

above. The regional hydrogeology summarized below is based on reports prepared in support of Clark Public Utilities (CPU) South Lake Wellfield (PGG, 2001; PGG, 2009), and by Ash Creek (2008a and 2008b).

The RAA is unconfined and receives recharge directly from the land surface and/or surface water features. The PAA directly underlies the RAA and is a productive aquifer with high well yields (several thousand gallons per minute [gpm] without significant drawdown). The groundwater flow system is highly influenced by local surface water bodies. The Columbia River, Vancouver Lake, Vancouver Lake Flushing Channel, and Lake River form natural hydrologic boundaries to the groundwater flow system. Tidal influences and seasonal variations in surface water runoff cause dynamic variation in the stage of the Columbia River, and resulting adjustments in the stages of the other three connected surface water bodies. The groundwater flow system is also influenced by tidal and seasonal variations in the surface water bodies. Regionally, it is anticipated that groundwater within the RAA and PAA near the Facility would have a net gradient towards Vancouver Lake and the Columbia River.

Site Hydrogeology. In the west tank farm, area depth to first encountered groundwater is typically 16 to 20 feet bgs, and in the eastern portion of the site, near the former truck loading area, depth to groundwater typically ranges from 26 to 32 feet bgs. During the May 2018 monitoring event, the water table was approximately 8 feet higher than typical spring water levels. A review of historical water level monitoring results suggests that the water levels in May 2018 were elevated in response to heavy rainfall and were not indicative of typical Spring conditions.

First encountered groundwater at the Facility corresponds to the silt and fine- to medium-grained sand of the RAA.

Shallow groundwater flow at the Facility is typically, under static conditions, flat with a slight gradient (0.0002 foot per foot [ft/ft]) to the southeast (AMEC, 2002a; SECOR, 2003; Ash Creek, 2009). The groundwater gradient during the February 2019 monitoring event was generally consistent with historical results, as shown on Figure 3. The groundwater elevation in well MW-7, located outside of the tank farm berm to the west, was lower than the wells in the western tank farm (MW-5, MW-6, and MW-8) suggesting a potential groundwater divide in the western tank farm. A quarterly monitoring program has been initiated in 2019, and groundwater flow will continue to be monitored during quarterly events.

3.0 SUMMARY OF SITE INVESTIGATIONS

The below sections summarize historical and recent investigations conducted at the Facility.

3.1 SUMMARY OF HISTORICAL INVESTIGATIONS – 2001 THROUGH 2012

Several investigations have been conducted at the Facility since 2001. The initial investigation assessed the area of a possible fuel release during a UST decommissioning and resulted in further work to define the extent of petroleum constituents in soil and groundwater (AMEC 2002a, 2002b).

In 2003, SECOR conducted a comprehensive Phase II Environmental Site Assessment (ESA) of the Facility as a part of due diligence activities for Cenex during the property transaction to NuStar (SECOR, 2003). From 2007 to 2008, Ash Creek completed several investigations to further characterize the site (Ash Creek, 2007, 2008a, and 2008b). Four monitoring wells were installed in 2004 and were monitored periodically or quarterly during the 2004 to 2012 investigation period. The scope and results of each of these investigations are detailed in the RI/RA Report (Ash Creek, 2010). Table 1 summarizes the depth to groundwater and groundwater elevation data from these investigations; Table 2 summarizes the historical soil data; and Table 3 summarizes the historical grab groundwater data; and Table 4 summarizes the historical groundwater monitoring data from site monitoring wells.

3.2 SUMMARY OF ADDITIONAL INVESTIGATION – 2014 THROUGH 2016

As previously discussed in Section 1.0, Ecology provided NuStar with comments on the Draft FS on October 16, 2013. In the months following receipt, NuStar held several meetings with Ecology to discuss Ecology's comments on the FS, as well as additional comments that were presented to NuStar in a February 4, 2014 meeting. The additional comments included a request for additional groundwater investigation near historical borings SB-8 and SB-9; the locations of these borings are shown on Figure 2. NuStar agreed to the additional investigation, and the preliminary investigation indicated that petroleum hydrocarbon constituents were present in groundwater near historical borings SB-8 and SB-9 at concentrations above MTCA Method A Cleanup Levels. As a result, additional site investigation, well installation, and groundwater monitoring were conducted to evaluate the magnitude and extent of petroleum hydrocarbon constituents in groundwater in the western portion of the terminal. The results of these investigations are detailed in Apex 2015a, 2015b, and 2017. The soil results from these investigations are included in Table 3, and the grab groundwater results are shown in Table 4. Boring and monitoring well locations are shown on Figure 2.

In summary, these investigations included:

- Installing two monitoring wells, MW-5 and MW-6, at the locations of historical borings SB-8 and SB-9, respectively (soil boring SB-8 was located adjacent to tank 5503 while boring SB-9 was located adjacent to the transmix tank located in the southwestern quadrant of the Facility);
- Conducting one year of quarterly groundwater monitoring of existing wells MW-1 through MW-4 and the new wells, MW-5 and MW-6;
- Conducting additional groundwater investigation to define the extent of petroleum hydrocarbons and related constituents in the areas of wells MW-5 and MW-6, including the installation of 12 additional borings (B-1 through B-12) and the collection of two to three depth discrete groundwater samples from each boring using temporary well points;

- Conducting a groundwater investigation to delineate the extent of petroleum hydrocarbons in groundwater to the west of wells MW-5 and MW-6, including the installation of two borings, B-13 and B-14, outside and to the west of the tank farm berms of the Facility;
- Installing four shallow compliance wells, MW-7 through MW-10, to monitor the potential for offsite migration to the north, west, and south; and
- Installing two deeper monitoring wells, MW-5D and MW-8D, adjacent to wells MW-5 and MW-8, respectively to evaluate potential vertical gradients in groundwater.

Total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations in the samples from borings B-13 and B-14, and wells MW-7 through MW-10 and MW-8D were below method reporting limits. The results were presented to Ecology in a meeting on September 22, 2016. During the meeting, Ecology supported the conclusion that the compliance well network was acceptable for monitoring purposes.

3.3 PILOT STUDY - 2017

In the September 2016 meeting, Ecology stated that the FS would need to evaluate active remediation to address the petroleum hydrocarbons in groundwater near wells MW-5 and MW-6 based on the additional groundwater investigations conducted from 2014 to 2016. As such, NuStar indicated that initial evaluations of potential remedial alternatives identified injection of oxygen releasing compound (ORC) and/or *in-situ* chemical oxidation (ISCO) as possible options. However, due to the presence of the heavier hydrocarbons in the saturated soil and shallow groundwater, it was determined that a pilot study would be needed to better evaluate the viability of this option. A pilot study work plan was submitted to Ecology in August 2017 (Apex, 2017) and implemented in October and November 2017. After the injections were completed, one year of groundwater monitoring was conducted to assess the effectiveness of the ORC and ISCO injections. The results of the pilot study were submitted to Ecology in the Pilot Study Results Report (Cascadia, 2019b). While the remedial technology was not ruled out as a potential future cleanup option for the Facility, the tight soils in the tank farm area significantly limited the effective distribution of ISCO/ORC products into the subsurface rendering the technology inefficient for remediating petroleum hydrocarbon constituents in that portion of the site.

4.0 ADDITIONAL INVESTIGATION - 2019

In reviewing the available site data and the results of the pilot study, it became apparent that additional site data were needed to adequately evaluate remedial options and prepare the FS. Specifically, three areas of additional investigation were identified and included:

- Soil sampling adjacent to the truck loading rack to assess current petroleum hydrocarbon constituent concentrations;

- Additional groundwater sampling in the western area of the Facility to better delineate the vertical and lateral extent of petroleum hydrocarbon constituents in this area; and
- Soil and groundwater screening and sampling between wells MW-1 and MW-3 to confirm that petroleum hydrocarbon constituent concentrations in groundwater in this area are below MTCA Method A Cleanup Levels.

In addition, a comprehensive groundwater monitoring event was conducted in February 2019, initiating a quarterly monitoring program to be conducted at the Facility.

4.1 SCOPE AND RATIONALE FOR INVESTIGATION AREAS

The rationale and work scope for each area of investigation was provided in the Work Plan (Cascadia, 2019a). The section below summarizes the work scope for each of the investigation areas. Figure 2 shows the locations of the borings installed during the 2019 investigation.

4.1.1 Loading Rack Soil Investigation

Historical sampling conducted in 2002 and 2003 in the former truck loading rack, located just east of the current truck loading rack, indicated the presence of petroleum hydrocarbon constituents in soil, generally in the 8- to 10-foot depth interval. Historical grab groundwater sampling conducted in this area did not indicate the presence of petroleum hydrocarbons or related constituents above MTCA Method A Cleanup Levels, and hydrocarbon constituents were not detected in groundwater samples recently collected from monitoring well MW-4 located adjacent to this area.

To assess current soil conditions and better support remedial alternative evaluations for soil containing residual hydrocarbons in the truck rack area in the Revised FS, six soil borings were installed at the locations shown on Figure 2. Borings B-23, B-24, B-25, and B-27 were advanced at or near the locations of historical borings GP-34, GP-14, GP-33, and GP-32, respectively, to assess current hydrocarbon concentrations at these locations. The 2002/2003 investigations indicated petroleum hydrocarbon constituent concentrations ranging from 363 milligram per kilogram (mg/kg) up to 19,700 mg/kg at the historical boring locations. Two additional borings (B-26 and B-28) were advanced in the grassy area to the east of these borings to verify the low to non-detect results reported in the 2002/2003 investigation.

4.1.2 Soil and Groundwater Assessment for De-Icer Constituents

As requested by Ecology, soil and groundwater samples collected from one boring, B-27, were also analyzed for DGME, the primary compound in the de-icer stored at the terminal.

4.1.3 Groundwater Investigation – Western Area

While the aerial and vertical extent of groundwater in the tank farm area has been defined sufficiently for compliance monitoring purposes, additional assessment was completed to further refine delineation of petroleum hydrocarbon constituents in groundwater to support preparation of the FS.

Borings B-20 and B-21 were advanced to further vertically delineate groundwater in the vicinity of historical borings B-5 and B-9, respectively. Borings B-17 and B-18 were advanced to vertically delineate groundwater near historical boring B-4 and to the east of boring B-10, respectively. Boring B-18 also provides additional lateral delineation to the east of boring B-10.

Additionally, previous investigations have identified petroleum constituents in the vicinity of well MW-5, located in the northwestern area of the Facility, and well MW-6, located in the southwestern area of the Facility, and these results suggested that the dissolved-phase petroleum constituents are two separate "plumes". Therefore, further delineation was conducted between these two wells during the recent investigation to better assess whether the plumes are separate or connected. To this end, three borings were proposed in the Work Plan – two in the storm pond (B-15 and B-16) and one to the east of the storm pond (B-19), at the locations shown on Figure 2. However, due to the steep slope of the bermed walls around the storm pond area, the "limited access" probe rig was not able to enter the storm pond area, and groundwater could not be sampled at locations B-15 and B-16. To supplement historical soil data collected in the storm pond, soil samples were collected from boings B-15 and B-16 using a hand auger to compare to historical soil results collected in the storm pond in 2003.

4.1.4 Groundwater Investigation – Vapor Recovery Area

In reviewing the historical grab groundwater data collected in the former truck loading rack area, an area of higher petroleum hydrocarbon concentrations was identified between wells MW-1 and MW-3, near the former vapor recovery unit, specifically at historical boring location B-8. Historical figures summarizing these data are contained in Appendix A.

Monitoring wells MW-1, MW-2, and MW-3 surround the former vapor recovery unit, and no longer contain petroleum hydrocarbon constituents at concentrations above MTCA Method A Cleanup Levels. Boring B-22 was advanced adjacent to historical boring GP-8, and in the approximate center of wells MW-1, MW-2, and MW-3, to confirm that petroleum hydrocarbons were no longer present in the historical vapor recovery area.

4.2 METHODS AND PROCEDURES

The following sections describe the methods and procedures utilized during the soil and groundwater investigation including preparatory activities, soil boring advancement, field screening and/or sampling of vadose zone soil, depth discrete sampling of groundwater, monitoring well installation, and sampling of groundwater monitoring wells. Soil boring and monitoring well construction logs are provided in Appendix C.

4.2.1 Preparatory Activities

Prior to the investigation, the public utility notification center was contacted, and on January 22, 2019, a private utility locator (Mt. View Locating) was contracted to check for the presence of buried utilities and/or infrastructure in the work area. Additionally, each probe location was

cleared with a hand auger down to 8 feet to confirm that no utilities or other buried materials were present in the subsurface at that location.

The proposed boring locations in the storm pond were not accessible during the January 22, 2019 private locate event due to standing water in the storm pond. By January 29, 2019, the storm pond no longer contained standing water, so a private utility locator (Locates Down Under) was contracted to check for buried infrastructure beneath the storm pond; the pond was cleared of buried infrastructure at the proposed sampling locations.

4.2.2 Soil Boring Installation

From January 28, 2019 through February 4, 2019, a representative from Cascade Drilling, of Clackamas, Oregon, advanced 12 borings using a direct-push rig. Two additional borings were advanced in the storm pond using a hand auger. The site investigation was conducted with oversight from a Cascadia Associates field scientist in accordance with Cascadia standard operating procedures (SOPs) for direct-push explorations (Appendix B).

4.2.3 Field Screening

Continuous soil samples were collected during push-probe activities for the purpose of documenting lithologic descriptions and for field screening. Field screening consisted of sheen testing and using a photoionization detector (PID). Soil boring logs with lithologic descriptions, PID measurements and sheen testing information are provided in Appendix C.

4.2.4 Soil Sample Collection – Former Truck Rack Area

In the former truck rack area, soil samples from borings B-23 through B-28 were collected for analysis from the same depth as the historically highest petroleum hydrocarbon concentrations in each borehole. An additional sample was collected at borings B-25 (from 8.5 to 9.5 feet bgs) and B-27 (from 9 to 10 feet bgs) for laboratory analysis because PID measurements indicated higher vapor concentrations at these depths than at the depth of the historically highest soil analytical result.

4.2.5 Soil Sample Collection – Western Area

Soil samples were collected from borings B-15 through B-21 in the western tank farm (Figure 2). One soil sample from each borehole was collected from just above the water table. A second sample was collected from the borings at a depth corresponding to the most elevated PID reading. PID readings were not elevated in boreholes B-15 and B-19, so only the sample directly above the water table was collected for chemical analysis in those boreholes.

4.2.6 Depth Discrete Groundwater Sampling – Western Area

Grab groundwater samples were collected from borings B-17 through B-21 in the western tank farm area. At each location, the borings were advanced to the bottom depth of the uppermost targeted sampling interval, and a temporary well with a 5-foot-long well screen was installed

through the push probe rod. The rod was then lifted 5 feet to allow the temporary well screen to be placed across the targeted sampling interval. A groundwater sample was then collected from the temporary well using low flow methodology in accordance with the Low Flow Groundwater Sampling Method SOP contained in Appendix B. Following collection of the uppermost groundwater sample, each borehole was further advanced to the bottom depth of the next targeted interval, and a new temporary well was installed as described above across the second targeted interval. This process was used to collect samples from each targeted interval. Sampled intervals for each boring are summarized in Table 3.

As previously discussed, the push probe rig was not able to navigate the steep slopes of the storm pond berm, so groundwater samples were not collected from locations B-15 and B-16; soil samples were collected from these locations via hand-auger.

4.2.7 Historical Vapor Recovery Area – Grab Groundwater Sampling and Monitoring Well Installation

A grab groundwater sample was collected from first encountered groundwater (20 to 25 feet bgs) in boring B-22 and was analyzed on a 24-hour turnaround time to determine whether or not a monitoring well was needed at that location. Per the January 2019 Work Plan, if petroleum constituent concentrations exceeded MTCA Method A Cleanup Levels in the grab groundwater sample, a monitoring well would be installed. After the borehole was sampled, it was backfilled with hydrated bentonite. The analytical results indicated that gasoline range hydrocarbons as well as benzene, ethylbenzene, xylenes were present in the grab groundwater sample from boring B-22 at concentrations above MTCA Method A Cleanup Levels. Therefore, per the Work Plan, monitoring well MW-11 was installed adjacent to boring B-22, at the location shown on Figure 2.

On February 26, 2019, well MW-11 was installed in accordance with WAC 173-160-400 and the Cascadia SOPs contained in Appendix B. Well MW-11 is constructed of 2-inch PVC casing, with a 0.01-inch slotted PVC screen from 10 to 25 feet bgs. The Work Plan (Cascadia, 2019a) stated that the well would be completed with casing and a monument that would extend approximately 6 inches above the ground surface. Upon conferring with the Washington licensed well driller, a stick-up monument would require multiple bollards around the monument to be compliant with state laws. There were concerns that this would be an obstruction for terminal operations, so the monument was instead raised 6 inches above the ground surface in a concrete mound. A mounded monument can be driven over, thus does not require protection using bollards.

Prior to setting the monument, a representative from Cascade Drilling developed the monitoring well using a downhole pump. The well was developed until groundwater was clear, which included the removal of 10 well volumes of groundwater or the equivalent of 12 gallons of groundwater. The development water was contained in a 55-gallon drum and was transported from the Facility for disposal as investigation-derived waste.

4.2.8 Comprehensive Groundwater Monitoring Event

On February 18, 2019, a comprehensive groundwater monitoring event was conducted to assess current groundwater conditions across the Facility and to support the evaluation of remedial alternatives for the Facility. The groundwater monitoring event including the gauging and sampling of wells MW-1 through MW-11, MW-5D and MW-8D. Samples were collected from each well using the low-flow sampling SOPs as provided in Appendix B and were submitted for laboratory analysis using the analytical program outlined in Section 4.3. Field sampling forms are provided in Appendix E.

4.3 ANALYTICAL PROGRAM

Soil and grab groundwater samples from the borings and groundwater samples from site monitoring wells were submitted to Apex Laboratory of Tigard, Oregon, for the following analyses.

- BTEX and methyl tert-butyl ether (MTBE) by U.S. Environmental Protection Agency (EPA) Method 8260B;
- TPHg by Method NWTPH-Gx and TPHd by Method NWTPH-Dx (with silica gel cleanup); and
- Soil and groundwater samples collected from boring B-27 were also analyzed for DGME using a modified (semi-quantitative) version of Method 8260B.

On March 21, 2019, after the investigation was completed, NuStar received an inquiry from Ecology requesting information about the historical analysis of lead and naphthalene at the Facility. NuStar provided Ecology with the requested data in an email on April 2, 2019, and it is summarized in tables and/or figures herein.

5.0 RESULTS

The results of the soil and groundwater investigation are summarized in the sections below. The laboratory analytical reports from this investigation are provided in Appendix D, along with a data quality assurance/quality control review. The analytical results of samples collected from monitoring wells, soil, and grab groundwater locations are provided in Tables 2 through 4, respectively. Soil analytical results are shown by location on Figures 4 and 5. Groundwater analytical results are summarized on Figures 6 through 9.

5.1 SOIL INVESTIGATION – FORMER TRUCK RACK AREA

Borings B-23, B-24, B-25, and B-27 were advanced in the former truck loading area to assess current conditions at historical boring locations GP-34, GP-14, GP-33, and GP-32, respectively. Historically, petroleum hydrocarbons were above MTCA Method A Cleanup Levels at these locations at depths between 6 and 10 feet. With the exception of boring B-27, the 2019 results were well below historical concentrations and/or below analytical reporting limits. A table comparing the 2002 and 2019 results is provided below.

Table 5.1A – Comparison of historical (2002) and recent (2019) soil samples in former truck loading area.

Sample ID (Depth ft bgs)	Sample year	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Xylenes
GP-34 (6-8)	2002	728	13,600	<0.500	<0.500	0.717	16.9
B-23 (6.5 – 7.5)	2019	<7.26	<25.0	<0.0145	<0.0726	<0.0363	<0.109
GP-14 (10-12)	2002	3,230	19,700	--	--	--	--
B-24 (10.5-11.5)	2019	<7.19	<26.5	<0.0144	<0.0719	<0.0359	<0.108
GP-33 (8-10)	2002	363	31,500	<0.500	<0.500	7.2	33.9
B-25 (8.5 – 9.5)	2019	88.6	7,650	<0.0148	<0.0739	<0.0369	<0.111
GP-32 (6.5 – 8)	2002	910	2,530	<5	<5	<5	16
B-27 (7 - 8)	2019	1,910	6,620	<0.0725	<0.363	1.89	11.1

Shading indicates exceedance of MTCA Method A Cleanup Level.
"--" indicates sample not analyzed for constituent.
"<" indicates analyte not detected at or above the specified laboratory method reporting limit.

It should be noted that the recent soil sample collected from a depth of 10 feet at boring B-27 contained TPH in the gasoline hydrocarbon range (TPHg) at a concentration of 11,500 mg/kg and in the diesel range (TPHd) at 23,000 mg/kg. Samples were not collected from this depth historically; therefore, a data comparison cannot be made to assess whether attenuation has occurred. However, as shown in the table below, PID readings collected below 10 feet in all recent borings except B-27 were below a 5 parts per million per volume (ppmv) equipment measurement levels, and the readings in boring B-27 decreased rapidly below a depth of 12 feet and were below measurement levels below a depth of 18 feet. These results support that the residual petroleum hydrocarbons in the truck rack area are limited to a vertical depth interval of approximately 6 to 13 feet.

Table 5.1B – PID measurements for 2019 soil samples in former truck loading area.

Boring	PID Measurement (ppmv)					
	0 to 6 feet	6 to 10 feet	11 to 13 feet	14 to 16 feet	17 to 18 feet	19 to bottom of boring
B-23	<5	<5	<5	<5	See note	See note
B-24	<5	<5	<5	<5	See note	See note
B-25	<5	1.2 - 21.5	<5	<5	See note	See note
B-26	<5	<5	<5	<5	<5	<5
B-27	<5	97 - 773	679	25 - 50	5.6	<5
B-28	<5	<5	<5	<5	See note	See note

Note: Bottom of boring at 15 feet bgs.

Borings B-26 and B-28 were advanced in the grassy area to the east of the former truck loading area borings to verify the low to non-detect results reported in the 2002 investigation. The concentrations of TPHg, TPHd, BTEX, and MTBE in borings B-26 and B-28 were below analytical reporting limits and confirmed the historical investigation results (Table 2).

The results of the former truck loading rack area investigation indicate that volatile organic compounds (VOCs) have attenuated significantly in this area since it was last investigated in 2002. Residual petroleum hydrocarbons in this area are limited to the vicinity of boring B-25 and B-27 and are constrained to the east and west by borings B-23 and B-24, to the north by historical borings GP-37 and GP-18, and to the south by historical borings GP-15 and GP-16.

5.2 SOIL SAMPLE RESULTS – WESTERN AREA

The soil sample results from the borings installed in the western area of the Facility are discussed in the sections below as the "Well MW-5 Area", the "Well MW-6 Area", and the "Storm Pond Area". Results of the recent soil investigation are shown on Figures 4 and 5. Table 2 summarizes both historical and recent analytical results of soil samples collected at the Facility.

5.2.1 Well MW-5 Area

Borings B-20 and B-21 were installed in the well MW-5 area to assess residual hydrocarbon concentrations in vadose zone soil to assist in FS remedial alternative evaluations for hydrocarbons in groundwater in this area. Soil samples were collected at two sampling intervals between 10 and 13 feet in boring B-20 and between 13 and 16.5 feet in boring B-21. Field observations of wet soil indicate that these samples were collected directly above and below the water table.

BTEX, MTBE, and naphthalene were not detected in the soil samples collected from either boring (Figure 4). TPHg and TPHd concentrations were low to non-detect in the soil samples collected from boring B-21 and the 12- to 13-foot sample from boring B-20 (Figure 5). TPHg and TPHd were detected at concentrations of 302 mg/kg and 89.4 mg/kg, respectively, in the 10- to 11-foot sample from B-20 (Figure 5).

Field screening results on soil collected directly below the water table in borings B-20 and B-21 indicated PID readings between 78 and 505 parts ppmv and a moderate sheen. Borings B-20 and B-21 were located adjacent to historical borings B-9 and B-6, respectively, and the field observations were consistent with the results observed in borings B-9 and B-6. First encountered grab groundwater samples were collected from the historical borings, and therefore, additional grab groundwater samples at the water table were not collected during the recent investigation, consistent with the Work Plan.

5.2.2 Well MW-6 Area

Similar to the MW-5 area, soil samples were collected from borings B-17 and B-18 to assess residual hydrocarbon concentrations in vadose zone soil in the MW-6 area to assist in FS remedial alternative evaluations for hydrocarbons in groundwater in this area. Soil samples were collected at

two sampling intervals between 11 and 16 feet in boring B-17 and between 6 and 15 feet in boring B-18.

BTEX, MTBE, and naphthalene were not detected in the soil samples collected from boring B-17, and TPHg and TPHd concentrations were low to non-detect (Figures 4 and 5, respectively). Higher than anticipated concentrations of TPHg, TPHd, and BTEX were detected in the soil samples collected at both sampling intervals from boring B-18 (Table 2), and PID measurements from soil screening ranged from 180 to 647 ppmv between the depths of 6 to 24 feet bgs. These results indicate that vadose zone soil below 6 feet bgs in the vicinity of boring B-18 might present a source of petroleum hydrocarbons to groundwater, and these results will need to be considered in the evaluation of remedial technologies for this area in the FS.

5.2.3 Storm Pond

Borings B-15 and B-16 were hand augered in the storm pond to compare analyte concentrations in soil to historical results from borings HA-4 and HA-5, respectively. A comparison of current and historical (2003) analytical results is provided in Table 4.2.2 below. As the comparison shows, concentrations have attenuated since the 2003 investigation.

Table 5.2.3 Comparison of historical (2003) and recent (2019) soil data in storm pond area.

	TPH-G (mg/kg)		TPH-D (mg/kg)	
Depth (feet bgs)	**3-4**	**5-6**	**3-4**	**5-6**
HA-5 (2003)	3,320	2,290	4,780	10,700
B-16 (2019)	<7.80	1,900	27.8	483

	TPH-G (mg/kg)	**TPH-D (mg/kg)**
Depth (feet bgs)	**5**	
HA-4 (2003)	ND	ND
B-15 (2019)	<7.94	<28.2

Shading indicates exceedance of MTCA Method A Cleanup Levels.
ND = indicates non-detect using HCID analysis.
"<" indicates analyte not detected at or above the specified laboratory method reporting limit.

BTEX, MTBE, and naphthalene were not detected in soil samples collected from borings B-15 or B-16, and these constituents were not analyzed in the historical samples from borings HA-4 or HA-5.

5.3 SOIL AND GROUNDWATER ASSESSMENT FOR DE-ICER CONSTITUENTS IN AST AND FORMER TRUCK LOADING RACK AREA

Soil and groundwater samples collected from boring B-27 in the truck loading rack area were analyzed for DGME, the primary chemical in the de-icing fluid stored at the Facility. The laboratory analysis was calibrated using de-icer product samples from the Facility as an analytical standard.

DGME was not detected in the soil or groundwater sample from boring B-27. Results are shown in Tables 2 and 3; the laboratory report, including standard preparation and method development information, is included in Appendix D.

5.4 GROUNDWATER INVESTIGATION – WESTERN AREA

Grab groundwater sampling was conducted in the western area of the Facility to determine the vertical extent of petroleum hydrocarbons in groundwater in the vicinity of wells MW-5 and MW-6, as well as to assess whether the petroleum hydrocarbons in groundwater extended between the two wells as one "plume" of dissolved-phase petroleum constituents. As detailed in the subsections below, the vertical extents of petroleum hydrocarbon constituents were determined in the vicinity of each well and the data show that the dissolved-phase petroleum hydrocarbons are localized around each well and are not connected. Results are shown graphically on Figures 6 and 7, and summarized in Table 3.

5.4.1 Vertical Delineation of Groundwater in the Well MW-5 Area

Borings B-20 and B-21 were advanced to vertically delineate hydrocarbons in groundwater in the vicinity of monitoring well MW-5. Analytical results for the grab groundwater samples collected from the borings are shown on Figures 6 and 7. In both borings, the deeper (60 to 65 feet bgs) sample did not contain TPHg or TPHd at concentrations above MTCA Method A Cleanup Levels. For boring B-20, TPHg and TPHd were detected in the shallower (45 to 50 feet bgs) groundwater grab sample; however, only TPHg exceeded the MTCA Method A Cleanup Level. The concentrations of BTEX, MTBE, and naphthalene were below laboratory reporting limits at both the 50 to 55 feet bgs and 60 to 65 feet bgs intervals in samples from both borings B-20 and B-21.

The results of the 2019 grab groundwater investigation and the previous investigations (Table 3) indicate that affected groundwater is not present deeper than 55 feet bgs in the well MW-5 area of the tank farm. A review of historical data indicates that the deepest extent of petroleum constituents to groundwater in the well MW-5 area are in the vicinity of boring B-9, at a depth of 46 to 50 feet bgs.

5.4.2 Vertical Delineation of Groundwater in the Well MW-6 Area

Borings B-17 and B-18 were advanced and grab groundwater samples were collected to further delineate the extent of petroleum hydrocarbons and related constituents vertically in groundwater in the well MW-6 area.

TPHg, TPHd, BTEX, MTBE, and naphthalene were not detected above MTCA Method A Cleanup Levels in the grab groundwater samples collected from borings B-17 and B-18 (Figures 6 and 7).

The results of the 2019 grab groundwater investigation and previous investigations (Table 3) indicate that affected groundwater is not present deeper than 40 feet bgs in the well MW-6 area.

5.4.3 Lateral Delineation Between the Well MW-5 and Well MW-6 Areas

Boring B-19 was installed between the well MW-5 and MW-6 areas to assess whether there are two distinct dissolved-phase petroleum hydrocarbon plumes around each well or if the dissolved-phase constituents are connected as one plume in the western area of the Facility. Grab groundwater samples were collected at depth intervals of 15 to 20 feet; 30 to 35 feet; 40 to 45 feet; and 50 to 55 feet.

TPHd, TPHg, BTEX, MTBE, and naphthalene were below laboratory method reporting limits for the depth intervals, as shown on Figures 6 and 7.

5.5 GROUNDWATER INVESTIGATION – FORMER VAPOR RECOVERY AREA

As discussed in section 4.2.7, boring B-22 was advanced in the former vapor recovery area and a grab groundwater sample was collected for laboratory analysis from the first encountered groundwater (Table 3). The analytical results of the grab groundwater sample indicated that gasoline range hydrocarbons as well as benzene, ethylbenzene, xylenes were present in the grab groundwater sample at concentrations above MTCA Method A Cleanup Levels. Per the Work Plan, monitoring well MW-11 was installed adjacent to boring B-22 and was sampled as part of the comprehensive groundwater monitoring event in February 2019.

TPHg, TPHg, BTEX, and MTBE were not detected in well MW-11 above MTCA Method A Cleanup Levels (Table 4). Well MW-11 will be sampled quarterly during preparation of the FS, to verify the results for that well.

5.6 COMPREHENSIVE GROUNDWATER SAMPLING EVENT

Site wells were sampled in February 2019; analytical results are tabulated in Table 4. BTEX, MTBE, and naphthalene results from the sampling event are shown on Figure 8, and TPHg and TPHd results are shown on Figure 9.

Consistent with historical sampling results from the former Vapor Recovery and Truck Rack areas, TPHd, TPHg, BTEX, and MTBE concentrations were non-detect or below MTCA Method A Cleanup Levels in wells MW-1 through MW-4 (Figures 8 and 9). As identified above, TPHd, TPHg, BTEX, MTBE, and naphthalene results on groundwater samples collected from new well MW-11 were either non-detect or below MTCA Method A Cleanup Levels.

Results from sampling of wells MW5 through MW-10, MW-5D, and MW-8D in the western area of the Facility were consistent with previous results from these wells (Table 4).

6.0 SUMMARY AND CONCLUSIONS

The January/February 2019 additional soil and groundwater investigation was successful in collecting additional data to support potential future pilot studies and the preparation of the FS for the Facility. Figures 10 and 11 summarize data collected from first encountered groundwater

during the current or previous investigations and show the lateral extent of BTEX/MTBE/naphthalene and TPH, respectively, in the western area of the Facility. As shown on the figures, the lateral extent is defined and consists of two dissolved-phase petroleum hydrocarbon plumes in the vicinity of wells MW-5 and MW-6, respectively.

Several conclusions can be made about the nature and extent of petroleum hydrocarbons and associated constituents from the historical and recent data collected from the Facility, and include the following:

- **Vertical Groundwater Delineation in the Tank Farm Area.** The maximum depth of petroleum constituents in groundwater in the tank farm area was confirmed during this investigation. In the well MW-5 area, affected groundwater is limited to above 50 feet bgs, and in the well MW-6 area affected groundwater is limited to above 40 feet bgs.
- **Lateral Groundwater Delineation in the Tank Farm Area.** The results from the 2019 investigation, in conjunction with historical grab groundwater and monitoring well data, were used to further define the extent of affected groundwater in the tank farm area. The recent investigation confirmed that the well MW-5 and well MW-6 area plumes are isolated and do not comprise one larger plume. The extent of the plumes depicted on Figures 10 and 11 are conservative and can be used for evaluating remedial options in the FS.
- **Confirmation of Natural Attenuation of Soil in the Storm Pond Area.** During the 2019 investigation, soil samples were collected from beneath the storm pond to compare to historical results from 2003. The results indicated a 65% to 95% reduction of total hydrocarbon concentration between 2003 and 2019 as a result of natural attenuation processes. BTEX and MTBE were not detected in any of the 2019 storm pond area samples.
- **Confirmation of Historical Soil Results in the Former Truck Loading Rack Area.** During the 2019 investigation, soil samples were collected from the former truck loading rack area from similar locations to samples collected during an investigation in 2002. The 2019 results indicated a significant reduction in hydrocarbon and BTEX concentrations due to natural attenuation processes. Additionally, the results support that residual hydrocarbons in soil in the truck rack area are limited vertically to the 6 to 13 feet bgs depth interval, which is approximately 20 feet above the water table. The data collected during the 2019 investigation can be used in the Revised FS to prepare a disproportionate cost analysis for evaluating remedial alternatives for soil in this portion of the Facility.
- **Verification of Groundwater Conditions near Former Vapor Recovery Area.** Grab groundwater samples were collected from the former vapor recovery area in a location that corresponds with the most elevated hydrocarbon concentrations observed during the 2002 investigation. While monitoring wells MW-1 through MW-3 were installed in the former vapor recovery area in 2004, they were positioned around but not in the most affected groundwater area, likely due to access restrictions associated with the vapor recovery unit. Well MW-11 was installed in the area which historically exhibited the highest petroleum

concentrations; the new well was developed and sampled for petroleum hydrocarbons and associated constituents. The results indicated that while hydrocarbons and some constituents were detected in the groundwater sample from well MW-11, the concentrations were below MTCA Method A Cleanup Levels. Well MW-11 will continue to be monitored during upcoming quarterly groundwater monitoring events to confirm the results obtained during the February 2019 groundwater monitoring event.

- **De-Icer Chemicals Not Present Near AST and Former Truck Loading Area.** Soil and groundwater from boring B-27 in the truck loading rack area (the location selected by Ecology) were analyzed for DGME, the primary chemical in the de-icing fluid stored at the Facility, to confirm that there had not been a historical release of de-icing material at the Facility. DGME was not detected in the soil or groundwater samples.

The conclusions from this investigation will be used to further evaluate remedial alternatives for the Facility to support preparation of the FS. As the most appropriate remedies are identified, an additional pilot test may be necessary to evaluate the implementability and potential effectiveness of the identified remedial action. If it is determined that an additional pilot study is needed to complete the FS, a Pilot Study Work Plan will be prepared and submitted to Ecology within 60 days of the submittal of this report. If a pilot study is not deemed necessary, a Revised FS report will be submitted within 120 days of the submittal of this report.

7.0 REFERENCES

AMEC, 2002a. *Phase II Environmental Site Assessment, Cenex Harvest State Cooperatives.* May 2002.

AMEC, 2002b. *Subsurface Investigation and Soil Removal Report, Cenex Harvest State Cooperatives.* December 2002

Apex Companies, LLC (Apex), 2015a. *Groundwater Monitoring Results – December 2014.* February 6, 2015.

Apex, 2015b. *March 2015 Groundwater Results Report and Groundwater Investigation Work Plan*. May 28, 2015.

Apex, 2017. *Additional Investigation Summary Report and Pilot Test Work Plan, NuStar Terminals Operations Partnership, L.P. – Vancouver Annex Terminal.* August 2, 2017.

Ash Creek Associates (Ash Creek), 2007. *Evaluation of Migration Potential Due to Proposed Clark Public Utilities Fruit Valley Well Field.* April 10, 2007.

Ash Creek, 2008a. *Results of Direct-Push Groundwater Assessment.* January 28, 2008.

Ash Creek, 2008b. *Groundwater Monitoring Report – Quarterly Monitoring 2007.* January 28, 2008.

Ash Creek, 2009. *Remedial Investigation Work Plan.* October 2009.

Ash Creek, 2010. *Remedial Investigation/Risk Assessment Report*. December 29, 2010.

Ash Creek, 2012. *Feasibility Study Vancouver Annex Terminal*，July 12, 2012.

Cascadia Associates, LLC (Cascadia), 2019a. *Additional Investigation Work Plan* NuStar Vancouver Annex Terminal. January 14, 2019.

Cascadia, 2019b. *Pilot Study Results Report.* NuStar Vancouver Annex Facility. January 17, 2019.

Pacific Groundwater Group (PGG), 2001. *Clark Public Utilities Lakeshore Wellfield Exploration and Testing Program.* February 2001.

PGG, 2009. *Hydrogeologic Evaluation for Clark Public Utilities South Lake Wellfield, SGA Production Wells PW-2 and PW-3.* July 2009.

SECOR, 2003. *Results of Phase II Environmental Site Assessment.* June 6, 2003.

TABLES

Table 1
Groundwater Elevation Data
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Date of Measurement	Top of Casing Elevation (feet above MSL)	Screened Interval (feet bgs)	Depth To SPH (feet)	Depth to Groundwater (feet)	SPH Thickness (feet)	Groundwater Elevation (feet)
MW-1	05/14/02	NS	14.5 - 24.5	--	16.00	--	NS
	05/25/07	26.66		--	14.92	--	11.74
	08/24/07	26.66		--	18.67	--	7.99
	11/26/07	26.66		--	17.91	--	8.75
	02/27/08	26.66		--	16.92	--	9.74
	03/30/10	26.66		--	17.09	--	9.57
	09/01/10	26.66		--	19.19	--	7.47
	12/16/14	26.66		--	16.19	--	10.47
	03/25/15	26.66		--	15.25	--	11.41
	06/24/15	26.66		--	18.43	--	8.23
	09/15/15	26.66		--	19.05	--	7.61
	11/30/17	26.72		--	16.16	--	10.56
	02/28/18	26.72		--	15.07	--	11.65
	05/29/18	26.72		--	8.43	--	18.29
	08/30/18	26.72		--	18.37	--	8.35
	02/18/19	26.72		--	16.51	--	10.21
MW-2	05/14/02	NS	20 - 35	--	27.46	--	NS
	05/25/07	38.21		--	26.46	--	11.75
	08/24/07	38.21		--	30.17	--	8.04
	11/26/07	38.21		--	29.42	--	8.79
	02/27/08	38.21		--	28.50	--	9.71
	03/30/10	38.21		--	28.66	--	9.55
	09/01/10	38.21		--	30.74	--	7.47
	12/16/14	38.21		--	27.77	--	10.44
	03/25/15	38.21		--	26.79	--	11.42
	06/24/15	38.21		--	30.05	--	8.16
	09/15/15	38.21		--	30.65	--	7.56
	11/30/17	38.27		--	27.66	--	10.61
	02/28/18	38.27		--	26.70	--	11.57
	05/29/18	38.27		--	19.96	--	18.31
	08/30/18	38.27		--	29.94	--	8.33
	02/18/19	38.27		--	28.04	--	10.23

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 1
Groundwater Elevation Data
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Date of Measurement	Top of Casing Elevation (feet above MSL)	Screened Interval (feet bgs)	Depth To SPH (feet)	Depth to Groundwater (feet)	SPH Thickness (feet)	Groundwater Elevation (feet)
MW-3	05/14/02	NS	24.5 - 34.5	--	28.15	--	NS
	05/25/07	39.11		--	27.17	--	11.94
	08/24/07	39.11		--	31.04	--	8.07
	11/06/07	39.11		--	30.36	--	8.75
	02/27/08	39.11		--	28.71	--	10.40
	03/30/10	39.11		--	29.55	--	9.56
	09/01/10	39.11		--	31.65	--	7.46
	12/16/14	39.11		--	28.54	--	10.57
	03/25/15	39.11		--	27.72	--	11.39
	06/24/15	39.11		--	30.85	--	8.26
	09/15/15	39.11		--	31.52	--	7.59
	11/30/17	39.17		--	28.61	--	10.56
	02/28/18	39.17		--	27.18	--	11.99
	05/29/18	39.17		--	20.91	--	18.26
	08/30/18	39.17		--	30.80	--	8.37
	02/18/19	39.17		--	28.94	--	10.23
MW-4	05/14/02	NS	20 - 35	--	29.40	--	NS
	05/25/07	40.17		--	28.35	--	11.82
	08/24/07	40.17		--	32.12	--	8.05
	11/06/07	40.17		--	31.40	--	8.77
	02/27/08	40.17		--	30.40	--	9.77
	03/30/10	40.17		--	30.77	--	9.40
	09/01/10	40.17		--	32.62	--	7.55
	12/16/14	40.17		--	29.63	--	10.54
	03/25/15	40.17		--	28.76	--	11.41
	06/24/15	40.17		--	31.92	--	8.25
	09/15/15	40.17		--	32.61	--	7.56
	11/30/17	40.23		--	29.59	--	10.64
	02/28/18	40.23		--	28.60	--	11.63
	05/29/18	40.23		--	21.88	--	18.35
	08/30/18	40.23		--	31.86	--	8.37
	02/18/19	40.23		--	30.04	--	10.19
MW-5	12/16/14	27.03	10 - 25	--	16.60	--	10.43
	03/25/15	27.03		--	15.37	--	11.66
	06/24/15	27.03		--	18.89	--	8.14
	09/15/15	27.03		--	19.35	--	7.68
	10/23/17	27.03		--	17.82	--	9.21
	11/30/17	27.03		--	16.39	--	10.64
	02/28/18	27.03		--	15.41	--	11.62
	05/29/18	27.03		--	8.68	--	18.35
	08/30/18	27.03		--	18.55	--	8.48
	02/18/19	27.03		--	16.70	--	10.33

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 1
Groundwater Elevation Data
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Date of Measurement	Top of Casing Elevation (feet above MSL)	Screened Interval (feet bgs)	Depth To SPH (feet)	Depth to Groundwater (feet)	SPH Thickness (feet)	Groundwater Elevation (feet)
MW-5D	10/24/17	26.71	35 - 45	--	17.50	--	9.21
	11/30/17	26.71		--	16.21	--	10.50
	02/28/18	26.71		--	15.20	--	11.51
	05/29/18	26.71		--	8.37	--	18.34
	08/30/18	26.71		--	18.51	--	8.20
	02/18/19	26.71			16.43	--	10.28
MW-6	12/16/14	27.33	10 - 25	--	16.93	--	10.40
	03/25/15	27.33		--	15.73	--	11.60
	06/24/15	27.33		--	19.34	--	7.99
	09/15/15	27.33		--	19.70	--	7.63
	10/24/17	27.33		--	18.12	--	9.21
	11/30/17	27.33		--	16.71	--	10.62
	02/28/18	27.33		--	15.77	--	11.56
	05/29/18	27.33		--	9.03	--	18.30
	08/30/18	27.33		--	18.99	--	8.34
	02/18/19	27.33		--	16.99	--	10.34
MW-7	11/30/2017	21.67	10 - 25	--	11.12	--	10.55
	2/28/2018	21.67		--	10.19	--	11.48
	5/29/2018	21.67		--	3.4	--	18.27
	08/30/18	21.67		--	13.26	--	8.41
	02/18/19	21.67		--	11.41	--	10.26
MW-8	11/30/2017	27.68	10 - 25	--	16.91	--	10.77
	2/28/2017	27.68		--	16.01	--	11.67
	5/29/2018	27.68		--	9.31	--	18.37
	08/30/18	27.68		--	19.22	--	8.46
	02/18/19	27.68		--	17.28	--	10.40
MW-8D	11/30/2017	27.87	35 - 45	--	17.36	--	10.51
	2/28/2018	27.87		--	16.35	--	11.52
	5/29/2018	27.87		--	9.53	--	18.34
	08/30/18	27.87		--	19.41	--	8.46
	02/18/19	27.87		--	17.59	--	10.28
MW-9	11/30/2017	29.39	10 - 25	--	18.78	--	10.61
	2/28/2018	29.39		--	17.79	--	11.60
	5/29/2018	29.39		--	11.09	--	18.30
	08/30/18	29.39		--	21.04	--	8.35
	02/18/19	29.39		--	19.13	--	10.26
MW-10	11/30/2017	28.71	10 - 25	--	18.16	--	10.55
	2/28/2018	28.71		--	17.19	--	11.52
	5/29/2018	28.71		--	10.38	--	18.33
	08/30/18	28.71		--	20.3	--	8.41
	02/18/19	28.71		--	18.42	--	10.29
MW-11	02/18/19	NS	NS	--	17.27	--	NS

Notes:

1. Survey elevations determined by Bluedot Group surveying, November 2017.
2. Reference elevation (i.e., top of casing) relative to NAVD 88, feet above mean sea level.
3. feet above MSL = feet above mean sea level.
4. NS = Not surveyed
5. -- = SPH not measured/observed.
6. bgs = below ground surface.

Cascadia Associates, LLC

Table 2
Summary of Analytical Results - Monitoring Wells
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Sample Date	TPHg Gasoline (mg/L)	TPHd Diesel (mg/L)	TPHo Heavy Oil (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	MTBE (mg/L)
MW-1	05/14/02	<0.080	0.455 [5.]	<0.500	<0.0005	<0.0005	<0.0005	<0.001	--
	05/19/03	--	--	--	<0.001	<0.001	<0.001	<0.002	--
	05/25/07	<0.080	<0.238	<0.476	<0.0002	<0.0005	<0.0005	<0.001	--
	08/24/07	<0.1	<0.238	<0.476	<0.001	<0.002	<0.002	<0.006	--
	11/26/07	<0.080	<0.236	<0.472	<0.001	<0.002	<0.002	<0.006	--
	02/27/08	<0.080	<0.294	<0.588	<0.0005	<0.0005	<0.0005	<0.001	--
	03/31/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	09/01/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	12/16/14	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0005	--
	03/25/15	<0.250	<0.046	<0.093	<0.0005	<0.0005	<0.0005	<0.001	--
	06/24/15	<0.250	<0.100	<0.250	<0.0005	<0.0005	<0.0005	<0.001	--
	09/15/15	<0.250	<0.130	<0.340	<0.0005	<0.0005	0.0015	0.0022	--
	02/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.00015	<0.001
MW-2	05/14/02	**41.4**	<0.250	<0.500	**4.35**	**2.68**	**1.84**	**8.72**	--
	05/19/03	--	--	--	**0.534**	0.00975	0.194	0.876	--
	05/25/07	0.439	<0.238	<0.476	**0.071**	0.00114	0.0361	0.0453	--
	08/24/07	0.102	<0.238	<0.476	<0.001	<0.002	<0.002	<0.006	--
	11/26/07	<0.080	<0.236	<0.472	<0.001	<0.002	<0.002	<0.006	--
	02/27/08	0.0817	<0.294	<0.588	0.005	<0.0005	<0.0005	<0.001	--
	03/31/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	09/01/10	<0.250	<0.250	<0.500	0.0016	<0.0005	<0.0005	<0.0015	--
	12/16/14	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0005	--
	03/25/15	<0.250	<0.046	<0.091	<0.0005	<0.0005	<0.0005	<0.001	--
	06/24/15	<0.250	<0.100	<0.250	<0.0005	<0.0005	<0.0005	<0.001	--
	09/15/15	<0.250	0.17 D	0.37	<0.0005	<0.0005	<0.0005	<0.001	--
	02/19/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	0.00121
MW-3	05/14/02	**4.5**	<0.250	<0.500	**0.0419**	0.0096	0.293	0.521	--
	05/19/03	--	--	--	**0.0908**	0.0097	0.338	0.5382	--
	05/25/07	0.361	<0.238	<0.476	<0.0005	<0.0005	0.0132	0.0145	--
	08/24/07	<0.1	<0.238	<0.476	<0.001	<0.002	<0.002	<0.006	--
	11/26/07	<0.080	<0.236	<0.472	0.0011	<0.002	0.0066	<0.006	--
	02/27/08	**2.14**	0.387 [6.]	<0.500	<0.0005	<0.0005	0.17	0.17	--
	2/27/2008 DUP	**1.85**	0.342	<0.485	0.0011	<0.0005	0.19	0.2	--
	03/31/10	**2.10**	<0.250	<0.500	<0.0005	<0.0005	0.018	0.021	--
	3/31/2010 DUP	**1.90**	<0.250	<0.500	<0.0015	<0.0015	0.018	0.020	--
	09/01/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	9/1/2010 DUP	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	12/16/14	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0005	--
	03/25/15	<0.418	<0.046	<0.092	<0.0005	<0.0005	<0.0005	<0.001	--
	06/24/15	<0.250	0.120	<0.026	<0.0005	<0.0005	<0.0005	<0.001	--
	09/15/15	<0.250	0.140	<0.250	<0.0008	<0.0008	<0.0008	<0.001	--
	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 2
Summary of Analytical Results - Monitoring Wells
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Sample Date	TPHg Gasoline (mg/L)	TPHd Diesel (mg/L)	TPHo Heavy Oil (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	MTBE (mg/L)
MW-4	05/14/02	<0.080	0.358 [5.]	<0.500	<0.0005	<0.0005	<0.0005	<0.001	--
	05/19/03	--	--	--	<0.001	<0.001	<0.001	<0.002	--
	05/25/07	<0.080	<0.238	<0.476	<0.0002	<0.0005	<0.0005	<0.001	--
	08/24/07	<0.1	<0.238	<0.476	<0.001	<0.002	<0.002	<0.006	--
	11/26/07	<0.080	<0.236	<0.472	<0.001	<0.002	<0.002	<0.006	--
	02/27/08	<0.080	<0.248	<0.495	<0.0005	<0.0005	<0.0005	<0.001	--
	03/31/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	09/01/10	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0015	--
	12/16/14	<0.250	<0.250	<0.500	<0.0005	<0.0005	<0.0005	<0.0005	--
	03/25/15	<0.250	0.074	<0.091	<0.0005	<0.0005	<0.0005	<0.001	--
	06/24/15	<0.250	<0.099	<0.250	<0.0005	<0.0005	<0.0005	<0.001	--
	09/15/15	<0.250	<0.130	<0.340	<0.0005	<0.0005	<0.0005	<0.001	--
	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00150	<0.001
MW-5	12/16/14	**15**	0.350	<0.500	0.00070	0.00066	0.12	**1.2**	--
	12/16/2014 DUP	**15**	<0.250	<0.500	0.00088	0.00081	0.18	**1.3**	--
	03/25/15	**18.1**	<0.045	<0.091	<0.00050	0.00061	0.218	**1.45**	--
	3/25/2015 DUP	**17.2**	<0.046	<0.092	0.0005	0.00065	0.236	**1.22**	--
	06/24/15	**15**	0.33 D	<0.250	<0.0012	<0.0012	0.228	**1.51**	--
	6/24/2015 DUP	**16.8**	**0.560 D**	<0.250	<0.0012	<0.0012	0.232	**1.49**	--
	09/15/15	**17.3**	**0.82 D**	<0.34	<0.00050	0.00060	0.289	**1.92**	--
	07/11/16	**19.4**	**0.310**	<0.29	<0.00084	0.00100	0.215	**1.17**	--
	10/23/17	**7.93 J-**	**1.26**	<0.25	<0.0010	0.00117	0.174	0.99	--
	11/30/17	**11.3**	**1.63**	<0.25	<0.0250	<0.0250	0.187	**1.21**	--
	11/30/17 DUP	**10.9**	**1.75**	<0.25	<0.0010	0.00112	0.187	**1.48**	--
	02/28/18	**9.86**	**1.77**	<0.25	<0.0010	0.00115	0.145	0.877	--
	05/29/18	**13.2**	**2.20**	<0.25	<0.0010	0.00130	0.271	**1.15**	--
	08/30/18	**18.6**	**0.819 F-18**	<0.151	<0.00200	<0.0100	0.190	0.936	--
	8/30/2018 DUP	**20.8**	**0.631 F-18**	<0.151	<0.00200	<0.0100	0.212	**1.06**	--
	02/18/19	**29.2**	**1.06 F-18**	<0.151	<0.00200	<0.0100	0.187	**1.06**	<0.010
MW-5D	10/24/17	0.42	0.147 J	<0.25	<0.0010	<0.0010	0.00138	0.00296 J	--
	11/30/17	0.41	0.49	<0.25	<0.0010	<0.0010	<0.0010	<0.0030	--
	02/28/18	0.589	0.249	<0.25	<0.0010	<0.0010	0.00508	0.00204	--
	05/29/18	0.68	<0.38	<0.38	<0.0010	<0.0010	0.00220	<0.0030	--
	08/30/18	0.673	<0.0755	<0.151	<0.000200	<0.00100	<0.00050	<0.00150	--
	02/18/19	0.165	<0.0748	<0.150	<0.000200	<0.00100	<0.00050	<0.00150	<0.001
MW-6	12/16/14	**15**	<0.250	<0.500	**0.47**	0.065	**1.3**	**2.6**	--
	03/25/15	**13.7**	0.047	<0.092	**0.516**	0.0756	**1.40**	**2.26**	--
	06/24/15	**17.7**	**1.2 D**	<0.250	**0.423**	0.0582	**1.58**	**1.92**	--
	09/15/15	**15.1**	**0.54 D**	<0.34	**0.306**	0.0672	**1.23**	**1.92**	--
	9/15/2015 DUP	**14**	0.44 D	<0.35	**0.328**	0.0684	**1.32**	**2.07**	--
	07/11/16	**15.5**	0.23	<0.28	**0.358**	0.0616	**1.63**	**1.82**	--
	10/24/17	**7.73**	**5.07**	0.111 J	**0.194**	0.051	**1.51**	**1.29**	--
	10/24/17 DUP	**4.19 J**	**8.96 QJ**	**1.19 QJ**	**0.153**	0.046	**1.18**	**1.04**	--
	11/30/17	**9.42**	**7.44**	**0.69**	**2.223**	0.053	**1.71**	**1.12**	--
	02/28/18	**7.72**	**3.57**	0.152	**0.256**	0.0423	**1.44**	0.735	--
	05/29/18	**1.5**	**9.30**	**0.570**	**0.23**	0.0444	**1.38**	0.891	--
	08/30/18	**20.1**	**1.24 F-18**	<0.151	**0.212**	0.0452	**1.59**	**1.15**	--
	02/18/19	**18.2**	**2.15 F-20**	<0.151	**0.249**	0.0408	**1.74**	0.577	<0.010

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 2
Summary of Analytical Results - Monitoring Wells
NuStar Terminals Operations Partnership, L.P. – Annex Terminal
Vancouver, Washington

Well Number	Sample Date	TPHg Gasoline (mg/L)	TPHd Diesel (mg/L)	TPHo Heavy Oil (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	MTBE (mg/L)
MW-7	07/11/16	<0.250	<0.19	<0.29	<0.00050	<0.00050	<0.00050	<0.00015	--
	02/19/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.00015	<0.001
MW-8	07/11/16	<0.250	<0.19	<0.29	<0.00050	<0.00050	<0.00050	<0.00015	--
	7/11/16 DUP	<0.250	<0.19	<0.29	<0.00050	<0.00050	<0.00050	<0.00015	--
	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001
MW-8D	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001
MW-9	07/11/16	<0.250	<0.19	<0.29	<0.00050	<0.00050	<0.00050	<0.00015	--
	02/18/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.0015	<0.001
MW-10	07/11/16	<0.250	<0.19	<0.29	<0.00050	<0.00050	<0.00050	<0.00015	--
	02/19/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.00015	<0.001
MW-11	02/19/19	0.727	<0.0748	<0.150	0.00162	0.00176	0.083	0.0652	<0.001
Washington DOE MTCA Method A Cleanup Level		0.8	0.5	0.5	0.005	1	0.7	1	0.02

Notes:

1. TPHg = Total petroleum hydrocarbons in gasoline carbon range by NW-TPHgx method.
2. TPHd = Total petroleum hydrocarbons in diesel carbon range by NW-TPHdx method with silica gel cleanup.
3. TPHho = Total petroleum hydrocarbons ion heavy oil carbon range NW-TPHdx method with silica gel cleanup.
4. **Bold** values represent concentration that exceeds MTCA Method A cleanup level.
5. Analysis completed without silica gel cleanup. Lab detected hydrocarbons with non-petroleum peaks or elution pattern that suggests the presence of biogenic interference.
6. Hydrocarbon pattern most closely resembles a blend of heavy gas-/light diesel-range components.
7. mg/L (ppm) = Milligrams per liter (parts per million).
8. TPHg cleanup level dependent on presence of benzene in groundwater. Cleanup level = 0.800 mg/L if benzene is present and 1.00 mg/L if benzene is not present.
9. Washington DOE MTCA Method A cleanup level = Washington Department of Ecology Model Toxics Control Act Method A cleanup level.
10. < = Not detected at or above the specified laboratory method reporting limit (MRL).
11. bgs = below ground surface
12. -- = Sample not analyzed for constituent.

Quality Assurance/Quality Control Data Qualifiers

J = Reported result is an estimated value.
J- = Reported result is estimated and biased low.
Q = Sample prepared and/or analyzed outside of recommended holding time. Result is considered biased low.
F-18 = Result for Diesel (Diesel Range Organics, C12-C24) is due to overlap from Gasoline or a Gasoline Range product.
F-20 = Result for Diesel is estimated due to overlap from Gasoline Range Organics or other VOCs.
D = Laboratory report noted discreet peaks that are not indicative of diesel. The laboratory chemist confirmed the peaks were from non-petroleum organic material.

Table 3
Summary of Soil Analytical Results: TPH and VOCs
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/kg (ppm)																
Sample Location	**Sample Date**	**Depth**	**TPH-HCID**	**TPHg**	**TPHd**	**TPHho**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**1,2-Dibromo-ethane**	**1,2-Dichloro-ethane**	**Methyl tert-butyl ether (MTBE)**	**Naphthalene**	**1,2,4-Trimethyl-benzene**	**1,3,5-Trimethyl-benzene**	**Isopropyl-benzene**	**n-Propyl-benzene**	**n-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**
Soil Borings																					
GP-2	04/10/02-4/11/02	10-12	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-3	04/10/02-4/11/02	10-12	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-5	04/10/02-4/11/02	17-19	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-7	04/10/02-4/11/02	14-16	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-8	04/10/02-4/11/02	6-8	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-9	04/10/02-4/11/02	16-18	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-12	04/10/02-4/11/02	22-24	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP14	05/09/02	10-12	DET	**3,230**	**19,700**	<1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP16	05/09/02	10-12	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW2	05/09/02	25-26.5	ND	**314**	<25	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP26	06/26/02	6-8	--	**5,850**	--	--	<2.5	**9.74**	**91.3**	**825**	<2.5	<2.5	<10	124	891	293	29.7	125	--	--	--
GP27	06/26/02	10-12	--	**4.96**	--	--	<0.0050	<0.0050	<0.0050	<0.1	<0.05	<0.05	<0.2	<0.5	<0.1	<0.05	<0.2	<0.05	--	--	--
GP31	06/26/02	22-24	--	<2.5	<25	<50	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--	--	--	--	--	--	--	--
GP32	06/26/02	6.5-8	--	**910**	**2,530**	<50	<5	<5	<5	**16**	--	--	--	--	--	--	--	--	--	--	--
GP33	06/26/02	8-10	--	**363**	**31,500**	<2,500	<0.500	<0.500	**7.2**	**33.9**	--	--	--	--	--	--	--	--	--	--	--
GP34	06/26/02	6-8	--	**728**	**13,600**	<1,000	<0.500	<0.500	0.717	**16.9**	--	--	--	--	--	--	--	--	--	--	--
GP35	06/26/02	8-10	--	10.3	<25	<50	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--	--	--	--	--	--	--	--
SB-2	04/17/03	4	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2	04/17/03	22	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4	04/17/03	3	ND	--	<25	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4	04/17/03	27	ND	--	<25	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-5	04/17/03	11	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6	04/16/03	3	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6	04/16/03	16	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-7	04/17/03	12	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-8	04/17/03	8	DET	**1,020**	**7,890**	<1,000	<0.500	<0.500	<0.500	7.45	--	--	--	6.14	31	20.4	<1	3.22	3.54	<0.5	--
SB-8	04/17/03	16	DET	**369**	1,440	<50	<0.500	<0.500	<0.500	<1,000	--	--	--	6.47	1.67	<0.5	1.13	0.837	<2.5	0.539	--
SB-8R	09/30/14	12	--	<5.0	<5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9	04/18/03	12	DET	**504**	1,890	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9	04/18/03	15	DET	**168**	1,210	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9R	09/30/14	12	--	**1,000**	**4,000**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9R	09/30/14	13.5	--	--	**3,400**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-11	04/16/03	2.5	ND	--	<25	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-11	04/16/03	14	ND	--	<25	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-12	04/22/03	3	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-12	04/18/03	12	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-13	04/22/03	2	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-13	04/22/03	5	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

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NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/kg (ppm)																
Sample Location	**Sample Date**	**Depth**	**TPH-HCID**	**TPHg**	**TPHd**	**TPHho**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**1,2-Dibromo-ethane**	**1,2-Dichloro-ethane**	**Methyl tert-butyl ether (MTBE)**	**Naphthalene**	**1,2,4-Trimethyl-benzene**	**1,3,5-Trimethyl-benzene**	**Isopropyl-benzene**	**n-Propyl-benzene**	**n-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**
Soil Borings (continued)																					
B-15	01/31/19	4.5 - 5.5	--	<7.94	<28.2	<56.5	<0.0159	<0.0794	<0.0397	<0.119	--	--	<0.0794	<0.159	--	--	--	--	--	--	--
B-16-1	01/30/19	3 - 4	--	<7.80	27.8 F-11	<52.2	<0.0156	<0.0780	<0.0390	<0.117	--	--	<0.0780	<0.156	--	--	--	--	--	--	--
B-16-2	01/30/19	5 - 6	--	**1,900**	483 F-20	<52.0	<0.0683	<0.342	<0.171	<0.513	--	--	<0.342	1.53	--	--	--	--	--	--	--
B-17-1	01/31/19	11.5 - 12.5	--	<9.32	<28.5	<56.9	<0.0186	<0.0932	<0.0466	<0.140	--	--	<0.0932	<0.186	--	--	--	--	--	--	--
B-17-2	01/31/19	15 - 16	--	**38.7**	323 F-13	<61.2	<0.0174	<0.0872	<0.0436	<0.131	--	--	<0.0872	<0.174	--	--	--	--	--	--	--
B-18-1	01/30/19	6.5 - 7.5	--	**5,100**	**12,800**	<1100	**0.295**	<0.777	**24.5**	**88.7**	--	--	<0.777	**60.7**	--	--	--	--	--	--	--
B-18-2	01/30/19	**14 - 15**	--	**10,800**	**7,460**	<501	**4.05**	**67.6**	**98**	**524**	--	--	<3.07	**111**	--	--	--	--	--	--	--
B-19	01/29/19	10 - 11	--	<7.59	<27.8	<55.6	<0.0152	<0.0759	<0.0380	<0.114	--	--	<0.0759	<0.152	--	--	--	--	--	--	--
B-20-1	02/04/19	10 - 11	--	**302**	89.4	<50.0	<0.0139	<0.0696	<0.0348	<0.104	--	--	<0.0696	<.0.348	--	--	--	--	--	--	--
B-20-2	02/04/19	12 - 13	--	**35.1**	<27.4	<54.7	<0.0157	<0.0836	<0.0418	<0.125	--	--	<0.0836	<0.157	--	--	--	--	--	--	--
B-21-1	02/01/19	13 - 14	--	<8.11	<27.1	<54.3	<0.0162	<0.0811	<0.0405	<0.122	--	--	<0.0811	<0.162	--	--	--	--	--	--	--
B-21-2	02/01/19	15.5 - 16.5	--	10.5	<25.0	<50.0	<0.0131	<0.0656	<0.0328	<0.0983	--	--	<0.0656	<0.131	--	--	--	--	--	--	--
B-23	01/29/19	6.5 - 7.5	--	<7.26	<25.0	<50.0	<0.0145	<0.0726	<0.0363	<0.109	--	--	<0.0726	<0.145	--	--	--	--	--	--	--
B-24	01/28/19	10.5 - 11.5	--	<7.19	<26.5	<53.1	<0.0144	<0.0719	<0.0359	<0.108	--	--	<0.0719	<0.144	--	--	--	--	--	--	--
B-25-1	01/28/19	6 - 7	--	10.8	**5,540**	<534	<0.0146	<0.0728	<0.0364	<0.109	--	--	<0.0728	<0.146	--	--	--	--	--	--	--
B-25-2	01/28/19	8.5 - 9.5	--	**88.6**	**7,650**	<518	<0.0148	<0.0739	<0.0369	<0.111	--	--	<0.0739	0.394	--	--	--	--	--	--	--
B-26	01/28/19	8 - 9	--	<8.16	<27.3	<54.6	<0.0163	<0.0816	<0.0408	<0.122	--	--	<0.0816	<0.163	--	--	--	--	--	--	--
B-27	01/28/19	7 - 8	--	**1,910**	**6,620**	<493	<0.0725	<0.363	**1.89**	**11.1**	--	--	<0.363	**11.2**	--	--	--	--	--	--	<10.5
B-27-2	01/28/19	9 - 10	--	**11,500**	**23,700**	<1190	<0.597	<2.99	**71.2**	**573**	--	--	<2.99	**168**	--	--	--	--	--	--	--
B-28	01/28/19	8 - 9	--	<8.95	<30.2	<60.4	<0.0179	<0.0895	<0.0359	<0.134	--	--	<0.0895	<0.179	--	--	--	--	--	--	--
Hand Augers																					
HA-1	04/17/03	3	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-1	04/17/03	6	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-2	04/18/03	2	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-2	04/18/03	5	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-3	04/17/03	2	--	--	--	--	<0.1	<0.1	<0.1	<300	--	--	--	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
HA-3	04/17/03	5.5	--	--	--	--	<0.1	<0.1	<0.1	<300	--	--	--	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
HA-4	04/18/03	2	ND	--	--	--	<0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-4	04/18/03	5	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-5	04/18/03	3	DET	**3,320**	**4,780**	<50	<5.0	**10.5**	**48.5**	**500**	--	--	--	76.4	341	109	<10	39.1	<25	6.6	--
HA-5	04/18/03	5	DET	**2,290**	**10,700**	<250	**6.7**	**216**	**177**	**1,204**	--	--	--	141	576	176	20.8	83.3	34	<5	--
HA-6	04/18/03	2	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-6	04/18/03	5	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-7	04/14/03	6	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HA-8	04/14/03	6	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Washington DOE MTCA Method A cleanup level				100/30 [11.]	2,000	2,000	0.03	7	6	9	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Summary of Soil Analytical Results: TPH and VOCs
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/kg (ppm)																
Sample Location	**Sample Date**	**Depth**	**TPH-HCID**	**TPHg**	**TPHd**	**TPHho**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**1,2-Dibromo-ethane**	**1,2-Dichloro-ethane**	**Methyl tert-butyl ether (MTBE)**	**Naphthalene**	**1,2,4-Trimethyl-benzene**	**1,3,5-Trimethyl-benzene**	**Isopropyl-benzene**	**n-Propyl-benzene**	**n-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**
Soil Sample from Advancement of Temporary Monitoring Wells																					
PMW-5	04/16/03	8	ND		31	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-5	04/16/03	10	DET	--	146	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-6	04/16/03	3	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-6	04/16/03	12	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-7	04/16/03	3	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-7	04/16/03	16	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Soil Samples from Excavation Confirmation																					
N. Wall	5/20/2002	10	--	--	--	--	<0.100	<0.100	<0.100	<0.2	--	--	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
N. Wall	5/20/2002	3	--	--	--	--	<0.100	<0.100	<0.100	<0.2	--	--	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
E. Wall	5/21/2002	10	--	--	--	--	<0.100	<0.100	<0.100	<0.2	--	--	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
E. Wall	5/21/2002	3	--	--	--	--	<0.100	<0.100	<0.100	<0.2	--	--	<0.1	<0.2	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	--
Washington DOE MTCA Method A cleanup level[12.]				100/30[11.]	2,000	2,000	0.03	7	6	9	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA

Notes:

1. TPH-HCID = Total petroleum hydrocarbons hydrocarbon identification by NW-TPH-HCID
2. TPHg = Total petroleum hydrocarbons in the gasoline carbon range by NW-TPH-Gx method.
3. TPHd = Total petroleum hydrocarbons in the diesel carbon range by NW-TPH-Dx method with silica gel cleanup.
4. TPHho = Total petroleum hydrocarbons in the heavy oil carbon range by NW-TPH-Dx method with silica gel cleanup.

Note: Flags in the lab reports indicate that TPHg and TPHd results do not fall under the (respective) standard gasoline or diesel ranges, but typically represent an overlap of diesel and gasoline ranges. Specific notes for individual samples can be found in the attached laboratory anlaytical reports.

5. mg/kg (ppm) = Milligrams per kilogram (parts per million).
6. -- = Not analyzed or not available.
7. < = Not detected at or above the specified laboratory method reporting limit (MRL).
8. ND = Not detected; MRL not available.
9. DET = Gasoline-, diesel-, and/or heavy oil-range hydrocarbons was detected using NWTPH-HCID. Follow-up analysis was completed.
10. **Boldface** values represent concentration that exceeds MTCA Method A cleanup level.
11. TPHg cleanup level dependent on presence of benzene in soil. Cleanup level = 30 mg/kg if benzene is present and 100 mg/kg if benzene is not present.
12. Washington DOE MTCA = Washington Department of Ecology Model Toxics Control Act.
13. NA = Cleanup level not available.
14. Grey highlight identifies the 2014 borings installed at the historical (2003) locations of SB-8 and SB-9.

Cascadia Associates, LLC

Table 4
Summary of Grab Groundwater Sample Analytical Results: TPH and VOCs
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/L (ppm)																		
Sample Location	**Sample Date**	**Depth (feet bgs)**	**TPH-HCID**	**TPHg**	**TPHd[16]**	**TPHo[16]**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes**	**Methyl tert-butyl ether (MTBE)**	**Tert-Amyl Methyl Ether (TAME)**	**Naphthalene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**Isopropyl-benzene**	**n-Propylbenzene**	**n-Butyl-benzene**	**sec-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**	**Dissolved Lead**
Groundwater Samples from Soil Borings																						
B-1(1)	10/22/2015	21-25	--	0.483	**0.51**	<0.28	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-1(2)	10/22/2015	26-30	--	<0.250	0.24	0.38	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-1(3)	10/22/2015	36-40	--	0.687	0.35	<0.24	<0.00050	<0.00050	0.00053	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-2(1)	10/23/2015	16-20	--	**4.02**	**0.77**	<0.30	**0.0104**	0.0155	**1.31**	**3.18**	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-2(2)	10/23/2015	26-30	--	<0.250	0.2	<0.23	<0.00050	<0.00050	0.0057	0.0108	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-2(3)	10/23/2015	36-40	--	**2.37**	**3.5**	<0.28	0.0022	0.0019	0.122	0.184	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-3(1)	10/23/2015	16-20	--	**22.3**	**15.9/3.2[16]**	**0.69**/<0.003[16]	**3.94**	0.112	**1.24**	**3.9**	<0.010	--	--	--	--	--	--	--	--	--	--	--
B-3(2)	10/23/2015	26-30	--	**25.6**	**37.4**	0.46	**3.91**	0.104	**1.23**	**3.52**	<0.010	--	--	--	--	--	--	--	--	--	--	--
B-4(1)	10/23/2015	16-20	--	**10.3**	**6.2**	<0.300	<0.0012	<0.0012	0.26	0.321	<0.0012	--	--	--	--	--	--	--	--	--	--	--
B-4(2)	10/23/2015	26-30	--	**9.88**	**2.1**	<0.260	0.0012	0.001	0.255	0.214	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-5(1)	10/27/2015	16-20	--	**34.7**	**68.4**	**3.8**	<0.025	<0.025	**2.77**	**5.24**	<0.025	--	--	--	--	--	--	--	--	--	--	--
B-5(2)	10/27/2015	36-40	--	**20.6**	**0.89**	<0.30	<0.0031	0.0097	**0.955**	**1.26**	<0.0031	--	--	--	--	--	--	--	--	--	--	--
B-6(1)	10/27/2015	19-23	--	**48.6**	**117/67.7[16]**	**0.77/0.62[16]**	<0.0025	0.005	0.0743	0.0245	<0.0025	--	--	--	--	--	--	--	--	--	--	--
B-6(2)	10/27/2015	51-55	--	<0.250	0.35	0.31	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-6(3)	10/27/2015	61-65	--	<0.250	0.35	<0.30	<0.00050	<0.00050	<0.00050	<0.0010	0.0025	--	--	--	--	--	--	--	--	--	--	--
B-7 (1)	10/28/2015	21-25	--	<0.250	<0.170	<0.260	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-7(2)	10/28/2015	26-30	--	<0.250	<0.190	<0.280	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-8(1)	10/28/2015	16-20	--	<0.250	<0.190	<0.290	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-8(2)	10/28/2015	21-25	--	<0.250	<0.190	<0.290	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-9(1)	10/20/2015	16-20	--	**1.63**	0.24	0.28	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-9(2)	10/29/2015	36-40	--	**3.03**	0.38	**0.62**	<0.00050	<0.00050	<0.00050	<0.0010	0.0039	--	--	--	--	--	--	--	--	--	--	--
B-9(3)	10/29/2015	46-50	--	**1.55**	**0.56**	<0.300	<0.00050	<0.00050	<0.00050	<0.0010	0.0048	--	--	--	--	--	--	--	--	--	--	--
B-10(1)	10/29/2015	16-20	--	**32.7**	**284**	**0.58**	<0.0012	<0.0012	0.377	0.495	<0.0012	--	--	--	--	--	--	--	--	--	--	--
B-10(2)	10/29/2015	36-40	--	0.421	**2.2**	0.37	<0.00050	<0.00050	0.0022	0.003	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-11(1)	10/30/2015	21-25	--	**19.2**	**46.7**	**0.92**	<0.0025	<0.0025	0.455	0.701	<0.0025	--	--	--	--	--	--	--	--	--	--	--
B-11(2)	10/30/2015	36-40	--	**1.58**	**6.9**	**0.62**	<0.00050	<0.00050	0.0112	0.0187	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-11(3)	10/30/2015	41-45	--	<0.250	0.28	0.3	<0.00050	<0.00050	0.00052	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-12(1)	10/30/2015	16-20	--	0.265	<0.200	0.36	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-12(2)	10/30/2015	36-40	--	<0.250	0.29	<0.260	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	--	--	--	--	--	--	--	--	--	--	--
B-12(3)	10/30/2015	41-45	--	<0.250	<0.200	<0.300	<0.00050	<0.00050	<0.00050	<0.0010	0.001	--	--	--	--	--	--	--	--	--	--	--
B-13 (1)	7/7/2016	15-20	--	<0.250	<0.18	<0.27	<0.00050	<0.00050	<0.00050	<0.0015	--	--	--	--	--	--	--	--	--	--	--	--
B-13 (2)	7/7/2016	25-30	--	<0.250	<0.18	<0.27	<0.00050	<0.00050	<0.00050	<0.0015	--	--	--	--	--	--	--	--	--	--	--	--
B-14 (1)	7/7/2016	15-20	--	<0.250	<0.18	<0.27	<0.00050	<0.00050	<0.00050	<0.0015	--	--	--	--	--	--	--	--	--	--	--	--
B-14 (2)	7/7/2016	25-30	--	<0.250	<0.17	<0.26	<0.00050	<0.00050	<0.00050	<0.0015	--	--	--	--	--	--	--	--	--	--	--	--
B-17-40	1/31/2019	40-45	--	0.187	0.233 F-13	<0.154	<0.0002	<0.001	0.000816	<0.0015	<0.001	--	0.00261	--	--	--	--	--	--	--	--	--
B-17-50	1/31/2019	50-55	--	0.741 Q-42	0.397 F-13	<0.162	<0.0002	<0.001	0.00508	0.00574	<0.001	--	0.011	--	--	--	--	--	--	--	--	--
B-18-40	1/31/2019	40-45	--	<0.100	<0.0792	<0.158	<0.0002	<0.001	0.000981	0.00458	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-18-50	1/31/2019	50-55	--	0.154	<0.0784	<0.157	<0.0002	0.00148	0.00194	0.00972	<0.001	--	0.0023	--	--	--	--	--	--	--	--	--
B-19-15	1/29/2019	15-20	--	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-19-30	1/29/2019	30-35	--	<0.100	<0.0784	<0.157	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-19-40	1/29/2019	40-45	--	<0.100	<0.0769	<0.154	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-19-50	1/29/2019	50-55	--	<0.100	<0.0800	<0.160	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-20-50	2/4/2019	50-55	--	**2.47**	0.214 F-18	<0.167	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.003	--	--	--	--	--	--	--	--	--
B-20-60	2/4/2019	60-65	--	<0.100	<0.0800	<0.160	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-21-50	2/1/2019	50-55	--	<0.100	<0.0784	<0.157	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-21-60	2/1/2019	60-65	--	<0.100	<0.0777	<0.155	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--	<0.002	--	--	--	--	--	--	--	--	--
B-22	1/29/2019	20-25	--	**18.8**	0.500 L	<0.490	**0.017**	0.018	**2.2**	**2.5**	<0.0025	--	<0.010	--	--	--	--	--	--	--	--	--
B-27	1/28/2019	30-35	--	0.161	0.109 F-18	<0.160	<0.0002	<0.001	0.00119	0.00858	<0.001	--	<0.002	--	--	--	--	--	--	--	<0.0187	--

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 4
Summary of Grab Groundwater Sample Analytical Results: TPH and VOCs
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/L (ppm)																	
Sample Location	**Sample Date**	**Depth (feet bgs)**	**TPH-HCID**	**TPHg**	**TPHd[16]**	**TPHo[16]**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes**	**Methyl tert-butyl ether (MTBE)**	**Tert-Amyl Methyl Ether (TAME)**	**Naphthalene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**Isopropyl-benzene**	**n-Propylbenzene**	**n-Butyl-benzene**	**sec-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**	**Dissolved Lead**
Historical Grab Groundwater Samples from Soil Borings																					
GP-1	04/10/02-04/11/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-2	04/10/02-04/11/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-3	04/10/02-04/11/02	24	--	**25.1**	ND	--	**5.2**	**1.03**	**1.41**	**1.258**	--	--	0.14	0.338	0.128	--	0.113	--	--	--	--	--
GP-4	04/10/02-04/11/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-5	04/10/02-04/11/02	22	--	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-6	04/10/02-04/11/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-7	04/10/02-04/11/02	24	--	**60.2**	ND	--	**3.97**	**16.2**	**2.17**	**9.69**	--	--	**0.212**	0.914	0.228	--	0.113	--	--	--	--	--
GP-8	04/10/02-04/11/02	23	--	--	--	--	**15**	**32.9**	**4.51**	**19.57**	--	--	**0.462**	2.11	0.55	--	0.268	--	--	--	--	--
GP-9	04/10/02-04/11/02	24	--	0.536	--	--	ND	ND	**0.00135**	0.01153	--	--	0.0782	0.0102	0.0114	--	0.0031	0.0017	--	--	--	--
GP-10	04/10/02-04/11/02	23	--	**159**	ND	--	**4.44**	**28.1**	**5.09**	**23.07**	--	--	**0.476**	2.79	0.728	--	0.358	--	--	--	--	--
GP-11	04/10/02-04/11/02	32	--	--	--	--	**14.2**	**48.3**	**8.25**	**36.6**	--	--	**1.91**	6.4	1.76	--	0.835	--	--	--	--	--
GP-12	4/11/2002	32	--	--	--	--	**0.698**	**1.64**	0.363	0.999	--	--	--	0.11	0.0318	--	0.0244	--	--	--	--	--
GP-13	05/09/02-05/10/02	--	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
GP-14	5/9/2002	--	--	--	--	--	<0.001	<0.001	<0.001	0.00518	<0.001	--	<0.002	0.00219	<0.001	<0.002	<0.001	<0.005	<0.001	<0.001	--	--
GP-15	05/09/02-05/10/02	--	--	--	--	--	<0.0005	<0.0005	0.0019	0.0186	--	--	--	--	--	--	--	--	--	--	--	--
GP-16	5/9/2002	--	--	--	--	--	<0.0005	<0.0005	0.00515	0.0522	--	--	--	--	--	--	--	--	--	--	--	--
GP-17	05/09/02-05/10/02	--	--	--	--	--	**0.0243**	0.00056	0.00186	0.0146	--	--	--	--	--	--	--	--	--	--	--	--
GP-18	05/09/02-05/10/02	--	--	--	--	--	0.00064	0.00053	0.00051	0.00411	--	--	--	--	--	--	--	--	--	--	--	--
GP-19	05/09/02	34	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
GP-20	05/09/02	34	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
GP-21	05/10/02	34	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
GP-22	05/10/02	34	--	--	--	--	**5.81**	**29.2**	**6.31**	**28.6**	--	--	--	--	--	--	--	--	--	--	--	--
GP-23	05/10/02	34	--	--	--	--	**0.00544**	0.101	0.0667	0.302	--	--	--	--	--	--	--	--	--	--	--	--
GP-24	05/10/02	24	--	--	--	--	0.00094	0.0144	0.00846	0.0424	--	--	--	--	--	--	--	--	--	--	--	--
GP-25	05/10/02	24	--	--	--	--	0.00062	0.00882	0.00398	0.0193	--	--	--	--	--	--	--	--	--	--	--	--
GP-28	06/26/02	26	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
GP-29	06/26/02	50	--	--	--	--	**0.538**	**6.14**	**1.55**	**7.14**	--	--	--	--	--	--	--	--	--	--	--	--
GP-30	06/26/02	26	--	--	--	--	<0.0005	0.000626	0.000507	<0.001	--	--	--	--	--	--	--	--	--	--	--	--
SB-1	04/17/03	36	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2	04/17/03	--	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-3	04/18/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4	04/17/03	--	ND	--	<0.526	<1.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-5	04/17/03	--	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-6	04/18/03	24	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-7	04/17/03	--	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-8	04/17/03	--	DET[6]	--	**20.9**	<1.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-8R	09/30/14	--	--	**45**	**9.8**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9	04/18/03	--	DET[6]	--	**66.2**	<1.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-9R	09/30/14	--	--	**26**	**3.6**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-10	04/18/03	--	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-11	04/16/03	--	ND	--	<0.500	<1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-12	04/18/03	--	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-18	04/18/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GP-1	06/11/07	70-72	--	--	--	--	<0.001	<0.001	<0.001	<0.002	0.0137	<0.001	<0.002	<0.001	<0.001	<0.002	<0.001	--	--	--	--	--
GP-2	06/11/07	64-66	--	--	--	--	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.001	--	--	--	--	--
DP-1 GRAB	03/30/10	60.7-64.7	--	--	--	--	<0.0005	<0.0005	<0.0005	<0.0015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	--	<0.00100

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 4
Summary of Grab Groundwater Sample Analytical Results: TPH and VOCs
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

				Concentrations in mg/L (ppm)																	
Sample Location	**Sample Date**	**Depth (feet bgs)**	**TPH-HCID**	**TPHg**	**TPHd[16]**	**TPHo[16]**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes**	**Methyl tert-butyl ether (MTBE)**	**Tert-Amyl Methyl Ether (TAME)**	**Naphthalene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**Isopropyl-benzene**	**n-Propylbenzene**	**n-Butyl-benzene**	**sec-Butyl-benzene**	**Chloroform**	**Diehtylene glycol monomethyl ether**	**Dissolved Lead**
Groundwater Samples from Temporary Monitoring Wells																						
PMW-5	04/16/03	10-20	DET[6.]	--	**1.88**	<0.943	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-6	04/16/03	5-20	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-7	04/16/03	9-24	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Groundwater Sample from Irrigation Well																						
IRRIG WELL	04/17/03	--		--	--	--	<0.001	<0.001	<0.001	<0.002	<0.001	--	<0.002	<0.001	<0.001	<0.002	<0.001	<0.005	<0.001	<0.001		--
Washington DOE MTCA Method A cleanup level[12.]				0.800[11.]	0.5	0.5	0.005	1	0.7	1	0.02	NA	0.16	NA	NA	NA	NA	NA	NA	NA	NA	0.015

Notes:

1. TPH-HCID = Total petroleum hydrocarbons hydrocarbon identification by method NWTPH-HCID.
2. TPHg = Total petroleum hydrocarbons in the gasoline carbon range by NW-TPH-Gx method.
3. TPHd = Total petroleum hydrocarbons in the diesel carbon range by NW-TPH-Dx method. September 2014 samples were analyzed using silica gel cleanup method.
4. TPHho = Total petroleum hydrocarbons in the heavy oil carbon range by NW-TPH-Dx method.

Note: Flags in the lab reports indicate that TPHg and TPHd results do not fall under the (respective) standard gasoline or diesel ranges, but typically represent an overlap of diesel and gasoline ranges (i.e F-13, F-18, L) . Specific notes for individual samples can be found in the attached laboratory anlaytical reports and quality review summary report.

5. Benzene, toluene, ethylbenzene, and total xylenes (BTEX) analysis per EPA Method 8260B.
6. Volatile organic compounds (VOCs) analysis per EPA Method 8260B.
7. DET = Gasoline-, diesel-, and/or heavy oil-range hydrocarbons was detected using NWTPH-HCID. Follow-up analysis was completed.
8. ND = Not detected; method reporting limit (MRL) not available.
9. < = Not detected at or above the specified laboratory method reporting limit (MRL).
10. mg/L (ppm) = Milligrams per liter (parts per million).
11. TPHg cleanup level dependent on presence of benzene in groundwater. Cleanup level = 0.800 mg/L if benzene is present and 1.00 mg/L if benzene is not present.
12. Washington DOE MTCA = Washington Department of Ecology Model Toxics Control Act.
13. **Boldface** values represent concentration that exceeds MTCA Method A cleanup level.
14. NA = Cleanup level not available.
15. The screened intervals for the October 2015 samples are shown. Sample intake was generally from the centerpoint of each interval - see boring logs for more detail.
16. For TPHd and TPHo, the first value represents with silica gel cleanup and the second without (i.e. 15.9/3.2)
17. DGME = Diethylene glycol monomethyl ether

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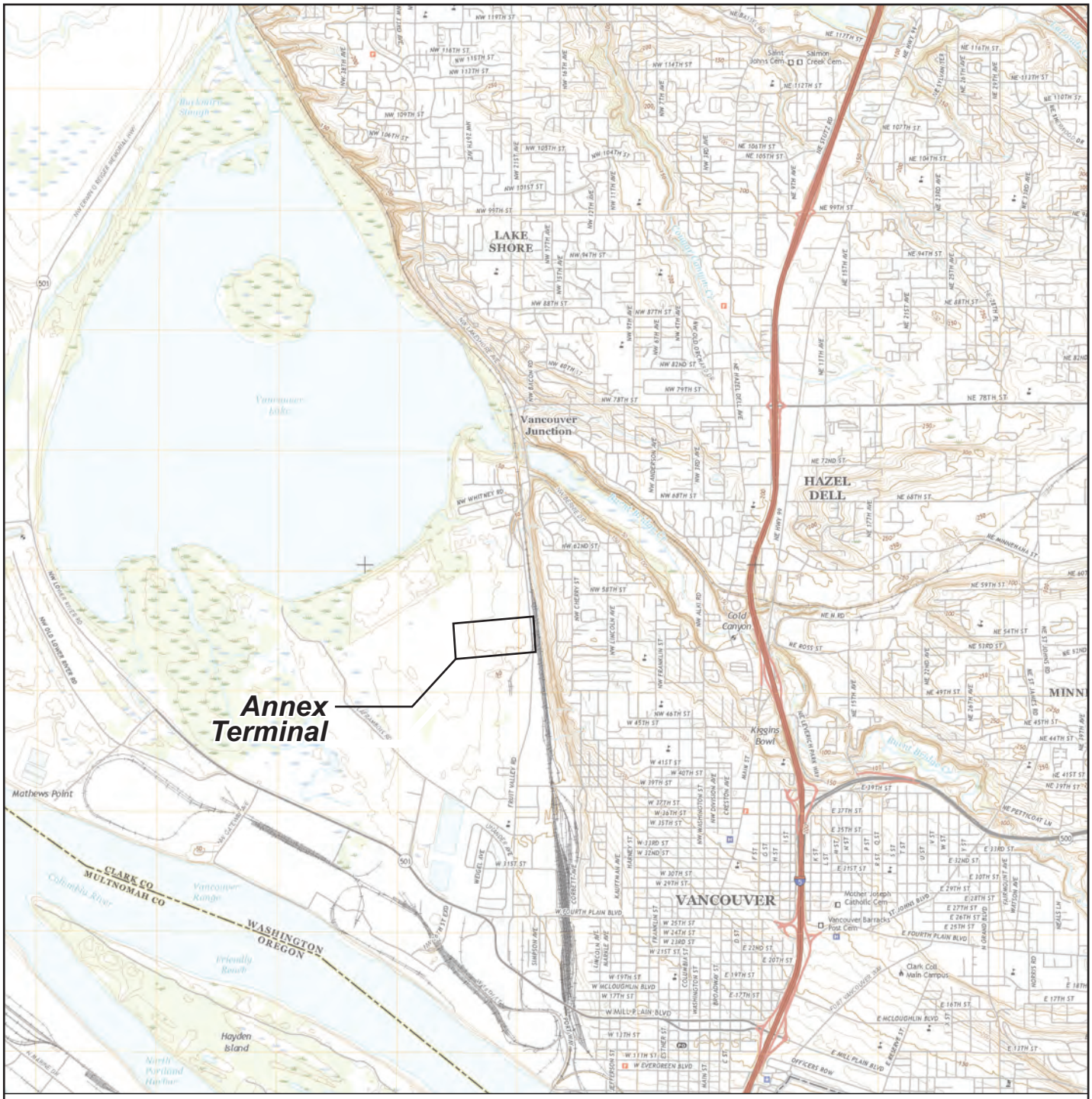
FIGURES



Note: Base map prepared from USGS 7.5-minute quadrangle of Vancouver, WA, dated 2017 as provided by USGS.gov.

0 4,000 8,000

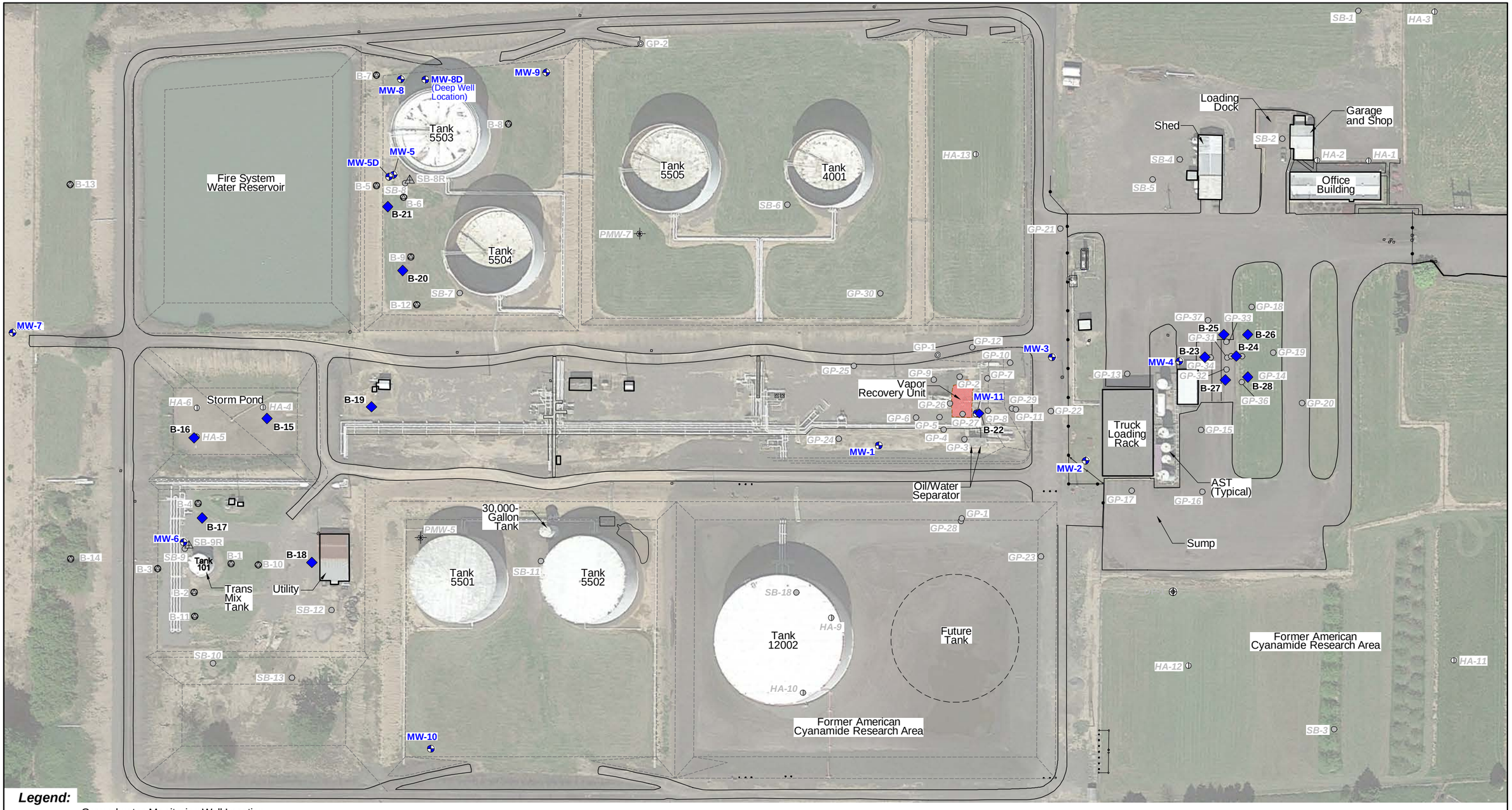
Approximate Scale in Feet

Site Location Map

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P.- Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
May 2019		1



Legend:

- **MW-1** Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- **SB-8R** Soil Boring Location (September 2014)
- **DP-1** Grab Groundwater Sample Location
- **GP-1** Deeper Direct-Push Geoprobe Location
- ***GP-1*** Historical Direct-Push Boring Location (Approximate)
- ***PMW-5*** Historical Temporary Well Location (Approximate)
- ***HA-1*** Historical Hand Auger Location (Approximate)
- **B-1** Soil Boring Location (October 2015)
- **B-1** Soil Boring Location (February 2019)

N

0 100 200

Scale in Feet

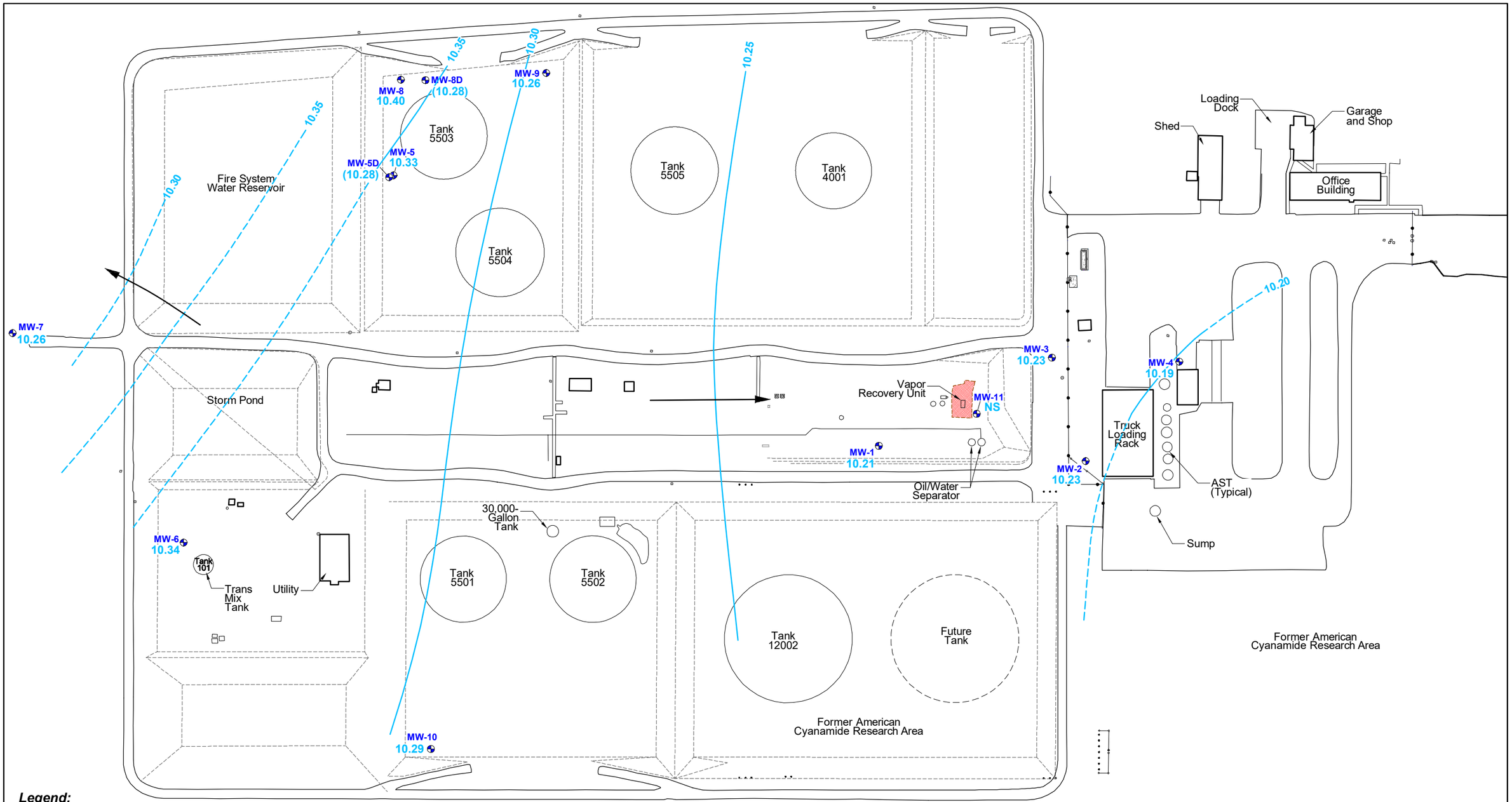
NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate. Aerial photograph from Google Earth Pro (4/2015).

Site Plan

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
May 2019		**2**



Legend:

MW-1	Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
10.21	Groundwater Elevation in Feet Above Mean Sea Limit (MSL)
(10.28)	Deep Well Groundwater Elevation in Feet MSL (Not Used for Contouring)
10.20	Groundwater Elevation Contour (Dashed Where Inferred)
NS	Not Surveyed
	Inferred Groundwater Flow Direction

N

0 100 200

Scale in Feet

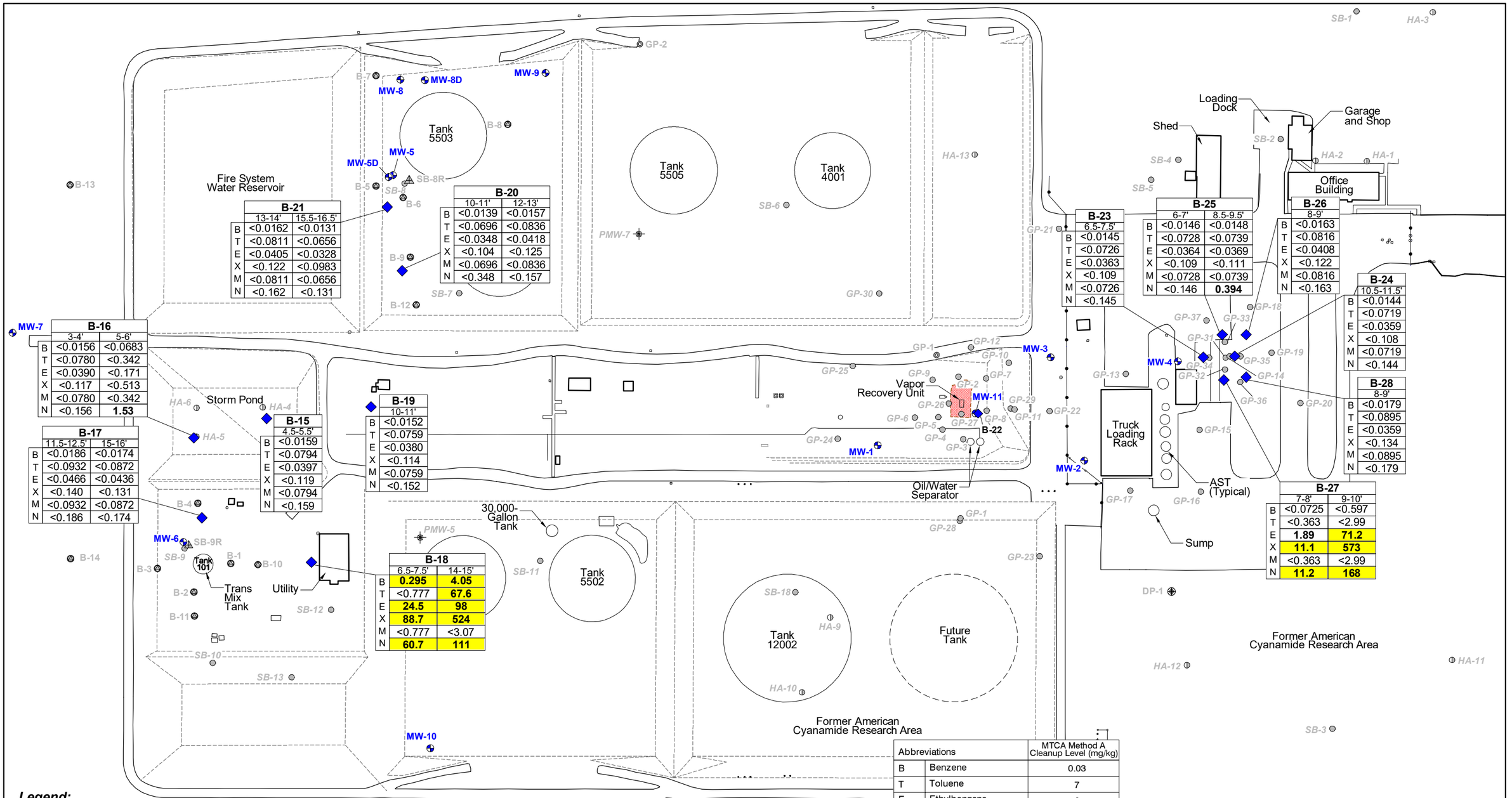
NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

Groundwater Elevations - February 2019

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005
May 2019	
Figure	3



Legend:

- MW-1 — Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- SB-8R — Soil Boring Location (September 2014)
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- *HA-1* — Historical Hand Auger Location (Approximate)
- B-1 — Soil Boring Location (October 2015)
- **B-1** — Soil Boring Location (February 2019)

B-28
8-9'
B <0.0179
T <0.0895
E <0.0359
X <0.134
M <0.0895
N <0.163

- Location Sampled
- Depth of Sample in Feet BGS
- Concentration in mg/kg
- Highlighted Concentration Exceeds MTCA Method A Cleanup Level
- Analyte Sampled

NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

BTEX, MTBE, and Naphthalene Soil Sample Results - January/February 2019

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number 0060-001-005

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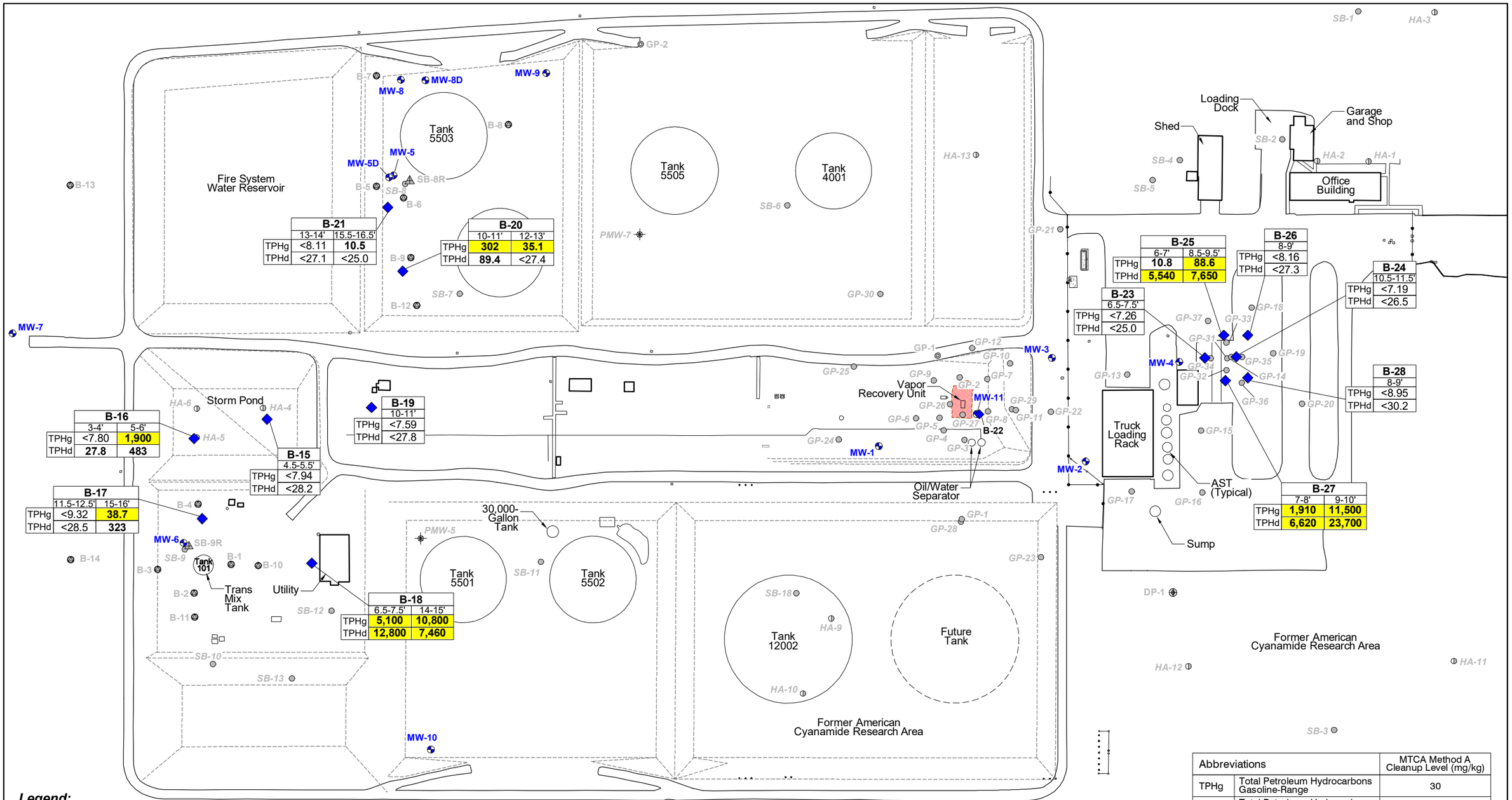
Figure **4**



B-21	13-14'	15.5-16.5'
TPHg	<8.11	**10.5**
TPHd	<27.1	<25.0

B-20	10-11'	12-13'
TPHg	**302**	**35.1**
TPHd	**89.4**	<27.4

B-19	10-11'
TPHg	<7.59
TPHd	<27.8

B-16	3-4'	5-6'
TPHg	<7.80	**1,900**
TPHd	**27.8**	**483**

B-15	4.5-5.5'
TPHg	<7.94
TPHd	<28.2

B-17	11.5-12.5'	15-16'
TPHg	<9.32	**38.7**
TPHd	<28.5	**323**

B-18	6.5-7.5'	14-15'
TPHg	**5,100**	**10,800**
TPHd	**12,800**	**7,460**

B-25	6-7'	8.5-9.5'
TPHg	**10.8**	**88.6**
TPHd	**5,540**	**7,650**

B-26	8-9'
TPHg	<8.16
TPHd	<27.3

B-23	6.5-7.5'
TPHg	<7.26
TPHd	<25.0

B-24	10.5-11.5'
TPHg	<7.19
TPHd	<26.5

B-28	8-9'
TPHg	<8.95
TPHd	<30.2

B-27	7-8'	9-10'
TPHg	**1,910**	**11,500**
TPHd	**6,620**	**23,700**

Legend:

- MW-1 — Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
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- GP-1 — Deeper Direct-Push Geoprobe Location
- *GP-1* — Historical Direct-Push Boring Location (Approximate)
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- *HA-1* — Historical Hand Auger Location (Approximate)
- B-1 — Soil Boring Location (October 2015)
- **B-1** — Soil Boring Location (February 2019)

B-28	8-9'
TPHg	<8.95
TPHd	<30.2

- B-28 — Location Sampled
- 8-9' — Depth of Sample in Feet BGS
- TPHg / TPHd — Concentration in mg/kg
- Highlighted Concentration Exceeds MTCA Method A Cleanup Level
- Analyte Sampled

N

0 100 200

Scale in Feet

NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

Abbreviations		MTCA Method A Cleanup Level (mg/kg)
TPHg	Total Petroleum Hydrocarbons Gasoline-Range	30
TPHd	Total Petroleum Hydrocarbons Diesel-Range	2,000

TPHg and TPHd Soil Sample Results - January/February 2019

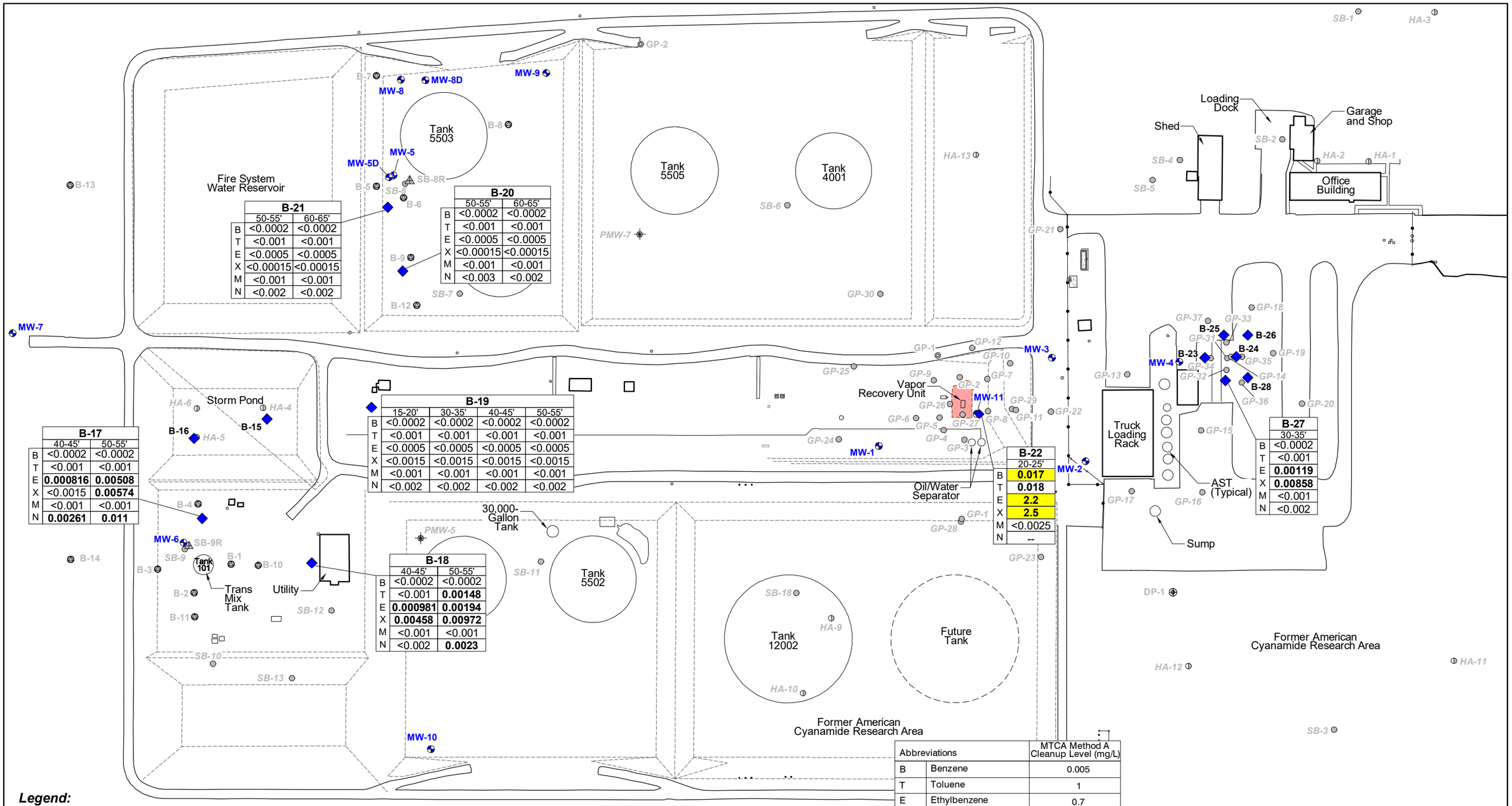
Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number 0060-001-005

May 2019

Figure 5



B-21	50-55'	60-65'
B	<0.0002	<0.0002
T	<0.001	<0.001
E	<0.0005	<0.0005
X	<0.00015	<0.00015
M	<0.001	<0.001
N	<0.002	<0.002

B-20	50-55'	60-65'
B	<0.0002	<0.0002
T	<0.001	<0.001
E	<0.0005	<0.0005
X	<0.00015	<0.00015
M	<0.001	<0.001
N	<0.003	<0.002

B-19	15-20'	30-35'	40-45'	50-55'
B	<0.0002	<0.0002	<0.0002	<0.0002
T	<0.001	<0.001	<0.001	<0.001
E	<0.0005	<0.0005	<0.0005	<0.0005
X	<0.0015	<0.0015	<0.0015	<0.0015
M	<0.001	<0.001	<0.001	<0.001
N	<0.002	<0.002	<0.002	<0.002

B-17	40-45'	50-55'
B	<0.0002	<0.0002
T	<0.001	<0.001
E	**0.000816**	**0.00508**
X	<0.0015	**0.00574**
M	<0.001	<0.001
N	**0.00261**	**0.011**

B-18	40-45'	50-55'
B	<0.0002	<0.0002
T	<0.001	**0.00148**
E	**0.000981**	**0.00194**
X	**0.00458**	**0.00972**
M	<0.001	<0.001
N	<0.002	**0.0023**

B-22	20-25'
B	**0.017**
T	**0.018**
E	**2.2**
X	**2.5**
M	<0.0025
N	--

B-27	30-35'
B	<0.0002
T	<0.001
E	**0.00119**
X	**0.00858**
M	<0.001
N	<0.002

Legend:

- MW-1 — Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- SB-8R — Soil Boring Location (September 2014)
- DP-1 — Grab Groundwater Sample Location
- GP-1 — Deeper Direct-Push Geoprobe Location
- *GP-1* — Historical Direct-Push Boring Location (Approximate)
- *PMW-5* — Historical Temporary Well Location (Approximate)
- *HA-1* — Historical Hand Auger Location (Approximate)
- B-1 — Soil Boring Location (October 2015)
- **B-1** — Soil Boring Location (February 2019)

B-27	Location Sampled
30-35'	Depth of Sample in Feet BGS
B <0.0002	
T <0.001	
E **0.00119**	Concentration in mg/L
X **0.00858**	Highlighted Concentration Exceeds MTCA Method A Cleanup Level
M <0.001	
N <0.002	Analyte Sampled

Abbreviations		MTCA Method A Cleanup Level (mg/L)
B	Benzene	0.005
T	Toluene	1
E	Ethylbenzene	0.7
X	Xylenes	1
M	Methyl Tert-Butyl Ether	0.02
N	Naphthalene	0.16

N

0 100 200

Scale in Feet

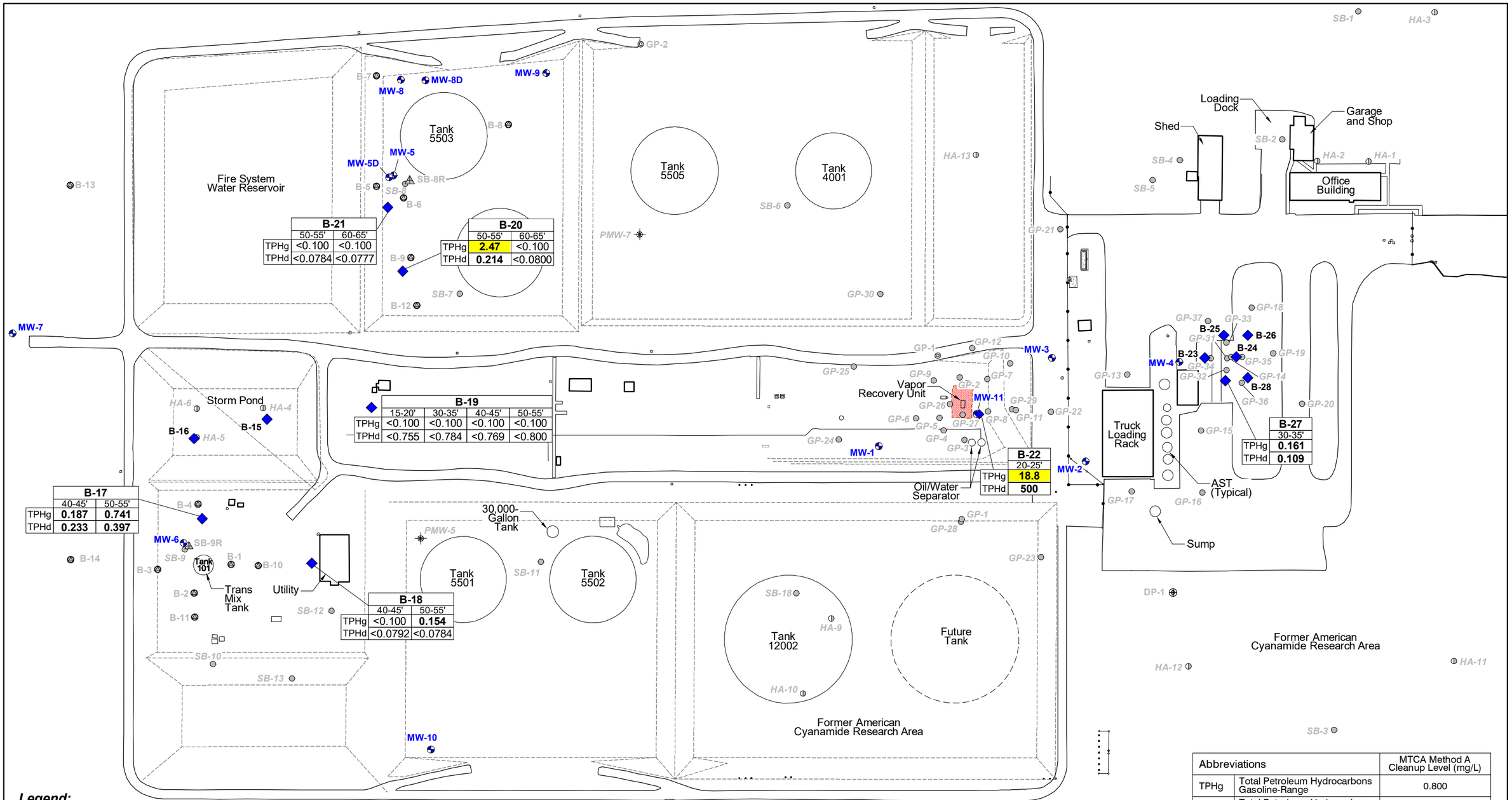
NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

BTEX, MTBE, and Naphthalene Grab Groundwater Results - January/February 2019

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
May 2019		6



Legend:

- MW-1 — Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- SB-8R — Soil Boring Location (September 2014)
- DP-1 — Grab Groundwater Sample Location
- GP-1 — Deeper Direct-Push Geoprobe Location
- *GP-1* — Historical Direct-Push Boring Location (Approximate)
- *PMW-5* — Historical Temporary Well Location (Approximate)
- *HA-1* — Historical Hand Auger Location (Approximate)
- B-1 — Soil Boring Location (October 2015)
- **B-1** — Soil Boring Location (February 2019)

B-27	Location Sampled
30-35'	Depth of Sample in Feet BGS
TPHg 0.161	Concentration in mg/L
TPHd 0.109	Highlighted Concentration Exceeds MTCA Method A Cleanup Level
	Analyte Sampled

NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

Abbreviations		MTCA Method A Cleanup Level (mg/L)
TPHg	Total Petroleum Hydrocarbons Gasoline-Range	0.800
TPHd	Total Petroleum Hydrocarbons Diesel-Range	0.5

TPHg and TPHd Grab Groundwater Results - January/February 2019

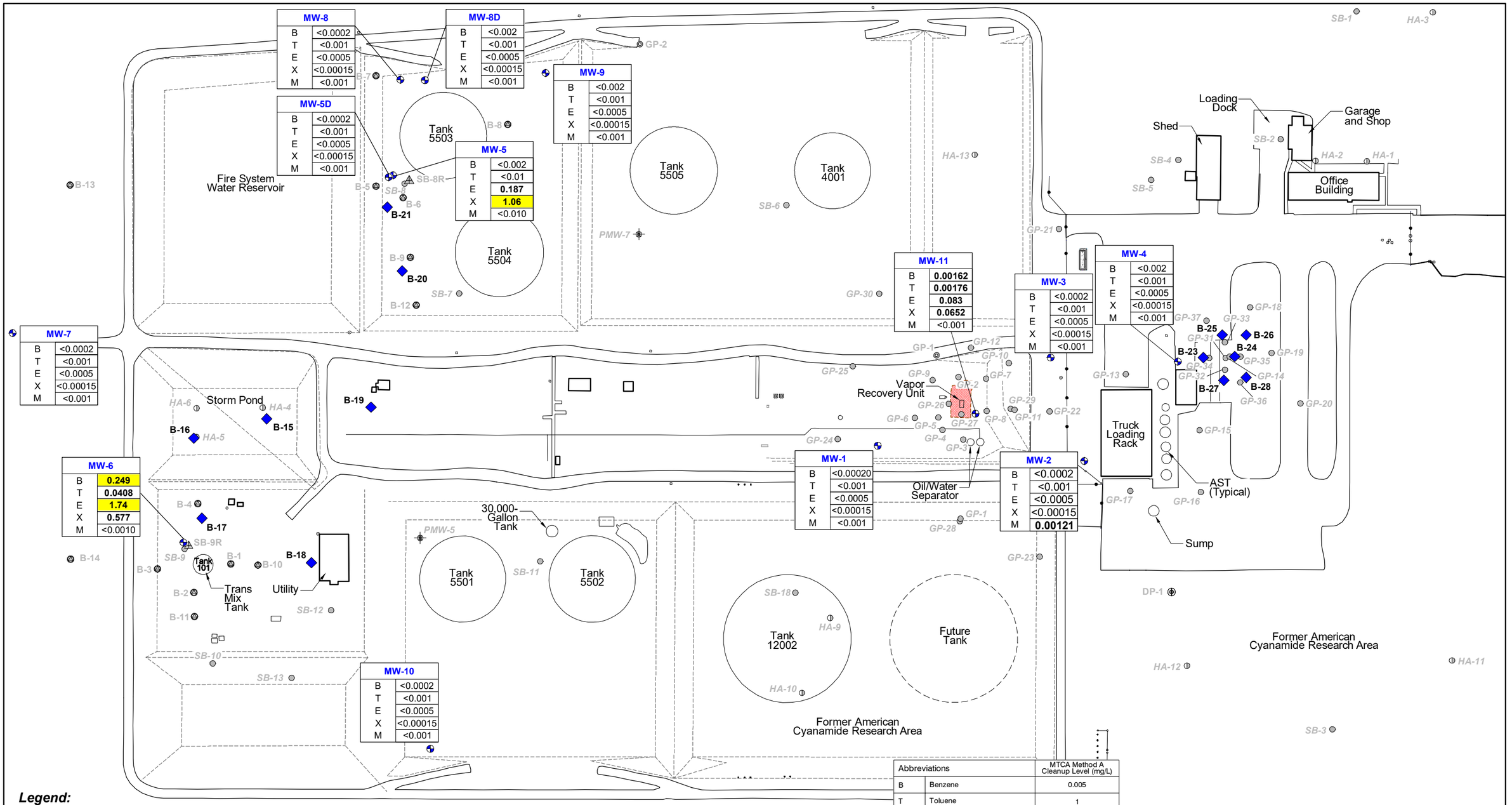
Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number 0060-001-005

May 2019

Figure 7



Legend:

- **MW-1** Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- SB-8R Soil Boring Location (September 2014)
- DP-1 Grab Groundwater Sample Location
- GP-1 Deeper Direct-Push Geoprobe Location
- *GP-1* Historical Direct-Push Boring Location (Approximate)
- *PMW-5* Historical Temporary Well Location (Approximate)
- *HA-1* Historical Hand Auger Location (Approximate)
- B-1 Soil Boring Location (October 2015)
- **B-1** Soil Boring Location (February 2019)

MW-5 — B <0.002; T <0.01; E **0.187**; X **1.06**; M <0.010

Location Sampled; Concentration in mg/L; Highlighted Concentration Exceeds MTCA Method A Cleanup Level; Analyte Sampled

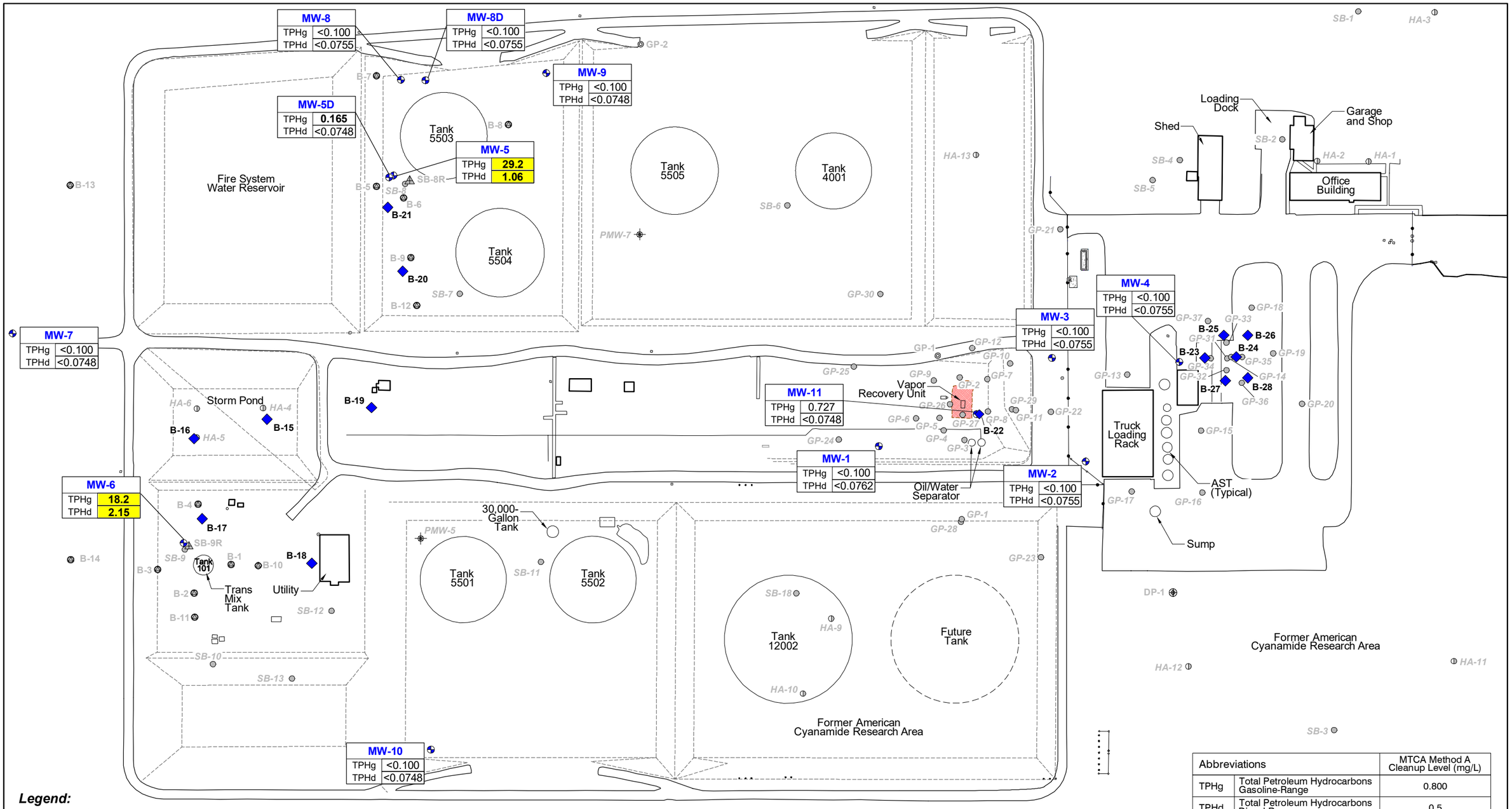
NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

BTEX and MTBE in Groundwater from Monitoring Wells - February 2019

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
May 2019		8



Legend:

- MW-1 — Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- SB-8R — Soil Boring Location (September 2014)
- DP-1 — Grab Groundwater Sample Location
- GP-1 — Deeper Direct-Push Geoprobe Location
- *GP-1* — Historical Direct-Push Boring Location (Approximate)
- *PMW-5* — Historical Temporary Well Location (Approximate)
- *HA-1* — Historical Hand Auger Location (Approximate)
- B-1 — Soil Boring Location (October 2015)
- **B-1** — Soil Boring Location (February 2019)

MW-6 | TPHg 18.2 | TPHd 2.15

- Location Sampled
- Concentration in mg/L
- Highlighted Concentration Exceeds MTCA Method A Cleanup Level
- Analyte Sampled

N

0 100 200

Scale in Feet

NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

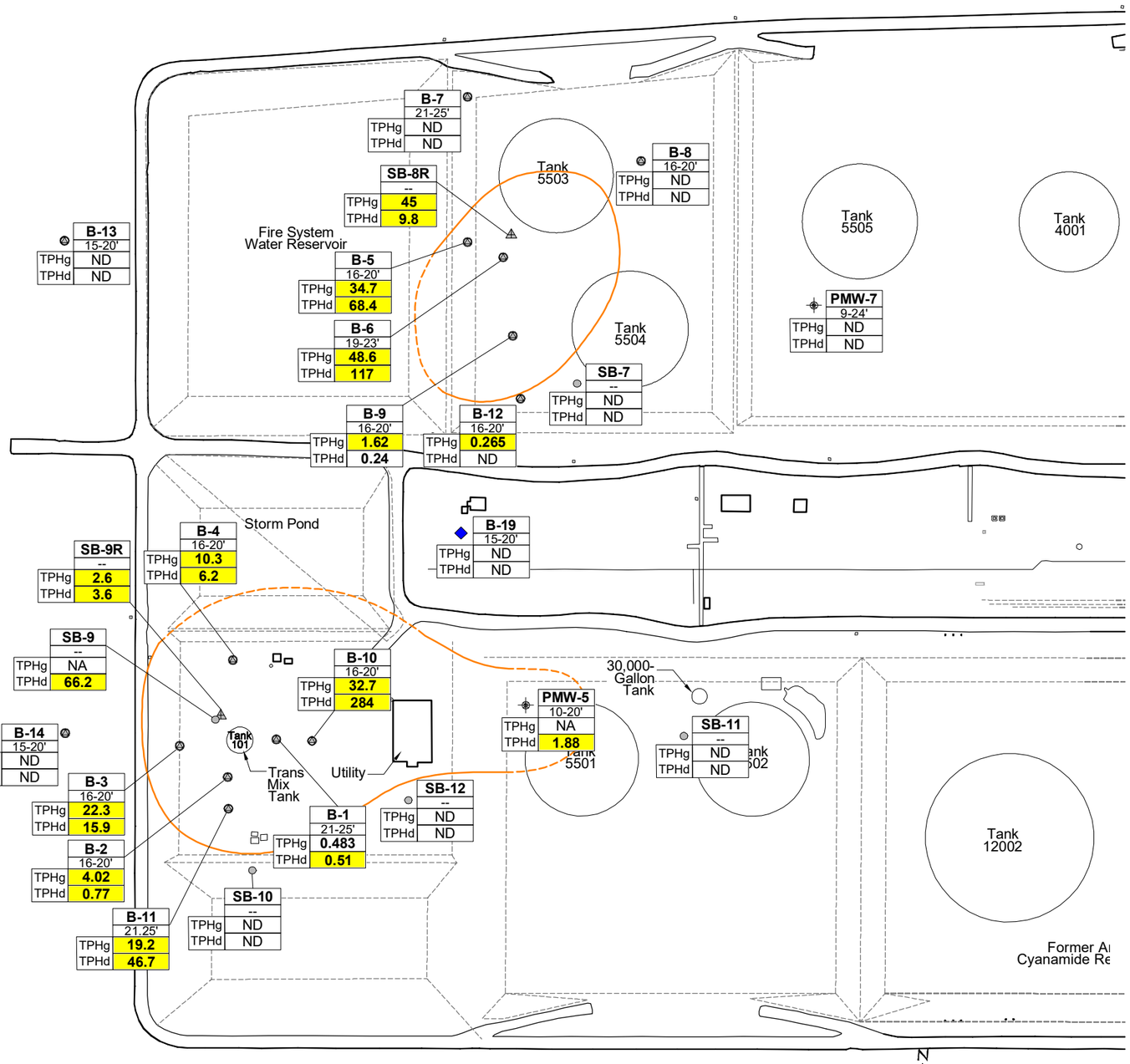
Abbreviations		MTCA Method A Cleanup Level (mg/L)
TPHg	Total Petroleum Hydrocarbons Gasoline-Range	0.800
TPHd	Total Petroleum Hydrocarbons Diesel-Range	0.5

TPHg and TPHd in Groundwater from Monitoring Wells - February 2019

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
May 2019		9



Legend:

- Soil Boring Location (September 2014)
- Historical Direct-Push Boring Location (Approximate)
- Historical Temporary Well Location (Approximate)
- Soil Boring Location (October 2015)
- Soil Boring Location (February 2019)

B-28 / 8-9' / TPHg <8.95 / TPHd <30.2

- Location Sampled
- Depth of Sample in Feet BGS
- Concentration in mg/L
- Highlighted Concentration Exceeds MTCA Method A Cleanup Level
- Analyte Sampled

Extent of TPH Above MTCA Method A Cleanup Levels (Dashed Where Inferred)

NOTE: Groundwater data presented on this figure are first encountered groundwater, unless otherwise noted.

Abbreviations		MTCA Method A Cleanup Level (mg/L)
TPHg	Total Petroleum Hydrocarbons Gasoline-Range	0.800
TPHd	Total Petroleum Hydrocarbons Diesel-Range	0.5

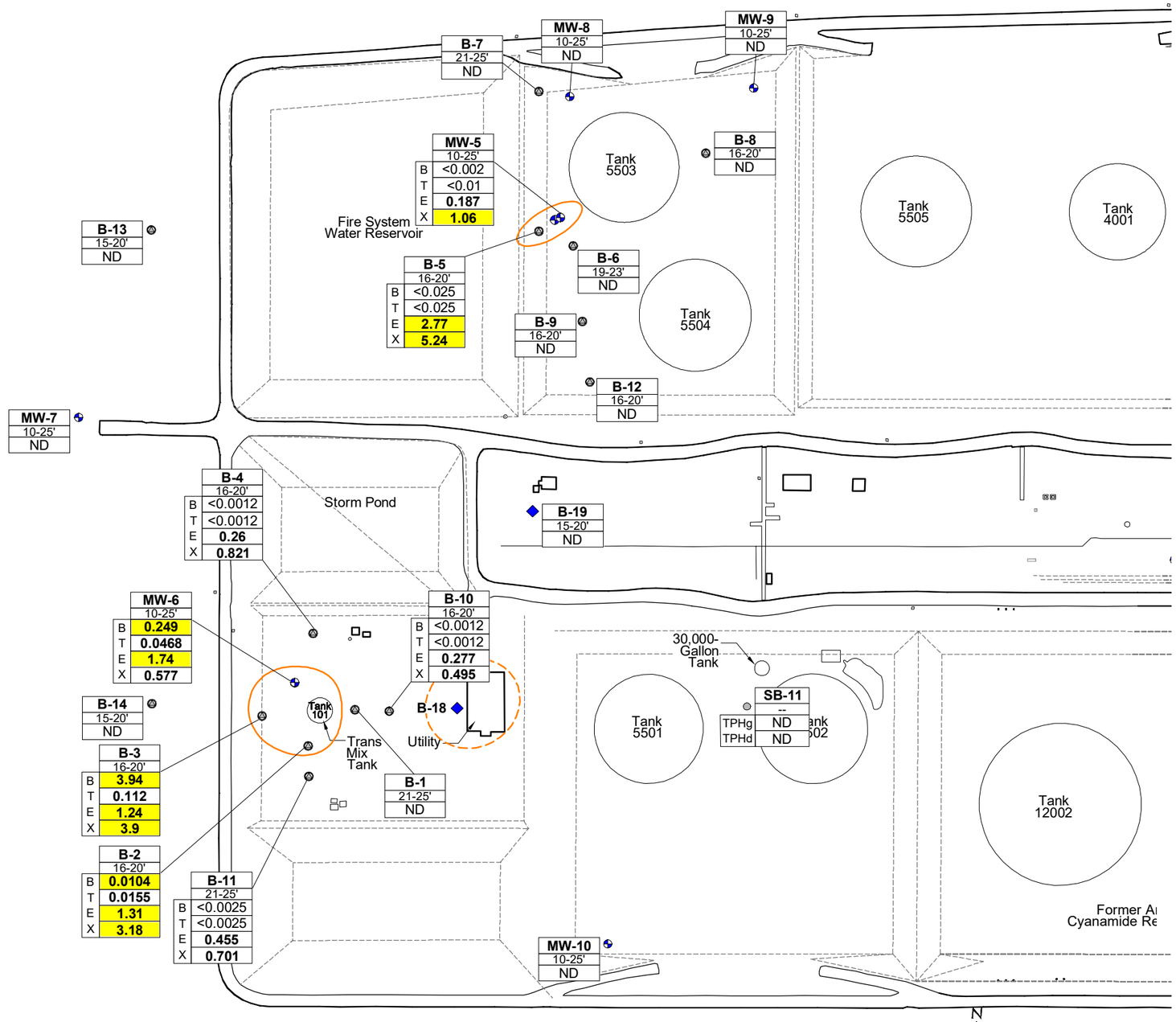
NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

TPH in First Encountered Groundwater - Western Area

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure 10
May 2019		



Legend:

- Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- Soil Boring Location (September 2014)
- Historical Direct-Push Boring Location (Approximate)
- Historical Temporary Well Location (Approximate)
- Soil Boring Location (October 2015)
- Soil Boring Location (February 2019)

MW-5	
	10-25'
B	<0.002
T	<0.01
E	0.187
X	1.06

- Location Sampled
- Depth of Sample in Feet BGS
- Concentration in mg/L
- Highlighted Concentration Exceeds MTCA Method A Cleanup Level - February 2019
- Analyte Sampled

Extent of TPH Above MTCA Method A Cleanup Levels (Dashed Where Uncertain)

NOTES: Groundwater data presented on this figure are first encountered groundwater, unless otherwise noted.

MTBE not detected in any samples, so data are not included on this figure.

If BTEX constituents are all below reporting limits, results are presented as 'ND' (Not Detected).

Abbreviations		MTCA Method A Cleanup Level (mg/L)
B	Benzene	0.005
T	Toluene	1
E	Ethylbenzene	0.7
X	Xylenes	1

NOTE: Base map completed from a number of sources including but not limited to; Figure VAN1-21-002 provided by NuStar (1/8/2007) and a Monitoring Well Survey by Statewide Land Surveying, Inc (10/30/2007). Locations of roads and containments are approximate.

BTEX in First Encountered Groundwater - Western Area

Additional Soil and Groundwater Investigation Results Report
NuStar Terminals Operations Partnership, L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-005	Figure
	May 2019	11

APPENDIX A

HISTORICAL FIGURES

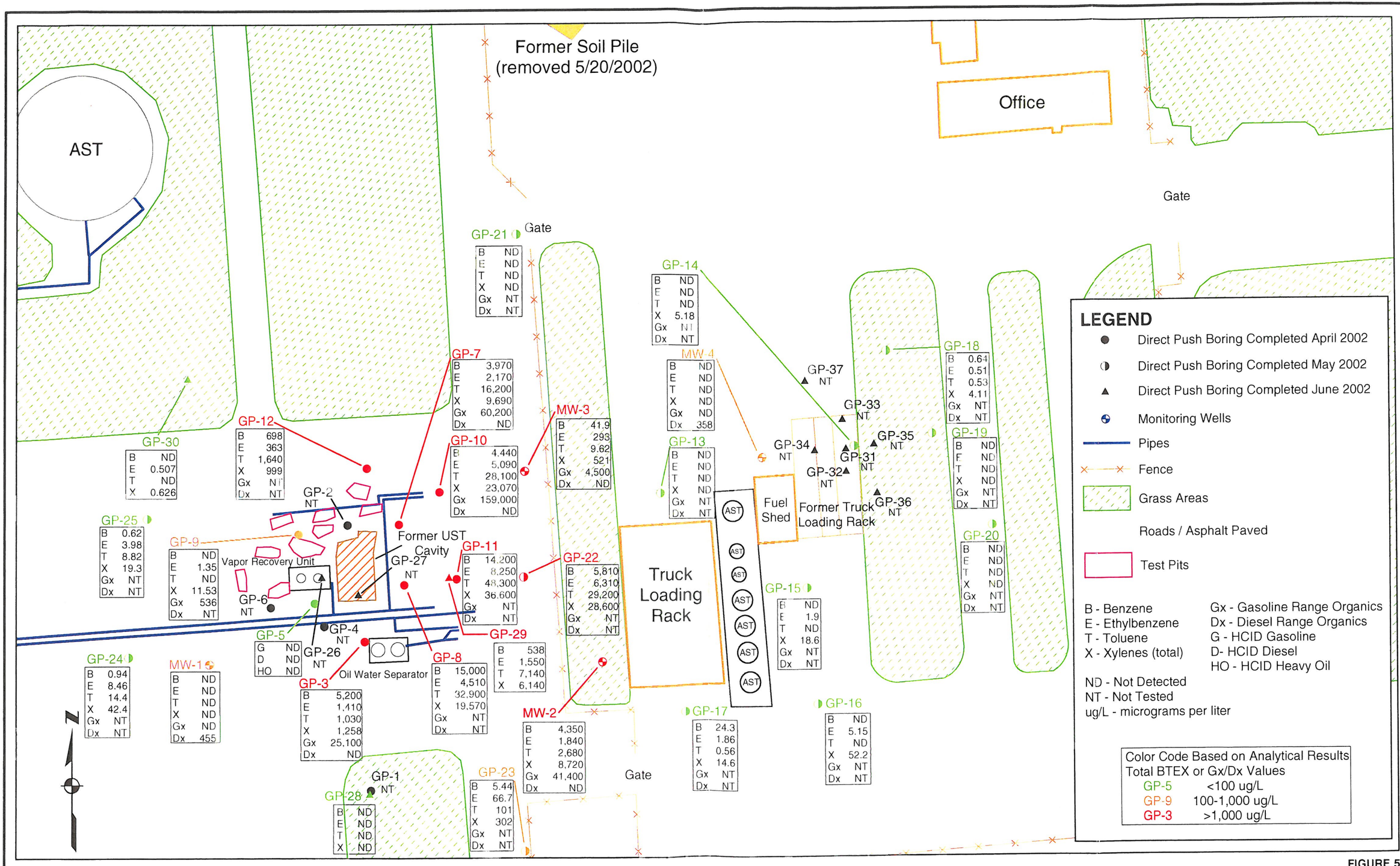


FIGURE 5

amec
7376 SW Durham Road
Portland, OR, U.S.A. 97224

W.O.	1-61M-11061-0 T2
DESIGN	BEL
DRAWN	BRJ
DATE	SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

BTEX, TPH-Gx, TPH-Dx, RESULTS FOR GROUNDWATER FROM DIRECT PUSH & MONITORING WELL BORINGS

K:\11000\11000\11061\dwg\arcview\Phase II RI\Figure 5 - Fuel Results - May & June 2002.mxd

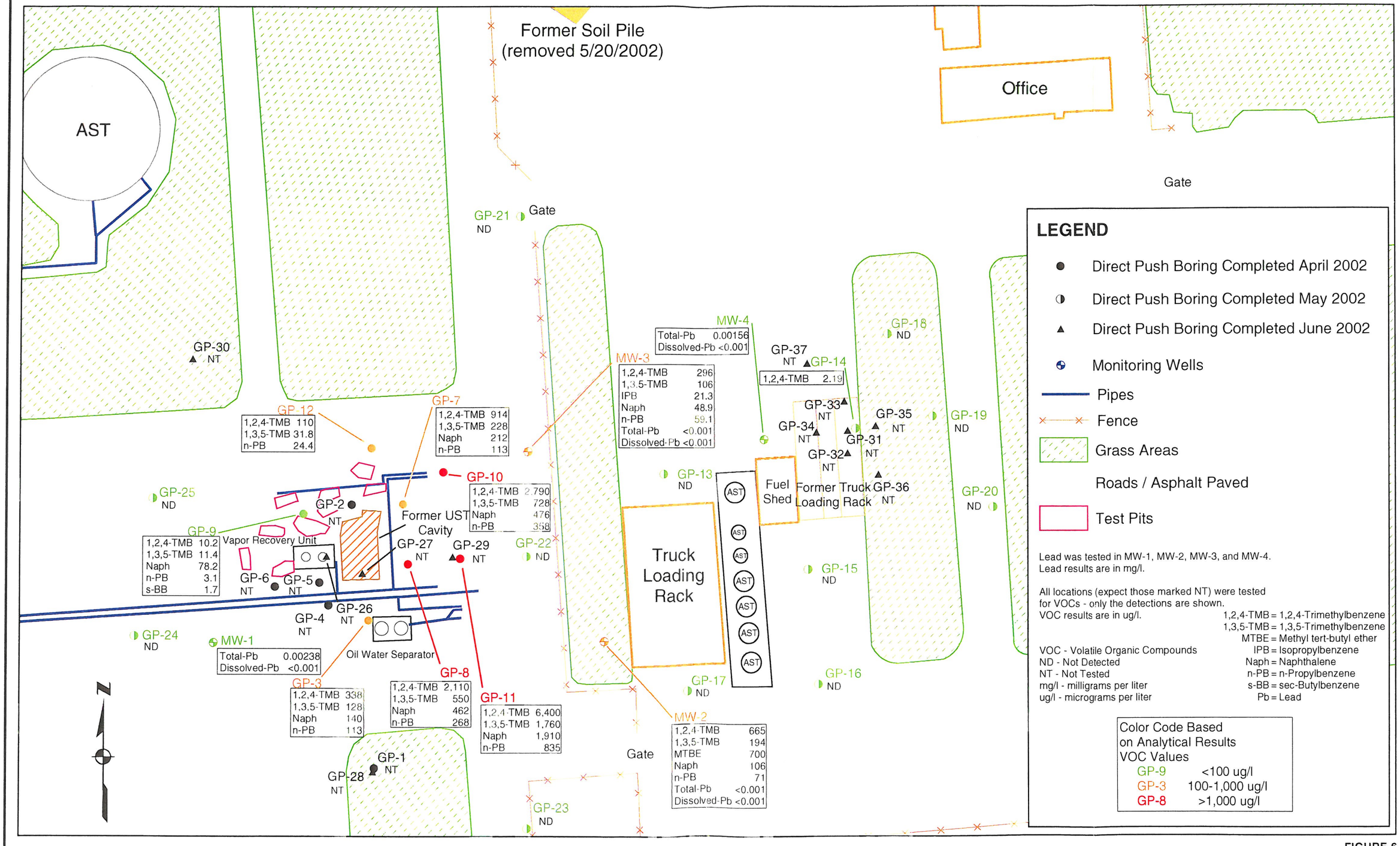


FIGURE 6

amec
7376 SW Durham Road
Portland, OR, U.S.A. 97224

W.O	1-61M-11061-0 T2
DESIGN	BEL
DRAWN	BRJ
DATE	SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

VOC and Pb RESULTS FOR GROUNDWATER FROM DIRECT PUSH & MONITORING WELL BORINGS

K:\11000\11000\11061\dwg\arcview\Phase II RI\Figure 6 - VOC and Pb Results - April & May & June 2002.mxd

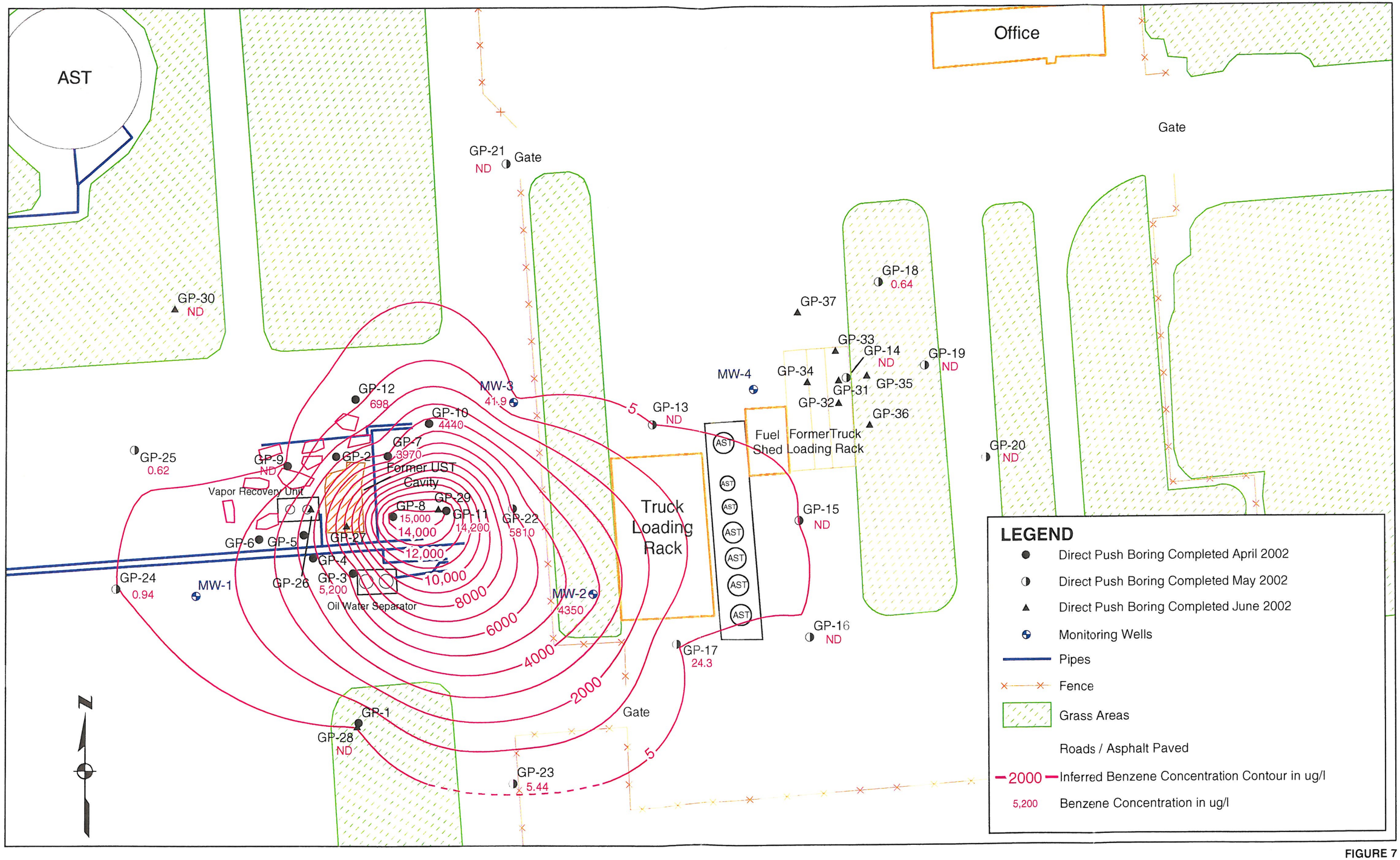


FIGURE 7

0 25 50 100 Feet

1 inch equals 50 feet

amec

7376 SW Durham Road
Portland, OR, U.S.A. 97224

W.O.	1-61M-11061-0 T2
DESIGN	BEL
DRAWN	BRJ
DATE	SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

BENZENE CONCENTRATIONS AND INFERRED CONTOUR FOR APRIL - JUNE 2002

K:\11000\11000\11061\dwg\arcview\Phase II RI\Figure 7 - Benzene Contour - April - May - June 2002.mxd

ANALYTE	
TPH–HCID	HYDROCARBON IDENTIFICATION
TPH–G	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
TPH–D	TOTAL PETROLEUM HYDROCARBONS AS DIESEL
OCP	ORGANO–CHLORINE PESTICIDES
OPP	ORGANO–PHOSPHORUS PESTICIDES
CH	CHLORINATED HERBICIDES
TZ	TRIAZINES
VOCs	VOLATILE ORGANIC COMPOUNDS
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	XYLENES
MTBE	METHYL–TERTIARY–BUTYL–ETHER
N	NAPHTHALENE
1,2,3–TMB	1,2,4–TRIMETHYL BENZENE
1,3,5–TMB	1,3,5–TRIMETHYL BENZENE
IPB	ISOPROPYL BENZENE
N–PB	N–PROPYL BENZENE
CF	CHLOROFORM
OTHER VOCs	OTHER VOLATILE ORGANIC COMPOUNDS
PAHs	POLYAROMATIC COMPOUNDS
AN	ACENAPHTHENE
AT	ANTHRACENE
CHRYS	CHRYSENE
F	FLUORENE
N	NAPHTHALENE
PHEN	PHENANTHRENE
PY	PYRENE
Pb	TOTAL LEAD

SB-8	ug/L
TPH–D	20,900
PAHs	
AN	11.2
F	17.9
N	642
PHEN	32.3

SB-1	ug/L
TPH–HCID	ND
OCP	ND
OPP	ND
CH	ND
TZ	ND

SB-2	ug/L
TPH–HCID	ND

SB-4	ug/L
TPH–HCID	ND
PAHs	ND

SB-5	ug/L
TPH–HCID	ND

SB-6	ug/L
TPH–HCID	ND

SB-7	ug/L
TPH–HCID	ND

PMW-7	ug/L
TPH–HCID	ND

PMW-6	ug/L
TPH–HCID	ND

MW-3	ug/L
VOCs	
B	90.8
T	9.65
E	338
X	538.2
MTBE	3.7
N	30.8
1,2,3–TMB	315
1,3,5–TMB	89.5
IPB	19.4
N–PB	62.3
OTHER VOCs	ND
OTHER PAHs	ND

MW-4	ug/L
VOCs	ND
PAHs	ND

MW-1	ug/L
VOCs	ND
PAHs	ND

SB-18	ug/L
TPH–HCID	ND

SB-11	ug/L
TPH–HCID	ND
N	0.266
OTHER PAHs	ND

SB-9	ug/L
TPH–D	66,200
Pb	1,780
PAHs	
AT	4.04
F	20.9
N	728
PHEN	38.9
PY	2.35
OTHER PAHs	ND

SB-12	ug/L
TPH–HCID	ND

PMW-5	ug/L
TPH–D	1,880
N	0.34
OTHER PAHs	ND

MW-2	ug/L
VOCs	
B	534
T	9.75
E	194
X	876
MTBE	77.6
N	15.0
1,2,3–TMB	160
1,3,5–TMB	62.4
IPB	19.4
N–PB	15.8
OTHER VOCs	ND
OTHER PAHs	ND

SB-3	ug/L
OCP	ND
OPP	ND
CH	ND
TZ	ND

12,000 GALLON AST #2 DIESEL
HA-3 HAZARDOUS WASTE STORAGE
SB-1
AMERICAN CYANAMID LABORATORY
SB-2
LOADING DOCK
GARAGE & SHOP
FORMER HEATING OIL UST
HA-1
HA-2
OFFICE BUILDING
SB-4
SB-5
TRUCK WASH AREA
SHED
TANK 912 #2 DIESEL
TANK 914 REGULAR
TANK 917 PREMIUM UNLEADED
TANK 913 KEROSENE
FIRE SYSTEM WATER RESERVIOR
SB-8
SB-7
SB-6
PMW-7
HA-13
AMERICAN CYANAMID TEST AREA
HA-7
PMW-6
FLUSHWATER OUTFALL AREA
PIPELINES TO PORT OF VANCOUVER
(2 X 12" ø PIPELINES)
VAPOR RECOVERY UNIT
OIL/WATER SEPARATOR
MW-1
20,000 GALLON TANK
HA-6
HA-4
HA-5
STORM POND
IW
UTILITY
SB-9
SLOPS TANK
SB-12
DRUM STORAGE AREA
SB-10
SB-13
FILL AREA
HA-8
PMW-5
TANK 910 #2 DIESEL
SB-11
TANK 911 FERTILIZER
AMERICAN CYANAMID TEST AREA
HA-10
HA-9
SB-18
MW-3
MW-4
MW-2
TRUCK LOADING RACK
ASTs
FORMER TRUCK RACK LOCATION
275 GAL. ASTs
SUMP
HA-12
AMERICAN CYANAMID TEST AREA
HA-11
SB-3
N
NOT TO SCALE

LEGEND

- PMW-1 — TEMPORARY MONITORING WELL LOCATION
- MW-5 — GROUNDWATER MONITORING WELL LOCATION
- SB-1 — AREA OF KNOWN RELEASES SOIL BORING/GROUNDWATER SAMPLE LOCATION
- SB-1 — AREA OF CONCERN SOIL BORING/GROUNDWATER SAMPLE LOCATION
- HA-1 — AREA OF KNOWN RELEASES HAND AUGER SAMPLE LOCATION
- HA-1 — AREA OF CONCERN HAND AUGER SAMPLE LOCATION
- IW — IRRIGATION WELL LOCATION

SECOR
International Incorporated
7730 SW MOHAWK STREET
TUALATIN, OREGON 97062
(503) 691–2030/692–7074 (FAX)

GROUNDWATER ANALYTICAL RESULTS MAP (APRIL 2003)
CENEX TERMINAL
5420 FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

FIGURE: 5

JOB#: 150T.0413.00.0004 APPR: DWN: KPM DATE: 06/02/03

N:/CENEX

DWG: 150T–9413–45A–0403.dwg

APPENDIX B

CASCADIA STANDARD OPERATING PROCEDURES (SOPS)

1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) describes the methods for observing and sampling from push-probes (i.e., GeoProbe™, AMS PowerProbe™, or similar). Subsurface soil cores may be obtained using this system for purposes of determining subsurface soil conditions and for obtaining soil samples for physical and/or chemical evaluation. Grab groundwater samples may be collected using temporary well screens. Soil vapor samples may be obtained using temporary well points. Shallow (less than 50 feet), small-diameter (2-inch max) pre-packed wells may also be installed using push-probe equipment. This procedure is applicable during all Cascadia Associates, LLC (Cascadia) push-probe activities.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- Traffic cones, tools, keys, and buckets/drums
- Water quality meter with calibration solutions (record daily calibration/calibration check in field notes)
- Sampling equipment (water level probe, pumps, tubing) and laboratory-supplied sample containers
- Field documentation materials
- Decontamination materials
- Personal protective equipment (as required by project Health and Safety Plan)

3. METHODOLOGY

Coring Procedure (Conducted by Drilling Subcontractor):

The sampling procedure includes driving a 2-inch outside-diameter, 5-foot-long, push-probe soil sampler to the desired depth using a combination of hydraulic pressure and mechanical hammer blows. When the sampling depth is reached, the pin attaching the sampler's tip is released (if a tip is used), which allows the tip to slide inside the sampler (Macro-Core Sampler with removable plastic liner). The sampler is driven the length of the sampler to collect a soil core, which is then withdrawn from the exploration. When the sampler is retrieved from the borehole the drive head/cutting shoe is detached and the liner is removed and the liner is cut open to expose the recovered soil core. Soil cores are collected continuously to the full depth of the exploration unless otherwise specified in a project-specific sampling and analysis plan (SAP). Verify that the subcontractor decontaminates the sampling device prior to its initial use and following collection of each soil sample.

Logging and Soil Sample Collection:

Remove the soil core from the sampler for field screening, description, and placement into sample jars. Soil samples will be collected for field screening and possible chemical analysis on two foot intervals unless otherwise specified in a project-specific SAP. The sampling interval will be determined in the field based on recovery, soil variability, and evidence of contamination.

Complete field screening as specified in the applicable SOP. Soil samples should be collected using different procedures for volatile on non-volatile analyses, as follows.

- Volatile Analyses. Sampling for volatile organics analysis (VOA) is different than other routine physical or chemical testing because of the potential loss of volatiles during sampling. To limit volatile loss, the soil sample must be obtained as quickly and as directly as possible. If a VOA sample is to collected as part of a multiple analyte sample, the VOA sample portion will be obtained first. The VOA sample should be obtained from a discrete portion of the entire collected sample and should not be composited or homogenized. Sample bottles should be filled to capacity, with no headspace.
- Other Analyses. Soil samples for non-volatile analyses will be thoroughly homogenized in a stainless-steel bowl prior to bottling. Sample homogenizing is accomplished by manually mixing the entire soil sample in the stainless-steel bowl with a clean sampling tool until a uniform mixture is achieved. The sample jar should be filled completely.

Grab Groundwater Sample Collection:

Collect grab groundwater samples using a sampling attachment with a 4 to 5-foot-long temporary screen (specify to drillers whether to use decontaminated stainless steel or disposable PVC. Also, specify whether a filter pack is necessary based on field observations). Obtain samples using a peristaltic pump unless otherwise specified in the SAP with new tubing for each boring. Record field parameters (e.g., temperature, conductivity, and pH) prior to sampling.

Backfilling the Excavation (Conducted by Drilling Subcontractor):

After sampling activities are completed, abandon each exploration in accordance with Oregon Water Resources Department (OWRD) regulations and procedures (or other regulatory authority if work is completed outside of the State of Oregon. The abandonment procedure typically consists of filling the exploration with granular bentonite and hydrating the bentonite with water. Match the surface completion to the surrounding materials.

1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) provides instructions for standard field screening. Field screening results are used to aid in the selection of soil samples for chemical analysis. This procedure is applicable during all Cascadia Associates, LLC (Cascadia) soil sampling operations.

Standard field screening techniques include the use of a photoionization detector (PID) to assess for volatile organic compounds (VOCs) and for the presence of separate-phase petroleum hydrocarbons using a sheen test. These methods will not detect all potential contaminants, so selection of screening techniques shall be based on an understanding of the site history. The PID is not compound or concentration-specific, but it can provide a qualitative indication of the presence of VOCs. PID measurements are affected by other field parameters such as temperature and soil moisture. Other field screening methods, such as screening for dense non-aqueous phase liquid (DNAPL) using dye or UV light, are not considered "standard" and will be detailed in the site-specific sampling and analysis plan (SAP).

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- PID with calibration gas (record daily calibration/calibration check in field notes);
- Plastic resealable bags (for PID measurement); and
- Glass jars or stainless steel bowls (for sheen testing).

3. METHODOLOGY

Each soil sample will be field screened for VOCs using a PID and for the presence of separate-phase petroleum hydrocarbons using a sheen test.

PID lamps come in multiple sizes, typically 9.8, 10.6, and 11.7 electron volts (eV). The eV rating for the lamp must be greater than the ionization potential (in eV) of a compound for the PID to detect the compound. For petroleum hydrocarbons, a lamp of at least 9.8 eV should be used. For typical chlorinated alkenes (dichloroethene, trichloroethene, tetrachloroethene, or vinyl chloride), a lamp of at least 10.6 eV should be used. The compatibility of the lamp size with the site constituents should be verified prior to the field event and will be detailed in the site-specific SAP.

PID Calibration Procedure: The PID used on-site should be calibrated daily or more frequently if needed. Calibration of the PID should be documented in field notes. Calibrations procedures should be conducted per the manufacturer's instructions.

PID Screening Procedure:

- Place a representative portion (approximately one ounce) of freshly exposed, uncompacted soil into a clean resealable plastic bag.
- Seal the bag and break up the soil to expose vapors from the soil matrix.
- Allow the bag to sit to reach ambient temperature. Note: Ambient temperature and

weather conditions/humidity should be recorded in field notes. Changes in ambient temperature and weather during the field work should also be recorded, as temperature and humidity can affect PID readings.

- Carefully insert the intake port of the PID into the plastic bag.
- Record the PID measurement in the field notes or boring logs.

Sheen Test Procedure:

- Following the PID screen, place approximately one ounce of freshly exposed, uncompacted soil into a clean glass jar or stainless steel bowl.
- Add enough water to cover the sample.
- Observe the water surface for signs of discoloration/sheen and characterize based on the descriptions below.

No Sheen (NS)	No visible sheen on the water surface
Biogenic Film (BF)	Dull, platy/blocky or foamy film.
Slight Sheen (SS)	Light sheen with irregular spread, not rapid. May have small spots of color/iridescence. Majority of water surface not covered by sheen.
Moderate Sheen (MS)	Medium to heavy coverage, some color/iridescence, spread is irregular to flowing. Sheen covering a large portion of water surface.
Heavy Sheen (HS)	Heavy sheen coverage with color/iridescence, spread is rapid, entire water surface covered with sheen. Separate-phase hydrocarbons may be evident during sheen test.

1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) describes the methods for documenting environmental field activities. The purpose of establishing SOPs for field notes and documentation is to establish a consistent method and format for the use and control of documentation generated during daily field activities. Field notes and records are intended to provide sufficient information that can be used to recreate the field activities, as well as, the collection of environmental data. Information placed in these documents and/or records shall be factual, detailed and objective.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- Bound field books;
- Black waterproof and/or indelible ink pens; and
- Field forms.

3. METHODOLOGY

This SOP primarily includes the documentation procedures for the field logbooks. However, procedures discussed in this SOP are applicable to all other types of field documentation collected, and should be universal in application. Details of other field records and forms (e.g. boring logs, sample labels, chain of custody records, and waste containment labels are discussed in the specific SOP associated with that field activity (e.g. borehole drilling, sample handling, investigative derived waste), and not covered in detail in this SOP.

Field Logbooks:

Field personnel will keep accurate written records of their daily activities in a bound logbook that will be sufficient to recreate the project field activities without reliance on memory. This information will be recorded in chronological order. All entries will be legible, written in black waterproof or indelible ink, and contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. Each page of the field logbook will be consecutively numbered, signed and dated by the field author(s). Pages should not be removed for any reason.

There should be no blank lines on a page. A single blank line or a partial blank line (such as at the end of a paragraph) should be lined to the end of the page. If only part of a page is used, the remainder of the page should have an "X" drawn across it.

In addition to documenting field activities, field logbooks will include the following:

- Date and time of activities,
- Site location,
- Purpose of site visit,
- Site and weather conditions,

- Personnel present, including sampling crew, facility/site personnel and representatives (including site arrival and departure times),
- Subcontractors present,
- Regulatory agencies and their representatives (including phone numbers, site arrival and departure times),
- Level of health and safety protection,
- Sampling methodology and information,
- Sample locations (sketches are helpful),
- Source of sample(s), sample identifications, sample container types and preservatives used, and lot numbers for bottles and preservatives (if applicable and if not recorded on other forms or in a sample control logbook),
- A chronological description of the field observations and events,
- Specific considerations associated with sample acquisition (e.g., field parameter measurements, field screening data, HASP monitoring data, etc.) (if not recorded on another form),
- Wastes generated, containment units (including volumes, matrix, etc), and storage location (if not recorded on another form),
- Field quality assurance/quality control samples collection, preparation, and origin (if not recorded on other forms or in a sample control logbook),
- The manufacturer, model and serial number of field instruments (e.g., PID, water quality, etc.) shall be recorded, if not using a calibration form. Also, source lot # and expiration date of standard shall be recorded if calibrated in the field.
- Well construction materials, water source(s), and other materials used on-site (if not recorded on another form).
- Sample conditions that could potentially affect the sample results,
- If deviating from plan, clearly state the reason(s) for deviation,
- Persons contacted and topics discussed,
- Documentation of exclusion zone set-up and location,
- Documentation of decontamination procedures, and
- Daily Summary.

Field situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the field activity without relying on the collector's memory. Language used shall be objective, factual, and free of personal opinions. Hypothesis for observed phenomena may be

recorded, however, they must be clearly indicated as such and only relate to the subject observation.

Logbooks will be assigned to a specific sampling team. If it is necessary to transfer the log book to alternative team member during field work, the person relinquishing the log book will sign and date the log book at the time of transfer.

Field logbooks should consist of a bound book, in which the insertion or removal of pages will be visibly noticeable after the logbook has been assembled. Logbooks can be prepared by gluing or laminating pages together either at the left side or top of the page. If inclement weather is expected, logbooks may have plastic laminated front and back covers to protect the interior pages, and should not be broken apart for coping. Loose-leaf binding, such as comb binding is not considered hard binding. To maintain the integrity of the logbook, pages should be consecutively numbered prior to use. Logbook pages can be of any format, and may include blank pages for recording or field forms that are used for specific tasks. As an alternative, commercially bound and consecutive page numbered field logbooks may also be used.

Additional Field Forms/Records:

Additional field records may be required for each specific field event. The use of these records and examples are described in other SOPs specific for the activity (e.g. Borehole Logging SOP, Groundwater Sampling and Purging SOP, etc.). These other records may include:

- Borehole Logs during drilling,
- Well Construction and Development records,
- Groundwater Purge and Sample Collection Records,
- Water Level Monitoring,
- Investigation Derived Waste (IDW) Tracking Records,
- Instrument Calibration Records, and
- Health and Safety Monitoring Records and sign-off sheets.

Prior to field activities, the field sampling personnel will coordinate with the Project Manager, or designee, to determine which additional records will be required for the specific field task. These additional records will be maintained in a field file or a three-ring notebook throughout the duration of the field activities, or included in a specially prepared site-specific notebook. If the field notebook is being created, the forms may be part of the laminated book.

Corrections:

If an error is made in the field, logbook corrections will be made by drawing a single line through the error, entering the correct information, and initialing and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes, are prohibited. All corrections will be initialed and dated. Some projects require that a brief reason for the change must also be added where the correction was made. Ask the Project Manager, if this requirement is necessary.

Documentation Reviews:

Periodically, the Project Manager, or designee, will review the field logbooks pertaining to the activities under their supervision. The elements of this review will include technical content, consistency, and compliance with the project plans and SOPs. Discrepancies and errors identified during the review should be resolved between reviewer and author of the field documentation. Corrections and/or additions of information shall be initialed and dated by the field author or reviewer.

1. PURPOSE AND SCOPE

The objective of this standard operating procedure (SOP) is to define the techniques and requirements for collecting shallow subsurface soil samples for environmental characterization purposes from the subsurface. The sampling techniques discussed in this SOP involve use of hand augers at various project sites.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- T-handle,
- Hand auger, extensions, bucket or tube type auger,
- Extension rods, and
- Wrenches/pliers.

3. METHODOLOGY

Preparation:

The following steps should be performed to prepare for hand auger soil sampling:

- Review the site-specific health and safety plan and sampling plan.
- Don the appropriate personal protective clothing as indicated in the site-specific health and safety plan.
- Locate sampling location(s).
- Use clean, (decontaminated) sampling tools to obtain sample material from each specified sample location.
- Carefully remove stones, vegetation, debris, etc. from the ground surface in the sampling location area. Core through Portland cement concrete or asphalt-concrete if necessary. Clear the sample location using a new and/or appropriately decontaminated tools.

Hand Auger Sampling:

The following steps must be followed when collecting environmental soil samples using a hand-auger and slide hammer:

- Auger to the depth required for sampling. Place cuttings on plastic sheeting. If possible, lay out the cuttings in stratigraphic order.
- During auger advancement and sample collection, record observations made of the geologic features of the soil.
- Stop advancing the auger when the top of the specified sampling depth has been reached. Remove the auger from the hole and set aside for future decontamination (see line item 11 below).
- Obtain the subsurface soil sample by driving the sample sleeve through the specified

sample interval with the slide hammer. Remove the stainless-steel liner from the slide hammer and quickly screen the sleeve for VOCs.

- Immediately subsample for VOCs (if required), observe stained soil, petroleum odor, or elevated PID reading).
- If it is not feasible to obtain the subsurface sample using a slide hammer, the soil sample may be collected directly from the auger bucket. The sample should be collected from material not in direct contact with the walls of the auger bucket.
- Decontaminate the auger bucket, sample tube and shoe, and repeat the preceding steps for sample collection from deeper depths as required by the FSP Addendum.
- When sampling is complete, place cuttings into a designated investigation-derived waste container. Place plastic sheeting and gloves in garbage bag and transfer decontamination water to a storage container.
- Decontaminate all equipment between each sample.
- Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the sample location.

1. PURPOSE AND SCOPE

The objective of this standard operating procedure (SOP) is to define the methods and requirements for collection of groundwater samples from monitoring wells applying low flow protocols. Low flow sampling is a technique for collecting samples that does not require the removal of large volumes of water and therefore does not overly agitate the water, suspend particles, or potentially aspirate VOCs. Typical flow rates for low flow sampling should range from 0.1 L/min to 0.5 L/min depending on site characteristics. The groundwater monitoring activities will consist of measuring water levels, purging and sampling groundwater, and measuring groundwater field parameters. This procedure is applicable during all Cascadia Associates, LLC low flow groundwater sampling activities.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- Traffic cones, tools, keys, and buckets/drums;
- Water quality meter with calibration solutions (record daily calibration/calibration check in field notes);
- Sampling equipment (water level indicator, pump, tubing);
- Laboratory-supplied sample containers (Consult the project-specific sampling and analysis plan (SAP) for sampling requirements);
- Field documentation materials;
- Decontamination materials; and
- Personal protective equipment (consult the site-specific Health and Safety Plan).

3. METHODOLOGY

Water Levels:

Water levels in the wells will be measured and recorded for the purpose of determining groundwater elevations and gradient. The wells will be opened and the water level allowed to equilibrate before the measurements are taken. Measurements of the depth to water will be made to the nearest 0.01 foot using an electronic water level indicator.

Purging:

Purge using low-flow sampling equipment (e.g., peristaltic or bladder pump) at a rate no greater than the recharge rate of the groundwater to prevent water table drawdown. Unless specified otherwise in the project-specific SAP the sample tubing/pump will be lowered to the middle of the screened interval. Groundwater field parameters (pH, electrical conductivity, and temperature) will be measured using a water quality meter and flow cell connected to the discharge tubing of the sample pump to assess the effectiveness of purging. Purging will be considered complete when the water quality parameters (i.e., pH, temperature, and specific conductance) stabilize within 10 percent for three consecutive 3-minute intervals. Consult the

project-specific SAP for additional parameters and stabilization criteria. Purge water will be placed in Department of Transportation (DOT) approved drums.

Sample Collection:

After the purging of each well is complete, collect groundwater samples for chemical analyses using the same pump used for the well purging.

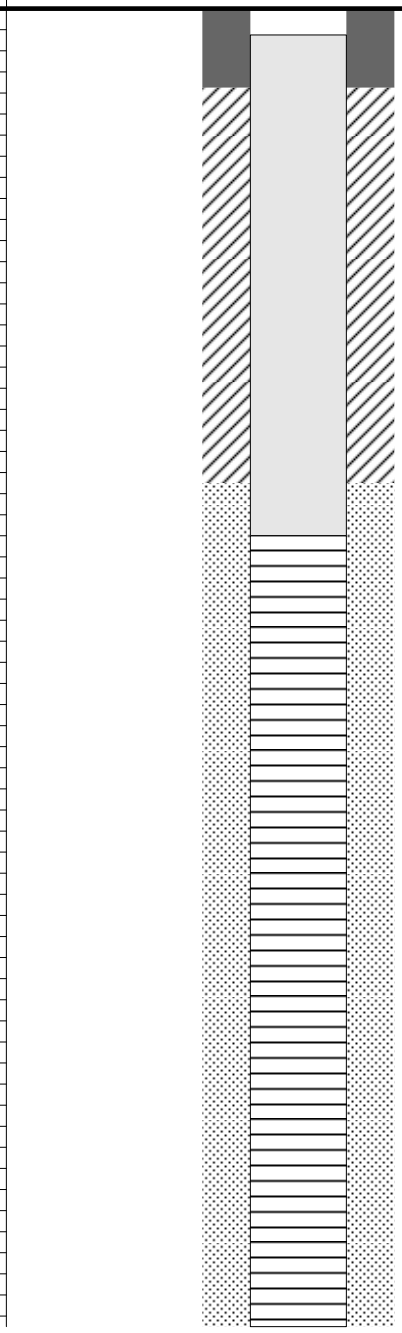
Low Yield Sampling Procedure:

If a well pumps dry during purging discontinue measurement of water quality parameters. Collect groundwater samples once the water level recovers to 90 percent of the pre-purge water column. Contact project manager in the event of slow recharge conditions. Always collect samples for VOC analysis as soon after recharge as possible.

APPENDIX C

BORING LOGS AND WELL MW-11 CONSTRUCTION LOG

Cascadia Associates, LLC	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-29**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **B-29**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	Hole Diameter: **4 in.**	Casing Diameter: **2 in. PVC**
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88):	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **25**	DEPTH TO WATER: **18**
LOGGED BY: **JM**	SAMPLING METHOD:	DATE STARTED:	DATE COMPLETED:

Depth (feet bgs)	Well Construction	Notes
0		Quick-set concrete
2		
4		3/8" chip bentonite
6		
8		
10		
12		
14		Silica sand
16		
18		
20		
22		
24		

NOTES: Bottom of boring at 25 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-15**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING: **24**
	DRILLING EQUIPMENT: **Hand Auger**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **10**	DEPTH TO WATER: **Not encountered**
LOGGED BY:	SAMPLING METHOD: **1.25-Inch Single Tube Sampler**	DATE STARTED: **1/31/19**	DATE COMPLETED: **1/31/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		Clayey SILT with trace fine sand, brown, slightly moist, stiff.	2.0/2.0	<5	NS		☒	
	ML		Fine sand increasing, becomes moist.						
2	ML		Clayey SILT with sand, brown, wet, medium stiff.	2.0/2.0	<5	NS			
4	ML		Clayey SILT with trace sand, brown, moist, stiff.	2.0/2.0	<5	NS			
			Becomes medium stiff.						
6	ML			2.0/2.0	<5	NS			
8	ML		Becomes wet.	2.0/2.0	<5	NS			
10									

NOTES: Bottom of boring at 10 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-16**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand Auger**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **10**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **1.25-Inch Single Tube Sampler**	DATE STARTED: **1/30/19**	DATE COMPLETED: **1/30/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		Clayey SILT, with trace fine sand, brown with grey mottles, slightly moist, stiff.	2.0/2.0	<5	NS			
2	ML		Becomes moist.	2.0/2.0	<5	NS			
					<5	NS	B-16 (1)	☒	
4			Clayey SILT, with trace fine sand, gray, wet, stiff.	2.0/2.0	100	MS			
					120	MS	B-16 (2)	☒	
6	ML			2.0/2.0	112	MS			
8				2.0/2.0	61	MS			
10					10.7	NS			

NOTES: Bottom of boring at 10 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-17**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/31/19**	DATE COMPLETED: **1/31/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		Clayey SILT, with trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2	ML		Becomes stiff.	2.0/2.0	<5	NS			
			Clay increasing, becomes moist.						
4	ML			2.0/2.0	<5	NS			
6	ML		Clayey SILT, with fine sand, gray/brown, moist, stiff.	2.0/2.0	<5	NS			
	ML		Becomes slightly moist, medium stiff.						
8				0/1.5					
10	ML		Clayey SILT, with fine sand, brown, slightly moist, medium stiff.	0.5/0.5	<5	NS			
	ML		Becomes moist.	5.0/5.0					
	ML		Clayey SILT, with fine sand, brown, moist, medium stiff.			NS			
12			Fine sand increasing, becomes wet.		<5		B-17 (1)	☒	
	ML					NS			
14					<5				
			Clayey SILT, with fine sand, gray, wet, medium stiff.			MS	B-17 (2)	☒	
16	ML				377				
						MS			
18	ML		Clay increasing, becomes stiff.		350				
					340	MS			
20			Clayey SILT, with fine sand, gray, wet, medium stiff.		141	MS			

NOTES: Bottom of boring at 55 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-17**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/31/19**	DATE COMPLETED: **1/31/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	ML			5.0/5.0	13.7	NS			
24	ML		Increasing clay, becomes stiff.						
26	ML		Becomes brown.		31	NS			
28	ML		Increasing sand.	5.0/5.0	5.1	NS			
30	ML		Sandy SILT with clay, brown, wet, medium stiff.		4.1	NS			
32	ML			5.0/5.0	25.8	NS			
34	ML				26.6	NS			
36	SM		SAND with silt, gray, wet, medium-grained, medium dense.	5.0/5.0	49.1	NS			
38	SM				6.7	NS			
40	SM		SAND with silt, gray, wet, medium-grained, medium dense.						
42	SM		Becomes coarser material.	5.0/5.0	18	NS			

NOTES: Bottom of boring at 55 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-17**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/31/19**	DATE COMPLETED: **1/31/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
44			SAND with trace silt, grey, wet, coarse-grained, medium dense.		8.3	NS			
46					24.5	NS			
48	SM			5.0/5.0	6.6	NS			
50					0.9	NS			
52			Silt increasing.	5.0/5.0	1.9	NS			
54	SM				25.8				

NOTES: Bottom of boring at 55 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-18**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/30/19**	DATE COMPLETED: **1/30/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT with gravel, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
	ML		Clayey SILT with trace fine sand, brown, slightly moist, medium stiff.						
2			Clayey SILT with fine sand, gray, slightly moist, stiff.	2.0/2.0	<5	NS			
	ML								
4				2.0/2.0	<5	NS			
			Fine sand increasing.						
6					246	MS			
				2.0/2.0			B-18 (1)	☒	
	ML				455	MS			
8				2.0/2.0	451	MS			
10			Becomes moist.						
					356	MS			
12	ML			5.0/5.0					
					604	MS			
14	ML		Becomes wet.				B-18 (2)	☒	
					647	MS			
			Clayey SILT with fine sand, gray, wet, stiff.						
16									
	ML			5.0/5.0	376	MS			
18									
20					431	MS			
			Clayey SILT with trace fine sand, gray, wet, medium stiff.						

NOTES: Bottom of boring at 55 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-18**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/30/19**	DATE COMPLETED: **1/30/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	ML			5.0/5.0	180	NS			
	ML		Clay increasing.						
24	ML		Becomes brown.						
			Clayey SILT with trace fine sand, brown, wet, medium stiff.		14.3	NS			
26					<5	NS			
	ML			5.0/5.0					
28					<5	NS			
					<5	NS			
30			SAND with trace silt, brown, wet, medium to fine-grained, medium dense.		13.4	NS			
32	SM			5.0/5.0	<5	NS			
34			SAND with silt, brown, wet, coarse to medium-grained, medium dense.		<5	NS			
36	SM			5.0/5.0	<5	NS			
38			Becomes coarser material.		<5	NS			
	SM								
40			SAND with silt, brown, wet, coarse to medium-grained, medium dense.		<5	NS			
	SM								
42			Becomes finer material.	5.0/5.0					

NOTES: Bottom of boring at 55 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-18**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/30/19**	DATE COMPLETED: **1/30/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
44	SM				<5	NS			
					<5	NS			
46			SAND with trace silt, brown, wet, medium-grained, medium dense		<5	NS			
	SM			5.0/5.0					
48					<5	NS			
50			SAND with silt, brown, wet, medium-grained, medium dense.		<5	NS			
	SM								
52			SAND with trace gravel, brown, wet, coarse to medium-grained, medium dense.	5.0/5.0					
	SW				<5	NS			
54									

NOTES: Bottom of boring at 55 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-19**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **17**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT with clay and trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2			Clayey SILT with trace fine sand, brown, slightly moist, stiff.	2.0/2.0	<5	NS			
4	ML			2.0/2.0	<5	NS			
6	ML		Becomes moist.	2.0/2.0	<5	NS			
8	ML		SILT with clay and fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
10	ML		Clayey SILT with trace fine sand, brown, moist, medium stiff.		<5	NS	B-19 (1)	☒	
12	ML		Becomes wet.	5.0/5.0		NS			
14			Clayey SILT with trace fine sand, gray, wet, medium stiff.		<5	NS			
16	ML				<5	NS			
18				5.0/5.0	<5	NS			
20			Clayey SILT with trace fine sand, gray, wet, soft.		1.2	NS			

NOTES: Bottom of boring at 55 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-19**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **17**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	ML			5.0/5.0	<5	NS			
24			Becomes brown and medium stiff.		<5	NS			
26	ML			5.0/5.0	<5	NS			
28			SAND; gray, wet, coarse-grained, medium dense		<5	NS			
30	SM		Silty SAND; gray, wet, medium-grained, medium dense.	5.0/5.0	<5	NS			
32					<5	NS			
34	SM				<5	NS			
36				5.0/5.0	<5	NS			
38	SM		Increasing silt.		<5	NS			
40			Silty SAND; dark gray ,wet, medium-grained, medium dense		<5	NS			
42	SM			5.0/5.0					

NOTES: Bottom of boring at 55 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-19**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **55**	DEPTH TO WATER: **17**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
44					<5	NS			
					<5	NS			
46	SM		Silty SAND; dark gray ,wet, medium-grained, medium dense.	5.0/5.0	<5	NS			
48					<5	NS			
50			Becomes dense.		<5	NS			
52	SM			5.0/5.0	<5	NS			
54					<5	NS			

NOTES: Bottom of boring at 55 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-20**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **60**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/4/19**	DATE COMPLETED: **2/4/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT with clay and fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2				2.0/2.0	<5	NS			
4	ML		Clayey SILT with trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
6				2.0/2.0	<5	NS			
8	ML		Fine sand increasing.	2.0/2.0	<5				
10	ML		Sandy SILT with clay, gray, slightly moist, medium stiff.		82.9		B-20 (1)	☒	
12	ML		Becomes wet.	5.0/5.0		NS	B-20 (2)	☒	
14			Clayey SILT with fine sand, gray, wet, soft.		35				
16	ML			5.0/5.0	219	MS			
18					78.5	MS			
20			Sandy SILT with clay, gray, wet, soft.						

NOTES: Bottom of boring at 60 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-20**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **60**	DEPTH TO WATER: **Not encountered**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/4/19**	DATE COMPLETED: **2/4/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	ML			5.0/5.0	378	MS			
24					9.4	NS			
26	ML		Clayey SILT with fine sand, gray, wet, soft.	5.0/5.0	3.4	NS			
28	SM		SAND with trace silt, dark gray, wet, coarse to medium-grained, medium dense.		6.1	NS			
30	SM		SAND with trace silt, gray, wet, mediumto fine-grained, medium dense.		3	NS			
32				5.0/5.0	1.4	NS			
34	SM		SAND with trace silt, brown, wet, mediumto fine-grained, medium dense.		1.6	NS			
36					<5	NS			
38	SM		SAND with trace silt, brown, wet, coarse to medium-grained, medium dense.	5.0/5.0	<5	NS			
40					<5	NS			
42			SAND with trace silt, brown, wet, medium-grained, medium dense.	5.0/5.0	<5	NS			

NOTES: Bottom of boring at 60 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-20**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION: **NA**
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **60**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/4/19**	DATE COMPLETED: **2/4/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
44	SM				<5	NS			
					<5	NS			
46			SAND with gravel, dark gray, wet, loose.		<5	NS			
				5.0/5.0					
48					<5	NS			
50					<5	NS			
52	SW			5.0/5.0	<5	NS			
54					<5	NS			
56					<5	NS			
				5.0/5.0					
58									
60									

NOTES: Bottom of boring at 60 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-21**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **65**	DEPTH TO WATER: **Not encountered**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/1/19**	DATE COMPLETED: **2/1/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		Clayey SILT with trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2				2.0/2.0	<5	NS			
4				2.0/2.0	<5	NS			
6				2.0/2.0	<5	NS			
8				2.0/2.0	<5	NS			
10	ML		Becomes light gray with red/orange mottles.		<5	NS			
12	ML		Fine sand increasing.	5.0/5.0	<5	NS	B-21 (1)	☒	
14					0.8	NS			
16	ML		Clayey SILT with fine sand, gray, moist, medium stiff.				B-21 (2)	☒	
			SAND; grey, wet, medium grained, dense		160.7	MS			
18	SW			5.0/5.0	389	MS			
20	ML		Clayey SILT with fine sand, gray, wet, soft.		504	MS			

NOTES: Bottom of boring at 65 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-21**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **65**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/1/19**	DATE COMPLETED: **2/1/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22									
			Clay increasing.	5.0/5.0	388	MS			
24	ML				185	MS			
26			Fine sand increasing.		23	NS			
	ML			5.0/5.0					
28					7.7	NS			
			SAND with silt, gray, wet, coarse to medium-grained, medium dense.						
30					71	NS			
	SM								
32				5.0/5.0	40	NS			
			Becomes finer material.						
34					13	NS			
36									
	SM				<5	NS			
				5.0/5.0					
38					<5	NS			
40									
					<5	NS			
42				5.0/5.0					

NOTES: Bottom of boring at 65 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-21**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **65**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/1/19**	DATE COMPLETED: **2/1/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
44			Becomes brown.		<5	NS			
					<5	NS			
46					<5	NS			
				5.0/5.0					
48					<5	NS			
50									
	SM				<5	NS			
52				5.0/5.0					
					<5	NS			
54									
					<5	NS			
56									
					<5	NS			
58				5.0/5.0					
					<5	NS			
60	SM		SAND with silt and gravel, gray, wet, coarse to medium-grained, medium dense.						
					<5	NS			
				5.0/5.0					
					<5	NS			

NOTES: Bottom of boring at 65 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-21**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **65**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **2/1/19**	DATE COMPLETED: **2/1/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes

NOTES: Bottom of boring at 65 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-22**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **25**	DEPTH TO WATER: **17.9**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		Clayey SILT with trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2	ML		SILT with trace clay and fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
4				2.0/2.0	<5	NS			
6	ML		Sand increasing.	2.0/2.0	<5	NS			
8	SM		SAND with silt, brown, slightly moist, medium-grained, medium dense.	2.0/2.0	<5	NS			
10	SM		Becomes dark gray.	5.0/5.0	<5	NS			
12	ML		Clayey SILT lens with trace fine sand, brown, wet, medium stiff.		<5	NS			
14	SM		SAND with silt, gray, slightly moist, medium-grained, medium dense.		<5	NS			
16	SM		Silt increasing.	5.0/5.0	<5	NS			
18	SM		Becomes moist.		<5	NS			
20			Silty SAND; gray, wet, medium grained, medium dense		<5	NS	B-22 (1)	☒	

NOTES: Bottom of boring at 25 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-22**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **25**	DEPTH TO WATER: **17.9**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	SM			5.0/5.0	65	NS			
24					45	NS			

NOTES: Bottom of boring at 25 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID:	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID:	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT:	SURFACE ELEV. (NAVD88):	TOC ELEVATION:
	DRILLING METHOD:	TOTAL DEPTH:	DEPTH TO WATER:
LOGGED BY:	SAMPLING METHOD:	DATE STARTED:	DATE COMPLETED:

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0									
2									
4									
6									
8									
10									
12									
14									
16									
18									
20									

NOTES:

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID:	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID:	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT:	SURFACE ELEV. (NAVD88):	TOC ELEVATION:
	DRILLING METHOD:	TOTAL DEPTH:	DEPTH TO WATER:
LOGGED BY:	SAMPLING METHOD:	DATE STARTED:	DATE COMPLETED:

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22									
24									

NOTES:

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-23**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **15**	DEPTH TO WATER: **Not encountered**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/29/19**	DATE COMPLETED: **1/29/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0			Clayey SILT with trace fine sand, brown, slightly moist, stiff.	2.0/2.0	<5	NS			
2	ML			2.0/2.0	<5	NS			
4	ML		SILT with clay, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
			Sand increasing.		<5	NS			
6					<5	NS			
				2.0/2.0	<5	NS	B-23 (1)	☒	
8	ML				<5	NS			
				2.0/2.0	<5	NS			
10					<5	NS			
	ML		Clayey SILT with trace fine sand, brown, moist, medium stiff.						
12			SILT with trace fine sand and clay, brown, dry, medium stiff.	5.0/5.0	<5	NS			
	ML								
14					<5	NS			

NOTES: Bottom of boring at 15 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-24**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **15**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT with trace clay, light brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
	ML		Trace angular to subangular gravel.						
2			Clayey SILT; light brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
4	ML			2.0/2.0	<5	NS			
6				2.0/2.0	<5	NS			
			Becomes brown.						
8	ML			2.0/2.0	<5	NS			
10			Clayey SILT with trace fine sand, brown, moist, medium stiff.	5.0/5.0	<5	NS	B-24 (1)	☒	
	ML								
12					<5	NS			
			Sandy SILT; brown, slightly moist, medium stiff.						
14	ML				<5	NS			

NOTES: Bottom of boring at 15 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**		BORING ID: **B-25**	
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**		WELL ID: **NA**	
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**		NORTHING:	EASTING:
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**		SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
DRILLING METHOD: **Direct-Push**		TOTAL DEPTH: **15**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT with gravel, dark gray, dry, medium stiff	2.0/2.0	9.2	NS			
			Clayey SILT with trace fine sand, dark brown, slightly moist, medium stiff.		<5	NS			
2				2.0/2.0	<5	NS			
	ML								
4				2.0/2.0	<5	NS			
6			Becomes gray and brown.	2.0/2.0	13.5	NS	B-25 (1)	☒	
	ML				1.2	NS			
8			SILT with clay, brown to gray, dry, medium stiff.	2.0/2.0	21.5	MS	B-25 (2)	☒	
10	ML			5.0/5.0	13.1	NS			
12			Becomes light brown.		<5	NS			
	ML								
14					<5	NS			

NOTES: Bottom of boring at 15 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-26**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **35**	DEPTH TO WATER: **Not encountered**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT; brown, slightly moist, medium stiff.	2.0/2.0	<5	NS	B-26 (1)	☒	
2				2.0/2.0	<5	NS			
4	ML		Clay increasing.	2.0/2.0	<5	NS			
6			Clayey SILT, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
8	ML			2.0/2.0	<5	NS			
10				5.0/5.0	<5	NS			
12					<5	MS			
14	ML		Becomes moist.		<5	NS			
16	ML		Sand increasing.	5.0/5.0	<5	NS			
18					<5	NS			
20	SM		SAND with silt, brown, slightly moist, medium grained, medium dense.						
			Clayey SILT lens, brown, slightly moist, medium stiff.		<5	NS			

NOTES: Bottom of boring at 35 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-26**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **35**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	ML			5.0/5.0	<5	NS			
24	SM		SAND with silt, brown, slightly moist, medium grained, medium dense.		<5	NS			
26	SM		SAND with trace silt, dark brown to gray, moist, coarse grained, medium dense.	5.0/5.0	<5	NS			
28	SM				<5	NS			
30	ML		Clayey SILT lens, brown, moist, medium stiff.		<5	NS			
32	SM		SAND with trace silt, dark brown to gray, moist, coarse-grained, medium dense.	5.0/5.0	<5	MS			
34	SM		Becomes wet.		<5	NS			

NOTES: Bottom of boring at 35 feet bgs.

PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-27**		
LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**		
DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:	
DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:	
DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **35**	DEPTH TO WATER: **30.8**	
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0			Asphalt						
	ML		Clayey SILT with trace fine sand, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
2				2.0/2.0	<5	NS			
					<5	NS			
4				2.0/2.0	<5	NS			
6	ML		Becomes gray.	2.0/2.0	97.2	MS			
	ML		Becomes moist.		170	MS	B-27 (1)	☒	
8			Becomes slightly moist.		697	MS			
				2.0/2.0			B-27 (2)	☒	
10					773	MS			
	ML			5.0/5.0					
12					679	MS			
14					25	MS			
16	ML		Clayey SILT with trace fine sand, brown to gray, wet, medium stiff.		50	MS			
				5.0/5.0					
18			SAND with silt, brown, moist, medium grained, medium dense.		21	NS			
					5.6	NS			
20					<5	NS			

NOTES: Bottom of boring at 35 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-27**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **35**	DEPTH TO WATER: **30.8**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
22	SM			5.0/5.0	<5	NS			
24					<5	NS			
26					<5	NS			
28			Becomes gray.	5.0/5.0	<5	NS			
30	SM				<5	NS			
32			Becomes wet.	5.0/5.0	<5	NS			
34	SM				<5	NS			

NOTES: Bottom of boring at 35 feet bgs.

	PROJECT: **Additional Soil and Groundwater Investigation**	BORING ID: **B-28**	
	LOCATION: **5420 NW Fruit Valley Rd, Vancouver, WA.**	WELL ID: **NA**	
	DRILLING CONTRACTOR: **NuStar Vancouver Annex Facility**	NORTHING:	EASTING:
	DRILLING EQUIPMENT: **Hand auger to 8', Geoprobe 7730 to depth**	SURFACE ELEV. (NAVD88): **Not measured**	TOC ELEVATION:
	DRILLING METHOD: **Direct-Push**	TOTAL DEPTH: **15**	DEPTH TO WATER: **Not encountered**
LOGGED BY: **LW**	SAMPLING METHOD: **2.25-Inch Single Tube Sampler**	DATE STARTED: **1/28/19**	DATE COMPLETED: **1/28/19**

Elev. (feet)	USCS	Graphic Log	Description	Driven/Rec. (ft.)	Headspace Vapor (ppm)	Sheen	Soil Sample	Sample Depth	Notes
0	ML		SILT; light brown, dry, medium stiff.	2.0/2.0	<5	NS			
			Becomes dark brown, slightly moist.						
2	ML			2.0/2.0	<5	NS			
4			SILT with clay, light brown, slightly moist, medium stiff.	2.0/2.0	<5	NS			
6	ML			2.0/2.0	<5	NS			
8	ML		SILT with fine sand and trace clay, brown, slightly moist, medium stiff.	2.0/2.0	<5	NS	B-28 (1)	☒	
			Clay increasing.						
10					<5	NS			
12	ML			5.0/5.0	<5	NS			
14					<5	NS			

NOTES: Bottom of boring at 15 feet bgs.

APPENDIX D

LABORATORY ANALYTICAL REPORTS AND

QUALITY ASSURANCE/QUALITY CONTROL REVIEW

1.0 INTRODUCTION

This attachment documents the results of a quality assurance/quality control (QA/QC) review of the analytical data for the soil and groundwater samples collected as part of the additional soil and groundwater investigation and subsequent groundwater monitoring event at the NuStar Terminals Operations Partnership (NuStar) Annex Terminal in Vancouver, Washington (the Facility). Soil and groundwater sample analyses were performed by accredited environmental laboratories; laboratories used during the investigation are listed in the table below. Copies of the laboratory reports are included in this attachment.

Report	Sampling Date	Event	Laboratory
ADB01017 Amended	1/28/19 – 2/7/19	Soil and grab groundwater investigation	Apex Labs- Portland, OR.
K1900833.01	1/29/19	Rush-turnaround samples for boring B-22.	ALS – Kelso, WA.
A9B0609	2/18/19	Groundwater monitoring event	Apex Labs - Portland, OR.

2.0 DATA VALIDATION

The QA review included examination and validation of the laboratory data packages for the following:

- Analytical preparation and quantitation methods
- Analytical method holding times
- Sample handling
- Chain of custody handling
- Detection and reporting limits
- Method blank detections
- Laboratory control samples, matrix spikes and surrogates to assess laboratory accuracy
- Laboratory control sample duplicates and matrix spike duplicates to assess laboratory precision
- Field duplicates to assess sampling and laboratory precision

The QA/QC review did not include a review of raw data.

2.1 DATA QUALIFIERS

Any data that is found to have possible bias or error was qualified and flagged. The flags used in the data table are below.

F-9 to F-20, L	Various laboratory notes regarding the hydrocarbon pattern on the NWTPH-Gx and NWTPH-Dx analysis; in general, the chromatograph patterns don't exactly match the standard and/or there is an overlap in hydrocarbon ranges in the samples. Note: while the hydrocarbon overlap was noted on the report tables, the data flags were not carried through to the tables as they don't indicate a quality issue for sample results.
Q-17	Relative percent difference (RPD) between original and duplicate is outside control limits.
Q-42	Matrix spike/matrix spike duplicate (MS/MSD) analysis was performed on sample and percent recovery or RPD was outside control limits.

3.0 ANALYTICAL METHODS

Soil and/or sample analyses included the following.

- Gasoline-range petroleum hydrocarbons (TPHg) by Method NWTPH-Gx;
- Diesel-range petroleum hydrocarbons (TPHd) and oil-range petroleum hydrocarbons (TPHo) by Method NWTPH-Dx with silica gel cleanup; and
- Benzene, toluene, ethylbenzene, and xylenes (collectively BTEX) by U.S. Environmental Protection Agency (EPA) Method 8260B.
- Diethylene glycol monomethyl ether (DGME) by modified Method 8270D.

4.0 QUALITY ASSURANCE OBJECTIONS AND REVIEW

The general QA objectives for this project were to develop and implement procedures for obtaining, evaluating, and confirming the usability of data of a specified quality for soil and groundwater concentration monitoring at the Facility. To collect such information, analytical data must have an appropriate degree of accuracy and reproducibility, samples collected must be representative of actual field conditions, and samples must be collected and analyzed using unbroken chain-of-custody procedures.

Reporting limits and analytical results for the samples were compared to Washington Department of Ecology MTCA Method A Cleanup Levels for each parameter. Precision, accuracy, representativeness, completeness, and comparability parameters used to indicate data quality are defined below.

4.1 HOLDING TIMES AND SAMPLE RECEIPT

The holding time is the minimum amount of time the sample can be stored before analytes start to degrade and are not representative of initial sampling concentrations. Holding times are defined by

analytical methods. The groundwater samples included in this QA/QC review were analyzed within the method recommended holding time.

Method	Matri	Analyte	Preservative	Hold Time
EPA 8260B	Soil/ Water	BTEX, MTBE and naphthalene	Hydrochloric Acid (HCl) to pH<2; No headspace; Glass	14 days
NWTPH-Gx	Soil/ Water	Gasoline Range Organics	Hydrochloric Acid (HCl) to pH<2; No headspace; Glass	14 days
NWTPH-Dx	Soil/ Water	Diesel Range Organics	Hydrochloric Acid (HCl) to pH<2; Amber glass container	14 days

Samples were received on ice below 4^0C by the analytical laboratory. Sampling containers arrived intact and unbroken to the laboratories. Groundwater samples to be analyzed for volatile organic compounds (VOCs) were received without headspace in VOA sampling containers. All chain-of-custodies were appropriately relinquished by the Cascadia Associates sampler and received by the intentional environmental laboratory. There were no major discrepancies found between the bottles and the chain of custodies received.

4.2 REPORTING LIMITS

Reporting limits are the lowest concentration an instrument is capable of accurately detecting an analyte. They are determined by the laboratory and are based on instrumentation capabilities, the matrix of field samples, sample preparation procedures and suggested reporting limits by the EPA or the Washington Department of Ecology. In some cases, the reporting limits may be raised due to high concentrations of analytes or matrix interferences. Detection limits were generally consistent with industry standards and regulatory standards. Reporting limits for individual samples varied based on the magnitude of the chemical impact.

4.3 METHOD BLANKS

A method- or laboratory-blank is a QC sample prepared by the laboratory from an analyte-free matrix and analyzed in an analytical batch along with environmental and other QC samples. It is used to assess laboratory contamination or background interferences. Analytes were not detected in the method blanks during the above-referenced analyses.

4.4 ACCURACY

Accuracy compares the accepted reference concentration of an analyte to the concentration determined analytically. Accuracy is measured as a percent recovery. This recovery must be within a certain range or control limit for the data in an analytical batch to be considered acceptable. The analytical laboratory provides QC samples and surrogates to help determine the accuracy and acceptability of the data reported. These QC samples and surrogates are discussed below.

4.4.1 Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control duplicate samples (LCSD) were analyzed by the laboratory to assess the accuracy of the analytical methods. A minimum of one set of LCS and LCSD was analyzed per analytical batch. The LCS and LCSD are prepared from an analyte-free matrix that is spiked with known levels of compounds of concern. The concentrations are measured and compared to the known spiked levels. This comparison is expressed as percent recovery. The percent recoveries for LCS and LCSD quality control samples were within method control limits.

4.4.2 Matrix Spikes

A matrix spike QC sample is used to assess the performance of the analytical method by determining potential matrix interferences. MS and MSD analyses are performed on one environmental sample per analytical batch. An MS sample uses an environmental sample that is spiked with known concentrations of analytes of interest. The MS is then prepared and analyzed with the same analytical procedures as environmental samples in the analytical batch. The resulting concentration of the MS is then compared to the known or true values plus the non-spiked environmental sample concentration. This comparison is expressed as a percent recovery. The percent recoveries for MS and MSD QC samples were within method control limits, with one exception:

> An MS/MSD analysis was performed on water sample B-17-50 (batch A9B0107-26) and the % recovery or RPD for gasoline range organics, ethylbenzene, naphthalene and total xylenes was outside of control limits. Because the associated LCS/LCSD percent recovery for the sample batch was within acceptable limits, no data are flagged.

4.4.3 Surrogates

Surrogates are organic compounds that are similar in chemical composition to the analytes of interest but are not likely to be found in the environment. They are spiked at a known concentration into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference, sample preparation efficiency and analysis performance on a sample-specific basis. Surrogate recoveries were within control limits. In some cases, the surrogate recovery was either estimated or not available due to sample dilution required for high analyte concentration and/or matrix interference.

4.5 PRECISION

Precision is measured by how close values of duplicate analyses are to each other. These duplicate analyses are prepared from separate aliquots of the same sample and are analyzed at the same (or similar) time. Precision in the field ensures that samples taken are representative of field concentrations; this is demonstrated by field duplicates. Analytical precision is the ability of the laboratory to reproduce results that are similar to each other; this is measured through duplicate

analysis of environmental and batch QC samples. Precision is estimated by the RPD between the original analysis and the duplicate analysis.

4.5.1 Laboratory Control Sample Duplicates

The analytical batch LCS concentration of an analyte is compared to the LCSD concentration of the same analyte. The RPD is calculated from these two concentrations; which must be below a certain percentage to be considered acceptable. The RPD values for the laboratory control samples of the same batch were within the method control limits.

4.5.2 Matrix Spikes

Like the LCS/LCSD, the MS/MSD analyte concentrations are also compared to each other and expressed as an RPD. The RPD values for analytical batch MS/MSD were within the control limit.

4.5.3 Field Duplicate

A field duplicate is a second field sample collected from a selected sample location. Field duplicate samples serve as a check on laboratory precision, sampling quality, as well as potential variability of the sample matrix. The field duplicate is analyzed and compared to the original sample to assess precision. This comparison can be expressed by the RPD between the original and duplicate samples. Application of RPD values is appropriate when the analyte result is five times greater than the reporting limit. Laboratory precision decreases as the analytical result approaches the reporting limit. Typically, one field duplicate is analyzed per 20 project samples during routine monitoring events; however, duplicates were inadvertently not collected from the February 2019 groundwater monitoring event.

5.0 CONCLUSION

The overall QA objectives have been met and the data are of adequate quality for use in this project.

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Friday, April 5, 2019

Stephanie Salisbury
Cascadia Associates
5820 SW Kelly Ave Unit B
Portland, OR 97239

RE: A9B0107 - Nustar Vannex - 0060-001-005

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A9B0107, which was received by the laboratory on 2/5/2019 at 2:25:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	5.6 degC	Cooler #2	4.1 degC
Cooler #3	2.8 degC	Cooler #4	2.7 degC
Cooler #5	5.1 degC		

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B-26	A9B0107-01	Soil	01/28/19 10:00	02/05/19 14:25
B-28	A9B0107-02	Soil	01/28/19 11:15	02/05/19 14:25
B-24	A9B0107-03	Soil	01/28/19 12:20	02/05/19 14:25
B-25-1	A9B0107-04	Soil	01/28/19 13:20	02/05/19 14:25
B-25-2	A9B0107-05	Soil	01/28/19 13:30	02/05/19 14:25
B-27	A9B0107-06	Soil	01/28/19 14:50	02/05/19 14:25
B-27-2	A9B0107-07	Soil	01/28/19 15:10	02/05/19 14:25
B-27 Water	A9B0107-08	Water	01/28/19 16:00	02/05/19 14:25
B-23	A9B0107-09	Soil	01/29/19 09:30	02/05/19 14:25
B-22	A9B0107-10	Soil	01/29/19 11:30	02/05/19 14:25
B-19	A9B0107-11	Soil	01/29/19 14:00	02/05/19 14:25
B-19-15	A9B0107-12	Water	01/29/19 14:40	02/05/19 14:25
B-19-30	A9B0107-13	Water	01/29/19 16:00	02/05/19 14:25
B-19-40	A9B0107-14	Water	01/30/19 09:30	02/05/19 14:25
B-19-50	A9B0107-15	Water	01/30/19 12:00	02/05/19 14:25
B-16-1	A9B0107-16	Soil	01/30/19 13:35	02/05/19 14:25
B-16-2	A9B0107-17	Soil	01/30/19 13:50	02/05/19 14:25
B-18-1	A9B0107-18	Soil	01/30/19 13:30	02/05/19 14:25
B-18-2	A9B0107-19	Soil	01/30/19 14:20	02/05/19 14:25
B-18-40	A9B0107-20	Water	01/31/19 08:30	02/05/19 14:25
B-18-50	A9B0107-21	Water	01/31/19 10:30	02/05/19 14:25
B-15	A9B0107-22	Soil	01/31/19 08:45	02/05/19 14:25
B-17-1	A9B0107-23	Soil	01/31/19 12:00	02/05/19 14:25
B-17-2	A9B0107-24	Soil	01/31/19 12:10	02/05/19 14:25
B-17-40	A9B0107-25	Water	01/31/19 14:00	02/05/19 14:25
B-17-50	A9B0107-26	Water	01/31/19 16:00	02/05/19 14:25
B-21-1	A9B0107-27	Soil	02/01/19 09:30	02/05/19 14:25
B-21-2	A9B0107-28	Soil	02/01/19 09:40	02/05/19 14:25
B-21-50	A9B0107-29	Water	02/01/19 12:00	02/05/19 14:25
B-21-60	A9B0107-30	Water	02/01/19 15:00	02/05/19 14:25
B-20-1	A9B0107-31	Soil	02/04/19 09:30	02/05/19 14:25
B-20-2	A9B0107-32	Soil	02/04/19 09:40	02/05/19 14:25

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B-20-50	A9B0107-33	Water	02/04/19 12:30	02/05/19 14:25
B-20-60	A9B0107-34	Water	02/04/19 15:00	02/05/19 14:25
IDW	A9B0107-35	Soil	02/04/19 15:30	02/05/19 14:25
Trip Blank	A9B0107-36	Water	01/28/19 00:00	02/05/19 14:25

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
12232 S.W. Garden Place
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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL CASE NARRATIVE

Work Order: A9B0107

Analytical notes for Diethylene Glycol Monomethyl Ether (DGME) analysis:

A Gas Chromatograph/Mass Spectrometer (GCMS) screening method using a modification of EPA Method 8270D was developed to determine the presence or absence of DGME in soil and water matrices.
The water sample was extracted by EPA method 3510 with the exception of the addition of salt to aid in the extraction efficiency. The soil was extracted by EPA method 3546. A Laboratory Control Standard, Method Blank and a Sample Duplicate (soil only) were extracted with each batch. Although there is no established hold time for this analyte the recommended holding times established in EPA Method 8270 were exceeded.
The GCMS analysis used a single point calibration at the Reporting Limit (RL) to verify GC retention time and mass spectra for identification of the DGME. Each sample was compared directly to the RL standard and it was determined there was no DGME present at the reported RL.

Mark Zehr
Organics Manager
3/22/2019

Amended Report Revision 1:

This report supersedes all previous reports.

At the client's request napthalene was added to the 8260C Volatile list.

Lisa Domenighini
Client Services Manager
4/5/19

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-26 (A9B0107-01)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	27.3	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	54.6	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 70 %*		*Limits: 50-150 %*	*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-28 (A9B0107-02)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	30.2	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	60.4	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 83 %*		*Limits: 50-150 %*	*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-24 (A9B0107-03)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	26.5	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	53.1	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 74 %*		*Limits: 50-150 %*	*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-25-1 (A9B0107-04RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**5540**	---	267	mg/kg dry	10	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	534	mg/kg dry	10	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 83 %*		*Limits: 50-150 %*	*10*	*02/08/19*	*NWTPH-Dx/SG*	*S-05*
B-25-2 (A9B0107-05RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**7650**	---	259	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	518	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 87 %*		*Limits: 50-150 %*	*10*	*02/09/19*	*NWTPH-Dx/SG*	*S-05*
B-27 (A9B0107-06RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**6620**	---	247	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	493	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 82 %*		*Limits: 50-150 %*	*10*	*02/09/19*	*NWTPH-Dx/SG*	*S-05*
B-27-2 (A9B0107-07RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**23700**	---	595	mg/kg dry	25	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	1190	mg/kg dry	25	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: %*		*Limits: 50-150 %*	*25*	*02/09/19*	*NWTPH-Dx/SG*	*S-01*
B-23 (A9B0107-09)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	25.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-23 (A9B0107-09)				**Matrix: Soil**		**Batch: 9020417**		
Oil	ND	---	50.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 66 %*		*Limits: 50-150 %*	*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-19 (A9B0107-11RE1)				**Matrix: Soil**		**Batch: 9020498**		
Diesel	ND	---	27.8	mg/kg dry	1	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	55.6	mg/kg dry	1	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 77 %*		*Limits: 50-150 %*	*1*	*02/09/19*	*NWTPH-Dx/SG*	
B-16-1 (A9B0107-16RE1)				**Matrix: Soil**		**Batch: 9020498**		
Diesel	**27.8**	---	26.1	mg/kg dry	1	02/09/19	NWTPH-Dx/SG	**F-11**
Oil	ND	---	52.2	mg/kg dry	1	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 86 %*		*Limits: 50-150 %*	*1*	*02/09/19*	*NWTPH-Dx/SG*	
B-16-2 (A9B0107-17)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**483**	---	26.0	mg/kg dry	1	02/07/19	NWTPH-Dx/SG	**F-20**
Oil	ND	---	52.0	mg/kg dry	1	02/07/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 70 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SG*	
B-18-1 (A9B0107-18RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**12800**	---	552	mg/kg dry	25	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	1100	mg/kg dry	25	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: %*		*Limits: 50-150 %*	*25*	*02/09/19*	*NWTPH-Dx/SG*	*S-01*
B-18-2 (A9B0107-19RE1)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**7460**	---	251	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Oil	ND	---	501	mg/kg dry	10	02/09/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*10*	*02/09/19*	*NWTPH-Dx/SG*	*S-05*
B-15 (A9B0107-22)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	28.2	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	56.5	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 78 %*		*Limits: 50-150 %*	*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-17-1 (A9B0107-23)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	28.5	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	56.9	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-17-1 (A9B0107-23)				**Matrix: Soil**		**Batch: 9020417**		
Surrogate: o-Terphenyl (Surr)		*Recovery: 68 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-17-2 (A9B0107-24)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**323**	---	30.6	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	**F-13**
Oil	ND	---	61.2	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 85 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-21-1 (A9B0107-27)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	27.1	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	54.3	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 83 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-21-2 (A9B0107-28)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	25.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	50.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 79 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-20-1 (A9B0107-31)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	**89.4**	---	25.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	50.0	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 68 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
B-20-2 (A9B0107-32)				**Matrix: Soil**		**Batch: 9020417**		
Diesel	ND	---	27.4	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Oil	ND	---	54.7	mg/kg dry	1	02/08/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 79 %*	*Limits: 50-150 %*		*1*	*02/08/19*	*NWTPH-Dx/SG*	
IDW (A9B0107-35)				**Matrix: Soil**		**Batch: 9020418**		
Diesel	ND	---	25.0	mg/kg dry	1	02/07/19	NWTPH-Dx/SG	
Oil	ND	---	50.0	mg/kg dry	1	02/07/19	NWTPH-Dx/SG	
Surrogate: o-Terphenyl (Surr)		*Recovery: 78 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SG*	

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-27 Water (A9B0107-08)				**Matrix: Water**		**Batch: 9020393**		
Diesel	**0.109**	---	0.0800	mg/L	1	02/07/19	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.160	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 88 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-19-15 (A9B0107-12)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0755	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 86 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-19-30 (A9B0107-13)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0784	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.157	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 88 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-19-40 (A9B0107-14)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0769	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.154	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-19-50 (A9B0107-15)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0800	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.160	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 87 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-18-40 (A9B0107-20)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0792	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.158	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-18-50 (A9B0107-21)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0784	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.157	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 81 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-17-40 (A9B0107-25)				**Matrix: Water**		**Batch: 9020393**		
Diesel	**0.233**	---	0.0769	mg/L	1	02/07/19	NWTPH-Dx/SGC	**F-13**

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-17-40 (A9B0107-25)				**Matrix: Water**		**Batch: 9020393**		
Oil	ND	---	0.154	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-17-50 (A9B0107-26)				**Matrix: Water**		**Batch: 9020393**		
Diesel	**0.397**	---	0.0808	mg/L	1	02/07/19	NWTPH-Dx/SGC	**F-13**
Oil	ND	---	0.162	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-21-50 (A9B0107-29)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0784	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.157	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 88 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-21-60 (A9B0107-30)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0777	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.155	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 90 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-20-50 (A9B0107-33)				**Matrix: Water**		**Batch: 9020393**		
Diesel	**0.214**	---	0.0833	mg/L	1	02/07/19	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.167	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 86 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	
B-20-60 (A9B0107-34)				**Matrix: Water**		**Batch: 9020393**		
Diesel	ND	---	0.0800	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Oil	ND	---	0.160	mg/L	1	02/07/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 96 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Dx/SGC*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-26 (A9B0107-01)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	ND	---	8.16	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-28 (A9B0107-02)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	ND	---	8.95	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*96 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-24 (A9B0107-03)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	ND	---	7.19	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-25-1 (A9B0107-04)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	**10.8**	---	7.28	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	**F-09**
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 109 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-25-2 (A9B0107-05)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	**88.6**	---	7.39	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	**F-09**
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 122 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-27 (A9B0107-06RE1)				**Matrix: Soil**		**Batch: 9020449**		
Gasoline Range Organics	**1910**	---	36.3	mg/kg dry	250	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 123 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-27-2 (A9B0107-07)				**Matrix: Soil**		**Batch: 9020408**		
Gasoline Range Organics	**11500**	---	299	mg/kg dry	2000	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-27 Water (A9B0107-08)				**Matrix: Water**		**Batch: 9020404**		
Gasoline Range Organics	**0.161**	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-27 Water (A9B0107-08)				**Matrix: Water**			**Batch: 9020404**	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 110 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*104 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-23 (A9B0107-09)				**Matrix: Soil**			**Batch: 9020408**	
Gasoline Range Organics	ND	---	7.26	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-19 (A9B0107-11)				**Matrix: Soil**			**Batch: 9020408**	
Gasoline Range Organics	ND	---	7.59	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 108 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-19-15 (A9B0107-12)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*99 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-19-30 (A9B0107-13)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 99 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-19-40 (A9B0107-14)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-19-50 (A9B0107-15)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-16-1 (A9B0107-16)				**Matrix: Soil**			**Batch: 9020408**	
Gasoline Range Organics	ND	---	7.80	mg/kg dry	50	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-16-1 (A9B0107-16)				**Matrix: Soil**			**Batch: 9020408**	
Surrogate: 1,4-Difluorobenzene (Sur)		*Recovery: 93 %*		*Limits: 50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-16-2 (A9B0107-17)				**Matrix: Soil**			**Batch: 9020449**	
Gasoline Range Organics	**1900**	---	34.2	mg/kg dry	200	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*114 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-18-1 (A9B0107-18)				**Matrix: Soil**			**Batch: 9020449**	
Gasoline Range Organics	**5100**	---	77.7	mg/kg dry	500	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*100 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-18-2 (A9B0107-19)				**Matrix: Soil**			**Batch: 9020449**	
Gasoline Range Organics	**10800**	---	307	mg/kg dry	2000	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-18-40 (A9B0107-20)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 100 %*		*Limits: 50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-18-50 (A9B0107-21)				**Matrix: Water**			**Batch: 9020429**	
Gasoline Range Organics	**0.154**	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*99 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-15 (A9B0107-22)				**Matrix: Soil**			**Batch: 9020449**	
Gasoline Range Organics	ND	---	7.94	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*92 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-17-1 (A9B0107-23)				**Matrix: Soil**			**Batch: 9020449**	
Gasoline Range Organics	ND	---	9.32	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 109 %*		*Limits: 50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-17-2 (A9B0107-24)				**Matrix: Soil**		**Batch: 9020449**		
Gasoline Range Organics	**38.7**	---	8.72	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 112 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-17-40 (A9B0107-25)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	**0.187**	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 100 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-17-50 (A9B0107-26)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	**0.741**	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	**Q-42**
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*93 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-21-1 (A9B0107-27)				**Matrix: Soil**		**Batch: 9020449**		
Gasoline Range Organics	ND	---	8.11	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 90 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*90 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-21-2 (A9B0107-28)				**Matrix: Soil**		**Batch: 9020449**		
Gasoline Range Organics	**10.5**	---	6.56	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 111 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-21-50 (A9B0107-29)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-21-60 (A9B0107-30)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/06/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*02/06/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*94 %*	*50-150 %*	*1*	*02/06/19*	*NWTPH-Gx (MS)*	
B-20-1 (A9B0107-31)				**Matrix: Soil**		**Batch: 9020449**		

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-20-1 (A9B0107-31)				**Matrix: Soil**		**Batch: 9020449**		
Gasoline Range Organics	**302**	---	6.96	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 140 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-20-2 (A9B0107-32RE1)				**Matrix: Soil**		**Batch: 9020511**		
Gasoline Range Organics	**35.1**	---	7.84	mg/kg dry	50	02/09/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 111 %*	*Limits: 50-150 %*		*1*	*02/09/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*96 %*	*50-150 %*	*1*	*02/09/19*	*NWTPH-Gx (MS)*	
B-20-50 (A9B0107-33)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	**2.47**	---	0.100	mg/L	1	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 104 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*132 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
B-20-60 (A9B0107-34)				**Matrix: Water**		**Batch: 9020429**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*93 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	
IDW (A9B0107-35)				**Matrix: Soil**		**Batch: 9020449**		**V-15**
Gasoline Range Organics	ND	---	8.36	mg/kg dry	50	02/07/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*	*Limits: 50-150 %*		*1*	*02/07/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*92 %*	*50-150 %*	*1*	*02/07/19*	*NWTPH-Gx (MS)*	

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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A9B0107-36)				**Matrix: Water**			**Batch: 9020404**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*101 %*	*Limits:* *80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-27 Water (A9B0107-08)				**Matrix: Water**			**Batch: 9020404**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	**1.19**	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	**8.58**	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-19-15 (A9B0107-12)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-19-30 (A9B0107-13)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-19-40 (A9B0107-14)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-19-40 (A9B0107-14)				**Matrix: Water**			**Batch: 9020429**	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-19-50 (A9B0107-15)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-18-40 (A9B0107-20)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	**0.981**	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	**4.58**	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-18-50 (A9B0107-21)				**Matrix: Water**			**Batch: 9020429**	
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	**1.94**	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	**2.30**	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	**1.48**	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	**9.72**	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-18-50 (A9B0107-21)				**Matrix: Water**		**Batch: 9020429**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 98 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-17-40 (A9B0107-25)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	**0.816**	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	**2.61**	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-17-50 (A9B0107-26)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	**5.08**	---	0.500	ug/L	1	02/06/19	EPA 8260C	**Q-42**
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	**11.0**	---	2.00	ug/L	1	02/06/19	EPA 8260C	**Q-42**
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	**5.74**	---	1.50	ug/L	1	02/06/19	EPA 8260C	**Q-42**
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 101 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-21-50 (A9B0107-29)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-21-60 (A9B0107-30)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/06/19	EPA 8260C	

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-21-60 (A9B0107-30)				**Matrix: Water**		**Batch: 9020429**		
Ethylbenzene	ND	---	0.500	ug/L	1	02/06/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/06/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/06/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/06/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*102 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/06/19*	*EPA 8260C*	
B-20-50 (A9B0107-33)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/07/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/07/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/07/19	EPA 8260C	
Naphthalene	ND	---	3.00	ug/L	1	02/07/19	EPA 8260C	R-02
Toluene	ND	---	1.00	ug/L	1	02/07/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/07/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*101 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*02/07/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/07/19*	*EPA 8260C*	
B-20-60 (A9B0107-34)				**Matrix: Water**		**Batch: 9020429**		
Benzene	ND	---	0.200	ug/L	1	02/07/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/07/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/07/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	02/07/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/07/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/07/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*101 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*02/07/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*02/07/19*	*EPA 8260C*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-26 (A9B0107-01)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	16.3	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	40.8	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	81.6	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	163	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	81.6	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	122	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-28 (A9B0107-02)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	17.9	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	44.7	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	89.5	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	179	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	89.5	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	134	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-24 (A9B0107-03)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	14.4	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	35.9	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	71.9	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	144	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	71.9	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	108	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-25-1 (A9B0107-04)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	14.6	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	36.4	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	72.8	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	146	ug/kg dry	50	02/06/19	5035A/8260C	

Apex Laboratories

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-25-1 (A9B0107-04)				**Matrix: Soil**			**Batch: 9020408**	
Toluene	ND	---	72.8	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	109	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-25-2 (A9B0107-05)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	14.8	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	36.9	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	73.9	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	**394**	---	148	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	73.9	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	111	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*107 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-27 (A9B0107-06RE1)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	72.5	ug/kg dry	250	02/07/19	5035A/8260C	
Ethylbenzene	**1890**	---	181	ug/kg dry	250	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	363	ug/kg dry	250	02/07/19	5035A/8260C	
Naphthalene	**11200**	---	725	ug/kg dry	250	02/07/19	5035A/8260C	
Toluene	ND	---	363	ug/kg dry	250	02/07/19	5035A/8260C	
Xylenes, total	**11100**	---	544	ug/kg dry	250	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*108 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-27-2 (A9B0107-07)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	597	ug/kg dry	2000	02/06/19	5035A/8260C	
Ethylbenzene	**71200**	---	1490	ug/kg dry	2000	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	2990	ug/kg dry	2000	02/06/19	5035A/8260C	
Naphthalene	**168000**	---	5970	ug/kg dry	2000	02/06/19	5035A/8260C	
Toluene	ND	---	2990	ug/kg dry	2000	02/06/19	5035A/8260C	
Xylenes, total	**573000**	---	4480	ug/kg dry	2000	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	

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Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-27-2 (A9B0107-07)				**Matrix: Soil**			**Batch: 9020408**	
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-23 (A9B0107-09)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	14.5	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	36.3	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	72.6	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	145	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	72.6	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	109	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*108 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-19 (A9B0107-11)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	15.2	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	38.0	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	75.9	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	152	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	75.9	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	114	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*104 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-16-1 (A9B0107-16)				**Matrix: Soil**			**Batch: 9020408**	
Benzene	ND	---	15.6	ug/kg dry	50	02/06/19	5035A/8260C	
Ethylbenzene	ND	---	39.0	ug/kg dry	50	02/06/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	78.0	ug/kg dry	50	02/06/19	5035A/8260C	
Naphthalene	ND	---	156	ug/kg dry	50	02/06/19	5035A/8260C	
Toluene	ND	---	78.0	ug/kg dry	50	02/06/19	5035A/8260C	
Xylenes, total	ND	---	117	ug/kg dry	50	02/06/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 98 %*		*Limits: 80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/06/19*	*5035A/8260C*	
B-16-2 (A9B0107-17)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	68.3	ug/kg dry	200	02/07/19	5035A/8260C	

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-16-2 (A9B0107-17)				**Matrix: Soil**			**Batch: 9020449**	
Ethylbenzene	ND	---	171	ug/kg dry	200	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	342	ug/kg dry	200	02/07/19	5035A/8260C	
Naphthalene	**1530**	---	683	ug/kg dry	200	02/07/19	5035A/8260C	
Toluene	ND	---	342	ug/kg dry	200	02/07/19	5035A/8260C	
Xylenes, total	ND	---	513	ug/kg dry	200	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*95 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*109 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-18-1 (A9B0107-18)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	**295**	---	155	ug/kg dry	500	02/07/19	5035A/8260C	
Ethylbenzene	**24500**	---	388	ug/kg dry	500	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	777	ug/kg dry	500	02/07/19	5035A/8260C	
Naphthalene	**60700**	---	1550	ug/kg dry	500	02/07/19	5035A/8260C	
Toluene	ND	---	777	ug/kg dry	500	02/07/19	5035A/8260C	
Xylenes, total	**88700**	---	1170	ug/kg dry	500	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*111 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-18-2 (A9B0107-19)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	**4050**	---	615	ug/kg dry	2000	02/07/19	5035A/8260C	
Ethylbenzene	**98000**	---	1540	ug/kg dry	2000	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	3070	ug/kg dry	2000	02/07/19	5035A/8260C	
Naphthalene	**111000**	---	6150	ug/kg dry	2000	02/07/19	5035A/8260C	
Toluene	**67600**	---	3070	ug/kg dry	2000	02/07/19	5035A/8260C	
Xylenes, total	**524000**	---	4610	ug/kg dry	2000	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*97 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*109 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-15 (A9B0107-22)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	15.9	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	39.7	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	79.4	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	159	ug/kg dry	50	02/07/19	5035A/8260C	
Toluene	ND	---	79.4	ug/kg dry	50	02/07/19	5035A/8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-15 (A9B0107-22)				**Matrix: Soil**			**Batch: 9020449**	
Xylenes, total	ND	---	119	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*97 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-17-1 (A9B0107-23)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	18.6	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	46.6	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	93.2	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	186	ug/kg dry	50	02/07/19	5035A/8260C	
Toluene	ND	---	93.2	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	140	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-17-2 (A9B0107-24)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	17.4	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	43.6	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	87.2	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	174	ug/kg dry	50	02/07/19	5035A/8260C	
Toluene	ND	---	87.2	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	131	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*98 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*109 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-21-1 (A9B0107-27)				**Matrix: Soil**			**Batch: 9020449**	
Benzene	ND	---	16.2	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	40.5	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	81.1	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	162	ug/kg dry	50	02/07/19	5035A/8260C	
Toluene	ND	---	81.1	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	122	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*95 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*105 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	

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12232 S.W. Garden Place
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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-21-2 (A9B0107-28)				**Matrix: Soil**		**Batch: 9020449**		
Benzene	ND	---	13.1	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	32.8	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	65.6	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	131	ug/kg dry	50	02/07/19	5035A/8260C	
Toluene	ND	---	65.6	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	98.3	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*108 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-20-1 (A9B0107-31)				**Matrix: Soil**		**Batch: 9020449**		
Benzene	ND	---	13.9	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	34.8	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	69.6	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	348	ug/kg dry	50	02/07/19	5035A/8260C	R-02
Toluene	ND	---	69.6	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	104	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*92 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*108 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
B-20-2 (A9B0107-32RE1)				**Matrix: Soil**		**Batch: 9020511**		
Benzene	ND	---	15.7	ug/kg dry	50	02/09/19	5035A/8260C	
Ethylbenzene	ND	---	39.2	ug/kg dry	50	02/09/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	78.4	ug/kg dry	50	02/09/19	5035A/8260C	
Naphthalene	ND	---	157	ug/kg dry	50	02/09/19	5035A/8260C	
Toluene	ND	---	78.4	ug/kg dry	50	02/09/19	5035A/8260C	
Xylenes, total	ND	---	118	ug/kg dry	50	02/09/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*02/09/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*02/09/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*107 %*	*80-120 %*	*1*	*02/09/19*	*5035A/8260C*	
IDW (A9B0107-35)				**Matrix: Soil**		**Batch: 9020449**		**V-15**
Benzene	ND	---	16.7	ug/kg dry	50	02/07/19	5035A/8260C	
Ethylbenzene	ND	---	41.8	ug/kg dry	50	02/07/19	5035A/8260C	
Methyl tert-butyl ether (MTBE)	ND	---	83.6	ug/kg dry	50	02/07/19	5035A/8260C	
Naphthalene	ND	---	167	ug/kg dry	50	02/07/19	5035A/8260C	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
IDW (A9B0107-35)				**Matrix: Soil**			**Batch: 9020449**	**V-15**
Toluene	ND	---	83.6	ug/kg dry	50	02/07/19	5035A/8260C	
Xylenes, total	ND	---	125	ug/kg dry	50	02/07/19	5035A/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*97 %*	*Limits: 80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	
4-Bromofluorobenzene (Surr)			*106 %*	*80-120 %*	*1*	*02/07/19*	*5035A/8260C*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

TCLP Volatile Organic Compounds by EPA 1311/8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
IDW (A9B0107-35)				**Matrix: Soil**			**Batch: 9020529**	
Benzene	ND	---	0.0125	mg/L	50	02/11/19	1311/8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*98 %*	*Limits: 80-120 %*	*1*	*02/11/19*	*1311/8260C*	
Toluene-d8 (Surr)			*115 %*	*80-120 %*	*1*	*02/11/19*	*1311/8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*02/11/19*	*1311/8260C*	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Diethylene glycol monomethyl ether (DGME) Screen by 8270M

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-27 (A9B0107-06)				**Matrix: Soil**			**Batch: 9030808**	**X**
Diethylene glycol monomethyl ether (DGME)	ND	---	10500	ug/kg dry	40	03/19/19	EPA 8270Dm	
Surrogate: Nitrobenzene-d5 (Surr)		*Recovery: 252 %*		*Limits: 37-122 %*	*40*	*03/19/19*	*EPA 8270Dm*	*S-05*
2-Fluorobiphenyl (Surr)			*93 %*	*44-115 %*	*40*	*03/19/19*	*EPA 8270Dm*	*S-05*
Phenol-d6 (Surr)			*70 %*	*33-122 %*	*40*	*03/19/19*	*EPA 8270Dm*	*S-05*
2-Fluorophenol (Surr)			*62 %*	*35-115 %*	*40*	*03/19/19*	*EPA 8270Dm*	*S-05*
2,4,6-Tribromophenol (Surr)			*55 %*	*39-132 %*	*40*	*03/19/19*	*EPA 8270Dm*	*S-05*
B-27 Water (A9B0107-08RE1)				**Matrix: Water**			**Batch: 9030798**	**R-04, X**
Diethylene glycol monomethyl ether (DGME)	ND	---	18.7	ug/L	4	03/19/19	EPA 8270Dm	
Surrogate: Nitrobenzene-d5 (Surr)		*Recovery: 88 %*		*Limits: 44-120 %*	*4*	*03/19/19*	*EPA 8270Dm*	
2-Fluorobiphenyl (Surr)			*74 %*	*44-120 %*	*4*	*03/19/19*	*EPA 8270Dm*	
Phenol-d6 (Surr)			*50 %*	*10-120 %*	*4*	*03/19/19*	*EPA 8270Dm*	
2-Fluorophenol (Surr)			*65 %*	*19-120 %*	*4*	*03/19/19*	*EPA 8270Dm*	
2,4,6-Tribromophenol (Surr)			*102 %*	*43-140 %*	*4*	*03/19/19*	*EPA 8270Dm*	

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

TCLP Extraction by EPA 1311 (ZHE)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
IDW (A9B0107-35)				**Matrix: Soil**			**Batch: 9020523**	
TCLP ZHE Extraction	PREP	---		N/A	1	02/10/19	EPA 1311 ZHE	

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-26 (A9B0107-01)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**71.7**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-28 (A9B0107-02)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**65.1**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-24 (A9B0107-03)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**71.4**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-25-1 (A9B0107-04)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**72.9**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-25-2 (A9B0107-05)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**76.0**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-27 (A9B0107-06)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**71.4**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-27-2 (A9B0107-07)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**74.1**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-23 (A9B0107-09)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**71.9**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-19 (A9B0107-11)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**70.5**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-16-1 (A9B0107-16)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**71.2**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-16-2 (A9B0107-17)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**66.5**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-18-1 (A9B0107-18)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**76.5**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-18-2 (A9B0107-19)				**Matrix: Soil**			**Batch: 9020395**	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
B-18-2 (A9B0107-19)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**70.8**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-15 (A9B0107-22)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**70.0**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-17-1 (A9B0107-23)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**68.3**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-17-2 (A9B0107-24)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**65.1**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-21-1 (A9B0107-27)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**69.3**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-21-2 (A9B0107-28)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**72.7**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-20-1 (A9B0107-31)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**76.4**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
B-20-2 (A9B0107-32)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**72.5**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	
IDW (A9B0107-35)				**Matrix: Soil**			**Batch: 9020395**	
% Solids	**74.8**	---	1.00	% by Weight	1	02/07/19	EPA 8000C	

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020417 - EPA 3546 w/SG+Acid (NWTPH)											Soil	
Blank (9020417-BLK1)			Prepared: 02/06/19 13:15 Analyzed: 02/07/19 23:24									
NWTPH-Dx/SG												
Diesel	ND	---	25.0	mg/kg wet	1	---	---	---	---	---	---	
Oil	ND	---	50.0	mg/kg wet	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 100 %*	*Limits: 50-150 %*			*Dilution: 1x*					
LCS (9020417-BS1)			Prepared: 02/06/19 13:15 Analyzed: 02/07/19 23:44									
NWTPH-Dx/SG												
Diesel	112	---	25.0	mg/kg wet	1	125	---	89	76-115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 98 %*	*Limits: 50-150 %*			*Dilution: 1x*					
Duplicate (9020417-DUP1)			Prepared: 02/06/19 13:15 Analyzed: 02/08/19 00:24									
QC Source Sample: B-26 (A9B0107-01)												
NWTPH-Dx/SG												
Diesel	ND	---	27.4	mg/kg dry	1	---	ND	---	---	---	30%	
Oil	ND	---	54.7	mg/kg dry	1	---	ND	---	---	---	30%	
Surr: o-Terphenyl (Surr)			*Recovery: 93 %*	*Limits: 50-150 %*			*Dilution: 1x*					
Duplicate (9020417-DUP2)			Prepared: 02/06/19 13:15 Analyzed: 02/08/19 03:04									
QC Source Sample: B-20-2 (A9B0107-32)												
NWTPH-Dx/SG												
Diesel	ND	---	27.3	mg/kg dry	1	---	21.1	---	---	***	30%	
Oil	ND	---	54.6	mg/kg dry	1	---	ND	---	---	---	30%	
Surr: o-Terphenyl (Surr)			*Recovery: 66 %*	*Limits: 50-150 %*			*Dilution: 1x*					
Batch 9020418 - EPA 3546 w/SG+Acid (NWTPH)											Soil	
Blank (9020418-BLK1)			Prepared: 02/06/19 13:18 Analyzed: 02/06/19 23:23									
NWTPH-Dx/SG												
Diesel	ND	---	25.0	mg/kg wet	1	---	---	---	---	---	---	
Oil	ND	---	50.0	mg/kg wet	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 87 %*	*Limits: 50-150 %*			*Dilution: 1x*					
LCS (9020418-BS1)			Prepared: 02/06/19 13:18 Analyzed: 02/06/19 23:45									

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020418 - EPA 3546 w/SG+Acid (NWTPH)											**Soil**	
LCS (9020418-BS1)		Prepared: 02/06/19 13:18		Analyzed: 02/06/19 23:45								
NWTPH-Dx/SG												
Diesel	108	---	25.0	mg/kg wet	1	125	---	87	76-115%	---	---	
Surr: o-Terphenyl (Surr)		*Recovery: 87 %*		*Limits: 50-150 %*		*Dilution: 1x*						
Duplicate (9020418-DUP1)		Prepared: 02/06/19 13:18		Analyzed: 02/07/19 00:30								
QC Source Sample: IDW (A9B0107-35)												
NWTPH-Dx/SG												
Diesel	ND	---	25.0	mg/kg dry	1	---	14.0	---	---	***	30%	
Oil	ND	---	50.0	mg/kg dry	1	---	ND	---	---	---	30%	
Surr: o-Terphenyl (Surr)		*Recovery: 69 %*		*Limits: 50-150 %*		*Dilution: 1x*						

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
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QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020498 - EPA 3546 w/SG+Acid (NWTPH)							Soil					
Blank (9020498-BLK1)		Prepared: 02/08/19 12:09		Analyzed: 02/08/19 23:36								
NWTPH-Dx/SG												
Diesel	ND	---	25.0	mg/kg wet	1	---	---	---	---	---	---	
Oil	ND	---	50.0	mg/kg wet	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)		*Recovery: 92 %*		*Limits: 50-150 %*			*Dilution: 1x*					
LCS (9020498-BS1)		Prepared: 02/08/19 12:09		Analyzed: 02/08/19 23:57								
NWTPH-Dx/SG												
Diesel	103	---	25.0	mg/kg wet	1	125	---	82	76-115%	---	---	
Surr: o-Terphenyl (Surr)		*Recovery: 90 %*		*Limits: 50-150 %*			*Dilution: 1x*					
Duplicate (9020498-DUP1)		Prepared: 02/08/19 12:09		Analyzed: 02/09/19 00:41								
QC Source Sample: B-19 (A9B0107-11RE1)												
NWTPH-Dx/SG												
Diesel	ND	---	27.6	mg/kg dry	1	---	ND	---	---	---	30%	
Oil	ND	---	55.1	mg/kg dry	1	---	ND	---	---	---	30%	
Surr: o-Terphenyl (Surr)		*Recovery: 75 %*		*Limits: 50-150 %*			*Dilution: 1x*					

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QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020393 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel												**Water**
Blank (9020393-BLK1)			Prepared: 02/06/19 07:20		Analyzed: 02/07/19 11:04							
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 86 %*		*Limits: 50-150 %*			*Dilution: 1x*				
LCS (9020393-BS1)			Prepared: 02/06/19 07:20		Analyzed: 02/07/19 11:27							
NWTPH-Dx/SGC												
Diesel	0.359	---	0.0800	mg/L	1	0.500	---	72	58-115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 90 %*		*Limits: 50-150 %*			*Dilution: 1x*				
LCS Dup (9020393-BSD1)			Prepared: 02/06/19 07:20		Analyzed: 02/07/19 11:50							**Q-19**
NWTPH-Dx/SGC												
Diesel	0.364	---	0.0800	mg/L	1	0.500	---	73	58-115%	1	20%	
Surr: o-Terphenyl (Surr)			*Recovery: 85 %*		*Limits: 50-150 %*			*Dilution: 1x*				

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QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020404 - EPA 5030B									Water			
Blank (9020404-BLK1)		Prepared: 02/06/19 11:26		Analyzed: 02/06/19 13:15								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*102 %*		*50-150 %*			*"*				
LCS (9020404-BS3)		Prepared: 02/06/19 11:26		Analyzed: 02/06/19 12:48								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.438	---	0.100	mg/L	1	0.500	---	88	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 105 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*100 %*		*50-150 %*			*"*				
Duplicate (9020404-DUP1)		Prepared: 02/06/19 13:06		Analyzed: 02/06/19 17:21								
QC Source Sample: B-27 Water (A9B0107-08)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**0.162**	---	0.100	mg/L	1	---	0.161	---	---	0.9	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 109 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*102 %*		*50-150 %*			*"*				

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
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QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020408 - EPA 5035A												**Soil**
Blank (9020408-BLK1)		Prepared: 02/06/19 10:00		Analyzed: 02/06/19 13:22								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	3.33	mg/kg wet	50	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*100 %*		*50-150 %*			*"*					
LCS (9020408-BS2)		Prepared: 02/06/19 10:00		Analyzed: 02/06/19 12:55								
NWTPH-Gx (MS)												
Gasoline Range Organics	23.1	---	5.00	mg/kg wet	50	25.0	---	92	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 105 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*98 %*		*50-150 %*			*"*					
Duplicate (9020408-DUP1)		Prepared: 01/28/19 10:00		Analyzed: 02/06/19 19:49								
QC Source Sample: B-26 (A9B0107-01)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	7.99	mg/kg dry	50	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*96 %*		*50-150 %*			*"*					
Duplicate (9020408-DUP2)		Prepared: 01/30/19 13:35		Analyzed: 02/07/19 00:17								**T-02**
QC Source Sample: B-16-1 (A9B0107-16)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	7.67	mg/kg dry	50	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*95 %*		*50-150 %*			*"*					

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AMENDED REPORT

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020429 - EPA 5030B												**Water**
Blank (9020429-BLK1)		Prepared: 02/06/19 16:45		Analyzed: 02/06/19 18:11								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*97 %*		*50-150 %*			*"*					
LCS (9020429-BS2)		Prepared: 02/06/19 16:45		Analyzed: 02/06/19 17:42								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.489	---	0.100	mg/L	1	0.500	---	98	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*91 %*		*50-150 %*			*"*					
Duplicate (9020429-DUP1)		Prepared: 02/06/19 18:03		Analyzed: 02/06/19 19:07								
QC Source Sample: B-19-15 (A9B0107-12)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 99 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*100 %*		*50-150 %*			*"*					
Duplicate (9020429-DUP2)		Prepared: 02/06/19 18:03		Analyzed: 02/06/19 22:55								
QC Source Sample: B-17-50 (A9B0107-26)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**1.23**	---	0.100	mg/L	1	---	0.741	---	---	**49**	**30%**	Q-17
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*90 %*		*50-150 %*			*"*					

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Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020449 - EPA 5035A												**Soil**
Blank (9020449-BLK1)		Prepared: 02/07/19 10:00		Analyzed: 02/07/19 12:46								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	3.33	mg/kg wet	50	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 104 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*95 %*		*50-150 %*			*"*					
LCS (9020449-BS2)		Prepared: 02/07/19 10:00		Analyzed: 02/07/19 12:19								
NWTPH-Gx (MS)												
Gasoline Range Organics	23.3	---	5.00	mg/kg wet	50	25.0	---	93	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*98 %*		*50-150 %*			*"*					
Duplicate (9020449-DUP1)		Prepared: 01/30/19 13:50		Analyzed: 02/07/19 13:40								
QC Source Sample: B-16-2 (A9B0107-17)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**1680**	---	35.9	mg/kg dry	200	---	1900	---	---	12	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*109 %*		*50-150 %*			*"*					
Duplicate (9020449-DUP2)		Prepared: 02/05/19 19:00		Analyzed: 02/07/19 19:03								**V-15**
QC Source Sample: IDW (A9B0107-35)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	8.03	mg/kg dry	50	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*94 %*		*50-150 %*			*"*					

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020511 - EPA 5035A									Soil			
Blank (9020511-BLK1)		Prepared: 02/08/19 15:00		Analyzed: 02/08/19 17:00								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	3.33	mg/kg wet	50	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*94 %*		*50-150 %*			*"*				
LCS (9020511-BS2)		Prepared: 02/08/19 15:00		Analyzed: 02/08/19 16:34								
NWTPH-Gx (MS)												
Gasoline Range Organics	22.3	---	5.00	mg/kg wet	50	25.0	---	89	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 94 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*92 %*		*50-150 %*			*"*				

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020404 - EPA 5030B							Water					
Blank (9020404-BLK1)		Prepared: 02/06/19 11:26 Analyzed: 02/06/19 13:15										
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*102 %*		*80-120 %*			*"*					
LCS (9020404-BS1)		Prepared: 02/06/19 11:26 Analyzed: 02/06/19 11:54										
EPA 8260C												
Benzene	19.4	---	0.200	ug/L	1	20.0	---	97	80-120%	---	---	
Toluene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Ethylbenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Xylenes, total	60.5	---	1.50	ug/L	1	60.0	---	101	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*98 %*		*80-120 %*			*"*					
Duplicate (9020404-DUP1)		Prepared: 02/06/19 13:06 Analyzed: 02/06/19 17:21										
QC Source Sample: B-27 Water (A9B0107-08)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
Toluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	**1.09**	---	0.500	ug/L	1	---	1.19	---	---	9	30%	
Xylenes, total	**8.12**	---	1.50	ug/L	1	---	8.58	---	---	6	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 103 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*98 %*		*80-120 %*			*"*					

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020404 - EPA 5030B												**Water**
Blank (9020404-BLK1)			Prepared: 02/06/19 11:26 Analyzed: 02/06/19 13:15									
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Naphthalene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 102 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*99 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*102 %*		*80-120 %*				*"*			
LCS (9020404-BS1)			Prepared: 02/06/19 11:26 Analyzed: 02/06/19 11:54									
EPA 8260C												
Benzene	19.4	---	0.200	ug/L	1	20.0	---	97	80-120%	---	---	
Ethylbenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	20.9	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Naphthalene	18.5	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
Toluene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Xylenes, total	60.5	---	1.50	ug/L	1	60.0	---	101	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 99 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*98 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*				*"*			
Duplicate (9020404-DUP1)			Prepared: 02/06/19 13:06 Analyzed: 02/06/19 17:21									
QC Source Sample: B-27 Water (A9B0107-08)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	**1.09**	---	0.500	ug/L	1	---	1.19	---	---	9	30%	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Naphthalene	ND	---	2.00	ug/L	1	---	1.69	---	---	***	30%	
Toluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020404 - EPA 5030B												**Water**
Duplicate (9020404-DUP1)		Prepared: 02/06/19 13:06 Analyzed: 02/06/19 17:21										
QC Source Sample: B-27 Water (A9B0107-08)												
Xylenes, total	**8.12**	---	1.50	ug/L	1	---	8.58	---	---	6	30%	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 103 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*			*"*				

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020429 - EPA 5030B												**Water**
Blank (9020429-BLK1)			Prepared: 02/06/19 16:45		Analyzed: 02/06/19 18:11							
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Naphthalene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 104 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*103 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*				*"*			
LCS (9020429-BS1)			Prepared: 02/06/19 16:45		Analyzed: 02/06/19 17:14							
EPA 8260C												
Benzene	20.2	---	0.200	ug/L	1	20.0	---	101	80-120%	---	---	
Ethylbenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
Naphthalene	17.7	---	2.00	ug/L	1	20.0	---	89	80-120%	---	---	
Toluene	19.9	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
Xylenes, total	60.0	---	1.50	ug/L	1	60.0	---	100	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 101 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*100 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*95 %*		*80-120 %*				*"*			
Duplicate (9020429-DUP1)			Prepared: 02/06/19 18:03		Analyzed: 02/06/19 19:07							
QC Source Sample: B-19-15 (A9B0107-12)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Naphthalene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
Toluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020429 - EPA 5030B												**Water**
Duplicate (9020429-DUP1)		Prepared: 02/06/19 18:03 Analyzed: 02/06/19 19:07										
QC Source Sample: B-19-15 (A9B0107-12)												
Xylenes, total	ND	---	1.50	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*102 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*101 %*		*80-120 %*			*"*					
Duplicate (9020429-DUP2)		Prepared: 02/06/19 18:03 Analyzed: 02/06/19 22:55										
QC Source Sample: B-17-50 (A9B0107-26)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	**8.90**	---	0.500	ug/L	1	---	5.08	---	---	**55**	**30%**	Q-17
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Naphthalene	**22.0**	---	2.00	ug/L	1	---	11.0	---	---	**66**	**30%**	Q-17
Toluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Xylenes, total	**9.79**	---	1.50	ug/L	1	---	5.74	---	---	**52**	**30%**	Q-17
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 101 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*102 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*98 %*		*80-120 %*			*"*					

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020408 - EPA 5035A							Soil					
Blank (9020408-BLK1)		Prepared: 02/06/19 10:00 Analyzed: 02/06/19 13:22										
5035A/8260C												
Benzene	ND	---	6.67	ug/kg wet	50	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	16.7	ug/kg wet	50	---	---	---	---	---	---	
Ethylbenzene	ND	---	16.7	ug/kg wet	50	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Naphthalene	ND	---	66.7	ug/kg wet	50	---	---	---	---	---	---	
Toluene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Xylenes, total	ND	---	50.0	ug/kg wet	50	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*107 %*		*80-120 %*			*"*					
LCS (9020408-BS1)		Prepared: 02/06/19 10:00 Analyzed: 02/06/19 12:24										
5035A/8260C												
Benzene	1000	---	10.0	ug/kg wet	50	1000	---	100	80-120%	---	---	
1,2-Dibromoethane (EDB)	1070	---	50.0	ug/kg wet	50	1000	---	107	80-120%	---	---	
1,2-Dichloroethane (EDC)	982	---	25.0	ug/kg wet	50	1000	---	98	80-120%	---	---	
Ethylbenzene	955	---	25.0	ug/kg wet	50	1000	---	95	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	1040	---	50.0	ug/kg wet	50	1000	---	104	80-120%	---	---	
Naphthalene	850	---	100	ug/kg wet	50	1000	---	85	80-120%	---	---	
Toluene	916	---	50.0	ug/kg wet	50	1000	---	92	80-120%	---	---	
Xylenes, total	2770	---	75.0	ug/kg wet	50	3000	---	92	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*95 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*100 %*		*80-120 %*			*"*					
Duplicate (9020408-DUP1)		Prepared: 01/28/19 10:00 Analyzed: 02/06/19 19:49										
QC Source Sample: B-26 (A9B0107-01)												
5035A/8260C												
Benzene	ND	---	16.0	ug/kg dry	50	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	79.9	ug/kg dry	50	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020408 - EPA 5035A							**Soil**					
Duplicate (9020408-DUP1)		Prepared: 01/28/19 10:00		Analyzed: 02/06/19 19:49								
QC Source Sample: B-26 (A9B0107-01)												
1,2-Dichloroethane (EDC)	ND	---	39.9	ug/kg dry	50	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	39.9	ug/kg dry	50	---	ND	---	---	---	30%	
Methyl tert-butyl ether (MTBE)	ND	---	79.9	ug/kg dry	50	---	ND	---	---	---	30%	
Naphthalene	ND	---	160	ug/kg dry	50	---	ND	---	---	---	30%	
Toluene	ND	---	79.9	ug/kg dry	50	---	ND	---	---	---	30%	
Xylenes, total	ND	---	120	ug/kg dry	50	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*107 %*		*80-120 %*			*"*					
Duplicate (9020408-DUP2)		Prepared: 01/30/19 13:35		Analyzed: 02/07/19 00:17								**T-02**
QC Source Sample: B-16-1 (A9B0107-16)												
5035A/8260C												
Benzene	ND	---	15.3	ug/kg dry	50	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	76.7	ug/kg dry	50	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	38.4	ug/kg dry	50	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	38.4	ug/kg dry	50	---	ND	---	---	---	30%	
Methyl tert-butyl ether (MTBE)	ND	---	76.7	ug/kg dry	50	---	ND	---	---	---	30%	
Naphthalene	ND	---	153	ug/kg dry	50	---	ND	---	---	---	30%	
Toluene	ND	---	76.7	ug/kg dry	50	---	ND	---	---	---	30%	
Xylenes, total	ND	---	115	ug/kg dry	50	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*108 %*		*80-120 %*			*"*					
Matrix Spike (9020408-MS1)		Prepared: 01/30/19 13:35		Analyzed: 02/07/19 00:44								**T-02**
QC Source Sample: B-16-1 (A9B0107-16)												
5035A/8260C												
Benzene	1520	---	15.6	ug/kg dry	50	1560	ND	97	77-121%	---	---	
1,2-Dibromoethane (EDB)	1670	---	78.0	ug/kg dry	50	1560	ND	107	78-122%	---	---	
1,2-Dichloroethane (EDC)	1420	---	39.0	ug/kg dry	50	1560	ND	91	73-128%	---	---	

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020408 - EPA 5035A							**Soil**					
Matrix Spike (9020408-MS1)		Prepared: 01/30/19 13:35		Analyzed: 02/07/19 00:44								**T-02**
QC Source Sample: B-16-1 (A9B0107-16)												
Ethylbenzene	1470	---	39.0	ug/kg dry	50	1560	ND	94	76-122%	---	---	
Methyl tert-butyl ether (MTBE)	1600	---	78.0	ug/kg dry	50	1560	ND	103	73-125%	---	---	
Naphthalene	1420	---	156	ug/kg dry	50	1560	ND	91	62-129%	---	---	
Toluene	1400	---	78.0	ug/kg dry	50	1560	ND	90	77-121%	---	---	
Xylenes, total	4320	---	117	ug/kg dry	50	4680	ND	92	78-124%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*98 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*95 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*104 %*		*80-120 %*			*"*				

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020449 - EPA 5035A							**Soil**					
Blank (9020449-BLK1)		Prepared: 02/07/19 10:00 Analyzed: 02/07/19 12:46										
5035A/8260C												
Benzene	ND	---	6.67	ug/kg wet	50	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	16.7	ug/kg wet	50	---	---	---	---	---	---	
Ethylbenzene	ND	---	16.7	ug/kg wet	50	---	---	---	---	---	---	
Isopropylbenzene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Naphthalene	ND	---	66.7	ug/kg wet	50	---	---	---	---	---	---	
Toluene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
1,2,4-Trimethylbenzene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
1,3,5-Trimethylbenzene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Xylenes, total	ND	---	50.0	ug/kg wet	50	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*106 %*		*80-120 %*			*"*					
LCS (9020449-BS1)		Prepared: 02/07/19 10:00 Analyzed: 02/07/19 11:52										
5035A/8260C												
Benzene	1000	---	10.0	ug/kg wet	50	1000	---	100	80-120%	---	---	
1,2-Dibromoethane (EDB)	1070	---	50.0	ug/kg wet	50	1000	---	107	80-120%	---	---	
1,2-Dichloroethane (EDC)	941	---	25.0	ug/kg wet	50	1000	---	94	80-120%	---	---	
Ethylbenzene	973	---	25.0	ug/kg wet	50	1000	---	97	80-120%	---	---	
Isopropylbenzene	945	---	50.0	ug/kg wet	50	1000	---	95	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	1040	---	50.0	ug/kg wet	50	1000	---	104	80-120%	---	---	
Naphthalene	907	---	100	ug/kg wet	50	1000	---	91	80-120%	---	---	
Toluene	932	---	50.0	ug/kg wet	50	1000	---	93	80-120%	---	---	
1,2,4-Trimethylbenzene	934	---	50.0	ug/kg wet	50	1000	---	93	80-120%	---	---	
1,3,5-Trimethylbenzene	915	---	50.0	ug/kg wet	50	1000	---	91	80-120%	---	---	
Xylenes, total	2850	---	75.0	ug/kg wet	50	3000	---	95	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 98 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*96 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*103 %*		*80-120 %*			*"*					

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020449 - EPA 5035A							**Soil**					
Duplicate (9020449-DUP1)		Prepared: 01/30/19 13:50 Analyzed: 02/07/19 13:40										
QC Source Sample: B-16-2 (A9B0107-17)												
5035A/8260C												
Benzene	ND	---	71.7	ug/kg dry	200	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	359	ug/kg dry	200	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	179	ug/kg dry	200	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	179	ug/kg dry	200	---	96.0	---	---	***	30%	
Isopropylbenzene	**1110**	---	359	ug/kg dry	200	---	1230	---	---	10	30%	
Methyl tert-butyl ether (MTBE)	ND	---	359	ug/kg dry	200	---	ND	---	---	---	30%	
Naphthalene	**1390**	---	717	ug/kg dry	200	---	1530	---	---	10	30%	
Toluene	ND	---	359	ug/kg dry	200	---	ND	---	---	---	30%	
1,2,4-Trimethylbenzene	**12700**	---	359	ug/kg dry	200	---	14100	---	---	10	30%	
1,3,5-Trimethylbenzene	**13400**	---	359	ug/kg dry	200	---	14400	---	---	8	30%	
Xylenes, total	ND	---	538	ug/kg dry	200	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*96 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*111 %*		*80-120 %*			*"*					
Duplicate (9020449-DUP2)		Prepared: 02/05/19 19:00 Analyzed: 02/07/19 19:03										**V-15**
QC Source Sample: IDW (A9B0107-35)												
5035A/8260C												
Benzene	ND	---	16.1	ug/kg dry	50	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	80.3	ug/kg dry	50	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	40.1	ug/kg dry	50	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	40.1	ug/kg dry	50	---	ND	---	---	---	30%	
Isopropylbenzene	ND	---	80.3	ug/kg dry	50	---	ND	---	---	---	30%	
Methyl tert-butyl ether (MTBE)	ND	---	80.3	ug/kg dry	50	---	ND	---	---	---	30%	
Naphthalene	ND	---	161	ug/kg dry	50	---	ND	---	---	---	30%	
Toluene	ND	---	80.3	ug/kg dry	50	---	ND	---	---	---	30%	
1,2,4-Trimethylbenzene	**83.3**	---	80.3	ug/kg dry	50	---	121	---	---	**37**	**30%**	Q-05
1,3,5-Trimethylbenzene	ND	---	80.3	ug/kg dry	50	---	ND	---	---	---	30%	
Xylenes, total	ND	---	120	ug/kg dry	50	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020449 - EPA 5035A							**Soil**					
Duplicate (9020449-DUP2)	Prepared: 02/05/19 19:00 Analyzed: 02/07/19 19:03											**V-15**
QC Source Sample: IDW (A9B0107-35)												
Surr: Toluene-d8 (Surr)	*Recovery: 97 %*		*Limits: 80-120 %*		*Dilution: 1x*							
4-Bromofluorobenzene (Surr)	*106 %*		*80-120 %*		*"*							
Matrix Spike (9020449-MS1)	Prepared: 02/05/19 19:00 Analyzed: 02/07/19 19:29											**V-15**
QC Source Sample: IDW (A9B0107-35)												
5035A/8260C												
Benzene	1600	---	16.7	ug/kg dry	50	1670	ND	95	77-121%	---	---	
1,2-Dibromoethane (EDB)	1740	---	83.6	ug/kg dry	50	1670	ND	104	78-122%	---	---	
1,2-Dichloroethane (EDC)	1450	---	41.8	ug/kg dry	50	1670	ND	87	73-128%	---	---	
Ethylbenzene	1570	---	41.8	ug/kg dry	50	1670	ND	94	76-122%	---	---	
Isopropylbenzene	1550	---	83.6	ug/kg dry	50	1670	ND	93	68-134%	---	---	
Methyl tert-butyl ether (MTBE)	1680	---	83.6	ug/kg dry	50	1670	ND	101	73-125%	---	---	
Naphthalene	1760	---	167	ug/kg dry	50	1670	ND	105	62-129%	---	---	
Toluene	1500	---	83.6	ug/kg dry	50	1670	ND	89	77-121%	---	---	
1,2,4-Trimethylbenzene	1680	---	83.6	ug/kg dry	50	1670	121	93	75-123%	---	---	
1,3,5-Trimethylbenzene	1540	---	83.6	ug/kg dry	50	1670	ND	92	73-124%	---	---	
Xylenes, total	4740	---	125	ug/kg dry	50	5020	ND	92	78-124%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	*Recovery: 97 %*		*Limits: 80-120 %*		*Dilution: 1x*							
Toluene-d8 (Surr)	*96 %*		*80-120 %*		*"*							
4-Bromofluorobenzene (Surr)	*104 %*		*80-120 %*		*"*							

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 5035A/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020511 - EPA 5035A							**Soil**					
Blank (9020511-BLK1)		Prepared: 02/08/19 15:00 Analyzed: 02/08/19 17:00										
5035A/8260C												
Benzene	ND	---	6.67	ug/kg wet	50	---	---	---	---	---	---	
Ethylbenzene	ND	---	16.7	ug/kg wet	50	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Naphthalene	ND	---	66.7	ug/kg wet	50	---	---	---	---	---	---	
Toluene	ND	---	33.3	ug/kg wet	50	---	---	---	---	---	---	
Xylenes, total	ND	---	50.0	ug/kg wet	50	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 99 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*99 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*106 %*		*80-120 %*				*"*			
LCS (9020511-BS1)		Prepared: 02/08/19 15:00 Analyzed: 02/08/19 16:07										
5035A/8260C												
Benzene	964	---	10.0	ug/kg wet	50	1000	---	96	80-120%	---	---	
Ethylbenzene	1000	---	25.0	ug/kg wet	50	1000	---	100	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	966	---	50.0	ug/kg wet	50	1000	---	97	80-120%	---	---	
Naphthalene	1030	---	100	ug/kg wet	50	1000	---	103	80-120%	---	---	
Toluene	974	---	50.0	ug/kg wet	50	1000	---	97	80-120%	---	---	
Xylenes, total	2900	---	75.0	ug/kg wet	50	3000	---	97	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 95 %*		*Limits: 80-120 %*				*Dilution: 1x*			
Toluene-d8 (Surr)			*100 %*		*80-120 %*				*"*			
4-Bromofluorobenzene (Surr)			*103 %*		*80-120 %*				*"*			

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

TCLP Volatile Organic Compounds by EPA 1311/8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020529 - EPA 1311/5030B TCLP Volatiles												**Water**
Blank (9020529-BLK1)			Prepared: 02/11/19 10:00		Analyzed: 02/11/19 12:20							**TCLP**
1311/8260C												
Benzene	ND	---	0.0125	mg/L	50	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 97 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*117 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*104 %*		*80-120 %*			*"*				
LCS (9020529-BS2)			Prepared: 02/11/19 10:00		Analyzed: 02/11/19 11:52							**TCLP**
1311/8260C												
Benzene	0.867	---	0.0125	mg/L	50	1.00	---	87	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 94 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*113 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*			*"*				
Matrix Spike (9020529-MS1)			Prepared: 02/11/19 12:13		Analyzed: 02/11/19 14:14							
QC Source Sample: IDW (A9B0107-35)												
1311/8260C												
Benzene	1.10	---	0.0125	mg/L	50	1.00	ND	110	70-130%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 101 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*106 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*95 %*		*80-120 %*			*"*				

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Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Diethylene glycol monomethyl ether (DGME) Screen by 8270M

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9030798 - EPA 3510C (Acid Extraction)									Water			
Blank (9030798-BLK1)		Prepared: 03/15/19 06:38 Analyzed: 03/19/19 10:07										
EPA 8270Dm												
Diethylene glycol monomethyl ether (DGME)	ND	---	4.55	ug/L	1	---	---	---	---	---	---	
Surr: Nitrobenzene-d5 (Surr)		*Recovery: 105 %*	*Limits: 44-120 %*		*Dilution: 1x*							
2-Fluorobiphenyl (Surr)		*94 %*	*44-120 %*		*"*							
Phenol-d6 (Surr)		*69 %*	*10-120 %*		*"*							
2-Fluorophenol (Surr)		*78 %*	*19-120 %*		*"*							
2,4,6-Tribromophenol (Surr)		*98 %*	*43-140 %*		*"*							
LCS (9030798-BS2)		Prepared: 03/15/19 06:38 Analyzed: 03/19/19 14:56										
EPA 8270Dm												
Diethylene glycol monomethyl ether (DGME)	DET	---	5.00	ug/L	1	20.0	---	**10**	**50-150%**	---	---	
Surr: Nitrobenzene-d5 (Surr)		*Recovery: 102 %*	*Limits: 44-120 %*		*Dilution: 1x*							
2-Fluorobiphenyl (Surr)		*93 %*	*44-120 %*		*"*							
Phenol-d6 (Surr)		*69 %*	*10-120 %*		*"*							
2-Fluorophenol (Surr)		*75 %*	*19-120 %*		*"*							
2,4,6-Tribromophenol (Surr)		*93 %*	*43-140 %*		*"*							

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Diethylene glycol monomethyl ether (DGME) Screen by 8270M

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9030808 - EPA 3546							Soil					
Blank (9030808-BLK1)		Prepared: 03/15/19 11:24 Analyzed: 03/19/19 10:42										
EPA 8270Dm												
Diethylene glycol monomethyl ether (DGME)	ND	---	182	ug/kg wet	1	---	---	---	---	---	---	
Surr: Nitrobenzene-d5 (Surr)		*Recovery: 86 %*		*Limits: 37-122 %*			*Dilution: 1x*					
2-Fluorobiphenyl (Surr)		*87 %*		*44-115 %*			*"*					
Phenol-d6 (Surr)		*73 %*		*33-122 %*			*"*					
2-Fluorophenol (Surr)		*70 %*		*35-115 %*			*"*					
2,4,6-Tribromophenol (Surr)		*78 %*		*39-132 %*			*"*					
LCS (9030808-BS1)		Prepared: 03/15/19 11:24 Analyzed: 03/19/19 14:19										
EPA 8270Dm												
Diethylene glycol monomethyl ether (DGME)	DET	---	800	ug/kg wet	4	800	---	89	50-150%	---	---	
Surr: Nitrobenzene-d5 (Surr)		*Recovery: 93 %*		*Limits: 37-122 %*			*Dilution: 4x*					
2-Fluorobiphenyl (Surr)		*99 %*		*44-115 %*			*"*					
Phenol-d6 (Surr)		*74 %*		*33-122 %*			*"*					
2-Fluorophenol (Surr)		*71 %*		*35-115 %*			*"*					
2,4,6-Tribromophenol (Surr)		*67 %*		*39-132 %*			*"*					
Duplicate (9030808-DUP1)		Prepared: 03/15/19 11:24 Analyzed: 03/19/19 11:57										
QC Source Sample: B-27 (A9B0107-06)												
EPA 8270Dm												
Diethylene glycol monomethyl ether (DGME)	ND	---	10400	ug/kg dry	40	---	ND	---	---	---	30%	
Surr: Nitrobenzene-d5 (Surr)		*Recovery: 231 %*		*Limits: 37-122 %*			*Dilution: 40x*					S-05
2-Fluorobiphenyl (Surr)		*84 %*		*44-115 %*			*"*					S-05
Phenol-d6 (Surr)		*40 %*		*33-122 %*			*"*					S-05
2-Fluorophenol (Surr)		*56 %*		*35-115 %*			*"*					S-05
2,4,6-Tribromophenol (Surr)		*43 %*		*39-132 %*			*"*					S-05

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020395 - Total Solids (Dry Weight)									Soil			
Duplicate (9020395-DUP4)		Prepared: 02/06/19 08:07		Analyzed: 02/07/19 08:53								
QC Source Sample: B-16-1 (A9B0107-16)												
EPA 8000C												
% Solids	**71.5**	---	1.00	% by Weight	1	---	71.2	---	---	0.4	10%	
Duplicate (9020395-DUP5)		Prepared: 02/06/19 08:07		Analyzed: 02/07/19 08:53								
QC Source Sample: IDW (A9B0107-35)												
EPA 8000C												
% Solids	**74.8**	---	1.00	% by Weight	1	---	74.8	---	---	0.06	10%	

No Client related Batch QC samples analyzed for this batch. See notes page for more information.

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Acid/Silica Gel Cleanup

Prep: EPA 3546 w/SG+Acid (NWTPH)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020417							
A9B0107-01	Soil	NWTPH-Dx/SG	01/28/19 10:00	02/06/19 13:15	10.21g/5mL	10g/5mL	0.98
A9B0107-02	Soil	NWTPH-Dx/SG	01/28/19 11:15	02/06/19 13:15	10.16g/5mL	10g/5mL	0.98
A9B0107-03	Soil	NWTPH-Dx/SG	01/28/19 12:20	02/06/19 13:15	10.55g/5mL	10g/5mL	0.95
A9B0107-04RE1	Soil	NWTPH-Dx/SG	01/28/19 13:20	02/06/19 13:15	10.28g/5mL	10g/5mL	0.97
A9B0107-05RE1	Soil	NWTPH-Dx/SG	01/28/19 13:30	02/06/19 13:15	10.16g/5mL	10g/5mL	0.98
A9B0107-06RE1	Soil	NWTPH-Dx/SG	01/28/19 14:50	02/06/19 13:15	11.36g/5mL	10g/5mL	0.88
A9B0107-07RE1	Soil	NWTPH-Dx/SG	01/28/19 15:10	02/06/19 13:15	11.34g/5mL	10g/5mL	0.88
A9B0107-09	Soil	NWTPH-Dx/SG	01/29/19 09:30	02/06/19 13:15	11.43g/5mL	10g/5mL	0.88
A9B0107-17	Soil	NWTPH-Dx/SG	01/30/19 13:50	02/06/19 13:15	11.57g/5mL	10g/5mL	0.86
A9B0107-18RE1	Soil	NWTPH-Dx/SG	01/30/19 13:30	02/06/19 13:15	11.84g/5mL	10g/5mL	0.85
A9B0107-19RE1	Soil	NWTPH-Dx/SG	01/30/19 14:20	02/06/19 13:15	11.26g/5mL	10g/5mL	0.89
A9B0107-22	Soil	NWTPH-Dx/SG	01/31/19 08:45	02/06/19 13:15	10.12g/5mL	10g/5mL	0.99
A9B0107-23	Soil	NWTPH-Dx/SG	01/31/19 12:00	02/06/19 13:15	10.29g/5mL	10g/5mL	0.97
A9B0107-24	Soil	NWTPH-Dx/SG	01/31/19 12:10	02/06/19 13:15	10.04g/5mL	10g/5mL	1.00
A9B0107-27	Soil	NWTPH-Dx/SG	02/01/19 09:30	02/06/19 13:15	10.63g/5mL	10g/5mL	0.94
A9B0107-28	Soil	NWTPH-Dx/SG	02/01/19 09:40	02/06/19 13:15	11.6g/5mL	10g/5mL	0.86
A9B0107-31	Soil	NWTPH-Dx/SG	02/04/19 09:30	02/06/19 13:15	10.62g/5mL	10g/5mL	0.94
A9B0107-32	Soil	NWTPH-Dx/SG	02/04/19 09:40	02/06/19 13:15	10.08g/5mL	10g/5mL	0.99
Batch: 9020418							
A9B0107-35	Soil	NWTPH-Dx/SG	02/04/19 15:30	02/06/19 13:18	10.84g/5mL	10g/5mL	0.92
Batch: 9020498							
A9B0107-11RE1	Soil	NWTPH-Dx/SG	01/29/19 14:00	02/08/19 12:09	10.2g/5mL	10g/5mL	0.98
A9B0107-16RE1	Soil	NWTPH-Dx/SG	01/30/19 13:35	02/08/19 12:09	10.77g/5mL	10g/5mL	0.93

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Prep: EPA 3510C (Fuels/Acid Ext.) w/Silica Gel

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020393							
A9B0107-08	Water	NWTPH-Dx/SGC	01/28/19 16:00	02/06/19 07:20			1.00
A9B0107-12	Water	NWTPH-Dx/SGC	01/29/19 14:40	02/06/19 07:20			0.94
A9B0107-13	Water	NWTPH-Dx/SGC	01/29/19 16:00	02/06/19 07:20			0.98
A9B0107-14	Water	NWTPH-Dx/SGC	01/30/19 09:30	02/06/19 07:20			0.96
A9B0107-15	Water	NWTPH-Dx/SGC	01/30/19 12:00	02/06/19 07:20			1.00
A9B0107-20	Water	NWTPH-Dx/SGC	01/31/19 08:30	02/06/19 07:20			0.99

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Prep: EPA 3510C (Fuels/Acid Ext.) w/Silica Gel

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9B0107-21	Water	NWTPH-Dx/SGC	01/31/19 10:30	02/06/19 07:20			0.98
A9B0107-25	Water	NWTPH-Dx/SGC	01/31/19 14:00	02/06/19 07:20			0.96
A9B0107-26	Water	NWTPH-Dx/SGC	01/31/19 16:00	02/06/19 07:20			1.01
A9B0107-29	Water	NWTPH-Dx/SGC	02/01/19 12:00	02/06/19 11:20			0.98
A9B0107-30	Water	NWTPH-Dx/SGC	02/01/19 15:00	02/06/19 11:20			0.97
A9B0107-33	Water	NWTPH-Dx/SGC	02/04/19 12:30	02/06/19 11:20			1.04
A9B0107-34	Water	NWTPH-Dx/SGC	02/04/19 15:00	02/06/19 11:20			1.00

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020404							
A9B0107-08	Water	NWTPH-Gx (MS)	01/28/19 16:00	02/06/19 13:06	5mL/5mL	5mL/5mL	1.00
Batch: 9020429							
A9B0107-12	Water	NWTPH-Gx (MS)	01/29/19 14:40	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-13	Water	NWTPH-Gx (MS)	01/29/19 16:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-14	Water	NWTPH-Gx (MS)	01/30/19 09:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-15	Water	NWTPH-Gx (MS)	01/30/19 12:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-20	Water	NWTPH-Gx (MS)	01/31/19 08:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-21	Water	NWTPH-Gx (MS)	01/31/19 10:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-25	Water	NWTPH-Gx (MS)	01/31/19 14:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-26	Water	NWTPH-Gx (MS)	01/31/19 16:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-29	Water	NWTPH-Gx (MS)	02/01/19 12:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-30	Water	NWTPH-Gx (MS)	02/01/19 15:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-33	Water	NWTPH-Gx (MS)	02/04/19 12:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-34	Water	NWTPH-Gx (MS)	02/04/19 15:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00

Prep: EPA 5035A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020408							
A9B0107-01	Soil	NWTPH-Gx (MS)	01/28/19 10:00	01/28/19 10:00	5.64g/5mL	5g/5mL	0.89
A9B0107-02	Soil	NWTPH-Gx (MS)	01/28/19 11:15	01/28/19 11:15	6.12g/5mL	5g/5mL	0.82
A9B0107-03	Soil	NWTPH-Gx (MS)	01/28/19 12:20	01/28/19 12:20	6.74g/5mL	5g/5mL	0.74
A9B0107-04	Soil	NWTPH-Gx (MS)	01/28/19 13:20	01/28/19 13:20	6.32g/5mL	5g/5mL	0.79
A9B0107-05	Soil	NWTPH-Gx (MS)	01/28/19 13:30	01/28/19 13:30	5.67g/5mL	5g/5mL	0.88
A9B0107-07	Soil	NWTPH-Gx (MS)	01/28/19 15:10	01/28/19 15:10	5.9g/5mL	5g/5mL	0.85

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Prep: EPA 5035A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9B0107-09	Soil	NWTPH-Gx (MS)	01/29/19 09:30	01/29/19 09:30	6.56g/5mL	5g/5mL	0.76
A9B0107-11	Soil	NWTPH-Gx (MS)	01/29/19 14:00	01/29/19 14:00	6.45g/5mL	5g/5mL	0.78
A9B0107-16	Soil	NWTPH-Gx (MS)	01/30/19 13:35	01/30/19 13:35	6.09g/5mL	5g/5mL	0.82
Batch: 9020449							
A9B0107-06RE1	Soil	NWTPH-Gx (MS)	01/28/19 14:50	01/28/19 14:50	6.67g/5mL	5g/5mL	0.75
A9B0107-17	Soil	NWTPH-Gx (MS)	01/30/19 13:50	01/30/19 13:50	6.24g/5mL	5g/5mL	0.80
A9B0107-18	Soil	NWTPH-Gx (MS)	01/30/19 13:30	01/30/19 13:30	5.25g/5mL	5g/5mL	0.95
A9B0107-19	Soil	NWTPH-Gx (MS)	01/30/19 14:20	01/30/19 14:20	6.27g/5mL	5g/5mL	0.80
A9B0107-22	Soil	NWTPH-Gx (MS)	01/31/19 08:45	01/31/19 08:45	6.16g/5mL	5g/5mL	0.81
A9B0107-23	Soil	NWTPH-Gx (MS)	01/31/19 12:00	01/31/19 12:00	5.23g/5mL	5g/5mL	0.96
A9B0107-24	Soil	NWTPH-Gx (MS)	01/31/19 12:10	01/31/19 12:10	6.37g/5mL	5g/5mL	0.79
A9B0107-27	Soil	NWTPH-Gx (MS)	02/01/19 09:30	02/01/19 09:30	6.12g/5mL	5g/5mL	0.82
A9B0107-28	Soil	NWTPH-Gx (MS)	02/01/19 09:40	02/01/19 09:40	7.35g/5mL	5g/5mL	0.68
A9B0107-31	Soil	NWTPH-Gx (MS)	02/04/19 09:30	02/04/19 09:30	6.05g/5mL	5g/5mL	0.83
A9B0107-35	Soil	NWTPH-Gx (MS)	02/04/19 15:30	02/05/19 19:00	5g/5mL	5g/5mL	1.00
Batch: 9020511							
A9B0107-32RE1	Soil	NWTPH-Gx (MS)	02/04/19 09:40	02/04/19 09:40	5.8g/5mL	5g/5mL	0.86

BTEX Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020404							
A9B0107-36	Water	EPA 8260C	01/28/19 00:00	02/06/19 13:06	5mL/5mL	5mL/5mL	1.00

Selected Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020404							
A9B0107-08	Water	EPA 8260C	01/28/19 16:00	02/06/19 13:06	5mL/5mL	5mL/5mL	1.00
Batch: 9020429							
A9B0107-12	Water	EPA 8260C	01/29/19 14:40	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-13	Water	EPA 8260C	01/29/19 16:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-14	Water	EPA 8260C	01/30/19 09:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-15	Water	EPA 8260C	01/30/19 12:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Selected Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9B0107-20	Water	EPA 8260C	01/31/19 08:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-21	Water	EPA 8260C	01/31/19 10:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-25	Water	EPA 8260C	01/31/19 14:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-26	Water	EPA 8260C	01/31/19 16:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-29	Water	EPA 8260C	02/01/19 12:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-30	Water	EPA 8260C	02/01/19 15:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-33	Water	EPA 8260C	02/04/19 12:30	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00
A9B0107-34	Water	EPA 8260C	02/04/19 15:00	02/06/19 18:03	5mL/5mL	5mL/5mL	1.00

Selected Volatile Organic Compounds by EPA 5035A/8260C

Prep: EPA 5035A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020408							
A9B0107-01	Soil	5035A/8260C	01/28/19 10:00	01/28/19 10:00	5.64g/5mL	5g/5mL	0.89
A9B0107-02	Soil	5035A/8260C	01/28/19 11:15	01/28/19 11:15	6.12g/5mL	5g/5mL	0.82
A9B0107-03	Soil	5035A/8260C	01/28/19 12:20	01/28/19 12:20	6.74g/5mL	5g/5mL	0.74
A9B0107-04	Soil	5035A/8260C	01/28/19 13:20	01/28/19 13:20	6.32g/5mL	5g/5mL	0.79
A9B0107-05	Soil	5035A/8260C	01/28/19 13:30	01/28/19 13:30	5.67g/5mL	5g/5mL	0.88
A9B0107-07	Soil	5035A/8260C	01/28/19 15:10	01/28/19 15:10	5.9g/5mL	5g/5mL	0.85
A9B0107-09	Soil	5035A/8260C	01/29/19 09:30	01/29/19 09:30	6.56g/5mL	5g/5mL	0.76
A9B0107-11	Soil	5035A/8260C	01/29/19 14:00	01/29/19 14:00	6.45g/5mL	5g/5mL	0.78
A9B0107-16	Soil	5035A/8260C	01/30/19 13:35	01/30/19 13:35	6.09g/5mL	5g/5mL	0.82
Batch: 9020449							
A9B0107-06RE1	Soil	5035A/8260C	01/28/19 14:50	01/28/19 14:50	6.67g/5mL	5g/5mL	0.75
A9B0107-17	Soil	5035A/8260C	01/30/19 13:50	01/30/19 13:50	6.24g/5mL	5g/5mL	0.80
A9B0107-18	Soil	5035A/8260C	01/30/19 13:30	01/30/19 13:30	5.25g/5mL	5g/5mL	0.95
A9B0107-19	Soil	5035A/8260C	01/30/19 14:20	01/30/19 14:20	6.27g/5mL	5g/5mL	0.80
A9B0107-22	Soil	5035A/8260C	01/31/19 08:45	01/31/19 08:45	6.16g/5mL	5g/5mL	0.81
A9B0107-23	Soil	5035A/8260C	01/31/19 12:00	01/31/19 12:00	5.23g/5mL	5g/5mL	0.96
A9B0107-24	Soil	5035A/8260C	01/31/19 12:10	01/31/19 12:10	6.37g/5mL	5g/5mL	0.79
A9B0107-27	Soil	5035A/8260C	02/01/19 09:30	02/01/19 09:30	6.12g/5mL	5g/5mL	0.82
A9B0107-28	Soil	5035A/8260C	02/01/19 09:40	02/01/19 09:40	7.35g/5mL	5g/5mL	0.68
A9B0107-31	Soil	5035A/8260C	02/04/19 09:30	02/04/19 09:30	6.05g/5mL	5g/5mL	0.83
A9B0107-35	Soil	5035A/8260C	02/04/19 15:30	02/05/19 19:00	5g/5mL	5g/5mL	1.00
Batch: 9020511							

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Selected Volatile Organic Compounds by EPA 5035A/8260C

Prep: EPA 5035A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9B0107-32RE1	Soil	5035A/8260C	02/04/19 09:40	02/04/19 09:40	5.8g/5mL	5g/5mL	0.86

TCLP Volatile Organic Compounds by EPA 1311/8260C

Prep: EPA 1311/5030B TCLP Volatiles

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020529							
A9B0107-35	Soil	1311/8260C	02/04/19 15:30	02/11/19 12:13	5mL/5mL	5mL/5mL	1.00

Diethylene glycol monomethyl ether (DGME) Screen by 8270M

Prep: EPA 3510C (Acid Extraction)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9030798							
A9B0107-08RE1	Water	EPA 8270Dm	01/28/19 16:00	03/15/19 06:38	1070mL/5mL	1000mL/5mL	0.94

Prep: EPA 3546

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9030808							
A9B0107-06	Soil	EPA 8270Dm	01/28/19 14:50	03/15/19 11:24	10.71g/2mL	10g/2mL	0.93

TCLP Extraction by EPA 1311 (ZHE)

Prep: EPA 1311 TCLP/ZHE

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020523							
A9B0107-35	Soil	EPA 1311 ZHE	02/04/19 15:30	02/10/19 17:20	20.03g/400mL	25g/500mL	NA

Percent Dry Weight

Prep: Total Solids (Dry Weight)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020395							
A9B0107-01	Soil	EPA 8000C	01/28/19 10:00	02/06/19 08:07			NA
A9B0107-02	Soil	EPA 8000C	01/28/19 11:15	02/06/19 08:07			NA
A9B0107-03	Soil	EPA 8000C	01/28/19 12:20	02/06/19 08:07			NA
A9B0107-04	Soil	EPA 8000C	01/28/19 13:20	02/06/19 08:07			NA

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

SAMPLE PREPARATION INFORMATION

Percent Dry Weight

Prep: Total Solids (Dry Weight)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9B0107-05	Soil	EPA 8000C	01/28/19 13:30	02/06/19 08:07			NA
A9B0107-06	Soil	EPA 8000C	01/28/19 14:50	02/06/19 08:07			NA
A9B0107-07	Soil	EPA 8000C	01/28/19 15:10	02/06/19 08:07			NA
A9B0107-09	Soil	EPA 8000C	01/29/19 09:30	02/06/19 08:07			NA
A9B0107-11	Soil	EPA 8000C	01/29/19 14:00	02/06/19 08:07			NA
A9B0107-16	Soil	EPA 8000C	01/30/19 13:35	02/06/19 08:07			NA
A9B0107-17	Soil	EPA 8000C	01/30/19 13:50	02/06/19 08:07			NA
A9B0107-18	Soil	EPA 8000C	01/30/19 13:30	02/06/19 08:07			NA
A9B0107-19	Soil	EPA 8000C	01/30/19 14:20	02/06/19 08:07			NA
A9B0107-22	Soil	EPA 8000C	01/31/19 08:45	02/06/19 08:07			NA
A9B0107-23	Soil	EPA 8000C	01/31/19 12:00	02/06/19 08:07			NA
A9B0107-24	Soil	EPA 8000C	01/31/19 12:10	02/06/19 08:07			NA
A9B0107-27	Soil	EPA 8000C	02/01/19 09:30	02/06/19 08:07			NA
A9B0107-28	Soil	EPA 8000C	02/01/19 09:40	02/06/19 08:07			NA
A9B0107-31	Soil	EPA 8000C	02/04/19 09:30	02/06/19 08:07			NA
A9B0107-32	Soil	EPA 8000C	02/04/19 09:40	02/06/19 08:07			NA
A9B0107-35	Soil	EPA 8000C	02/04/19 15:30	02/06/19 08:07			NA

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

F-09	Results in the Gasoline Range are primarily due to overlap from a heavier fuel hydrocarbon product.
F-11	The hydrocarbon pattern indicates possible weathered diesel, mineral oil, or a contribution from a related component.
F-13	The chromatographic pattern does not resemble the fuel standard used for quantitation
F-18	Result for Diesel (Diesel Range Organics, C12-C24) is due to overlap from Gasoline or a Gasoline Range product.
F-20	Result for Diesel is Estimated due to overlap from Gasoline Range Organics or other VOCs.
Q-05	Analyses are not controlled on RPD values from sample and duplicate concentrations that are below 5 times the reporting level.
Q-17	RPD between original and duplicate sample is outside of established control limits.
Q-19	Blank Spike Duplicate (BSD) sample analyzed in place of Matrix Spike/Duplicate samples due to limited sample amount available for analysis.
Q-42	Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits. (Refer to the QC Section of Analytical Report.)
R-02	The Reporting Limit for this analyte has been raised to account for interference from coeluting organic compounds present in the sample.
R-04	Reporting levels elevated due to preparation and/or analytical dilution necessary for analysis.
S-01	Surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interference.
S-05	Surrogate recovery is estimated due to sample dilution required for high analyte concentration and/or matrix interference.
T-02	This Batch QC sample was analyzed outside of the method specified 12 hour tune window. Results are estimated.
TCLP	This batch QC sample was prepared with TCLP or SPLP fluid from preparation batch 9020523.
V-15	Sample aliquot was subsampled from the sample container. The subsampled aliquot was preserved in the laboratory within 48 hours of sampling.
X	See Case Narrative.

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.
ND Analyte NOT DETECTED at or above the detection or reporting limit.
NR Result Not Reported
RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

Apex Laboratories

Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC
12232 S.W. Garden Place
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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
Soil	**EPA 8270Dm**		**Diethylene glycol monomethyl ether (DC**	**6267**	**NonNELAC**
Water	**EPA 8270Dm**		**Diethylene glycol monomethyl ether (DC**	**6267**	**NonNELAC**

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

Lisa Domenighini, Client Services Manager

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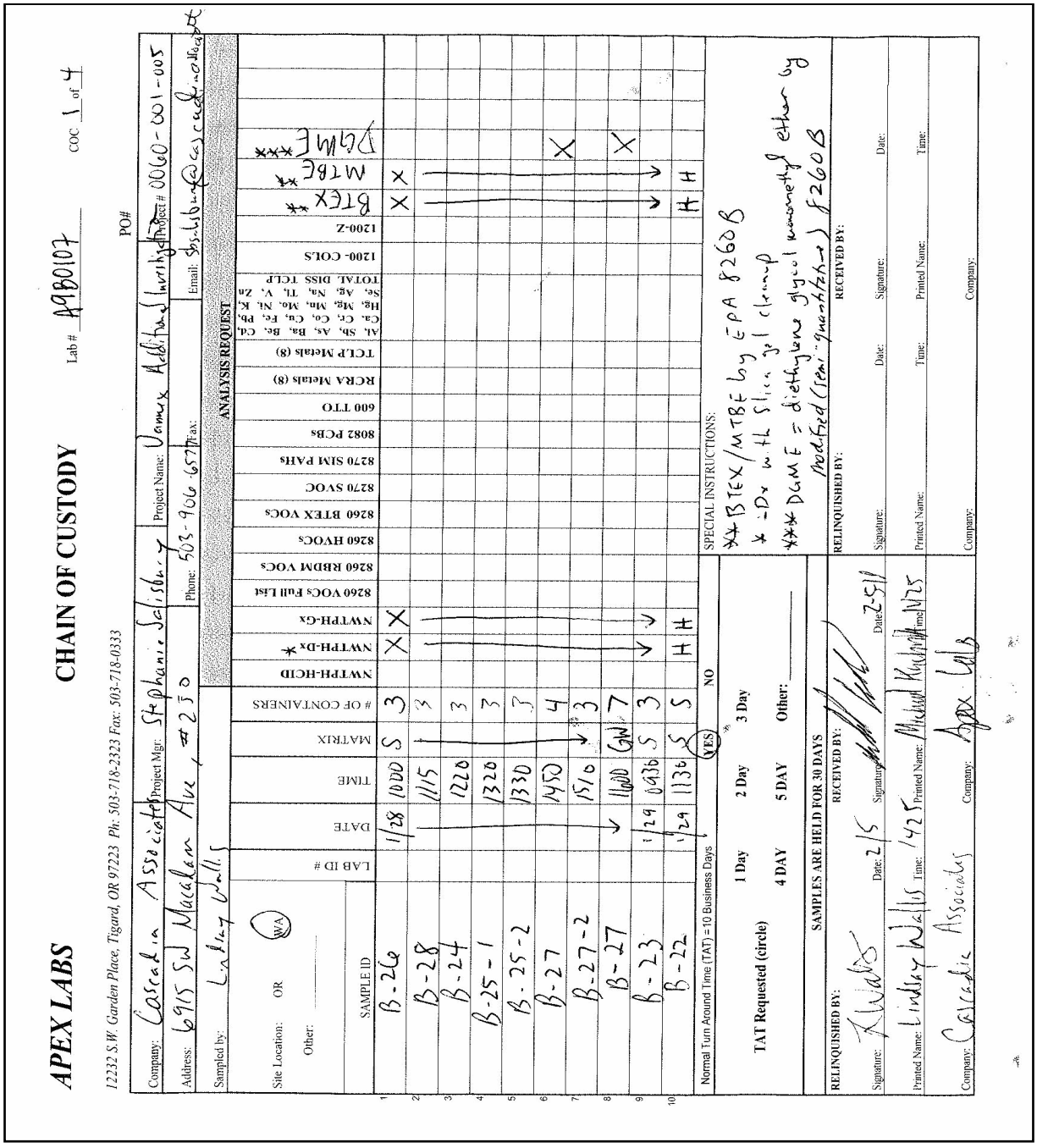
AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**



APEX LABS — **CHAIN OF CUSTODY** — Lab # A9B0107 — COC 1 of 4

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Associates — Project Mgr: Stephanie Salisbury — Project Name: Vannex Additional Investigation — Project # 0060-001-005

Address: 6915 SW Macadam Ave, #250 — Phone: 503-906-6577 — Fax: — Email: Stephanie@cascadiaassociates.com

Sampled by: Lindsay Wells — PO#

Site Location: OR WA — Other: _____

ANALYSIS REQUEST

#	SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx *	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn TOTAL DISS TCLP	1200- COLS	1200-Z	BTEX **	MTBE **	DgME ***
1	B-26		1/28	1000	S	3		X	X															
2	B-28			1115		3																		
3	B-24			1220		3																		
4	B-25-1			1320		3																		
5	B-25-2			1330		3																		
6	B-27			1450		4																	X	
7	B-27-2			1510		3																		
8	B-27		↓	1600	GW	7																	X	
9	B-23		1/29	0930	S	3																		
10	B-22		1/29	1130	S	5	H	H														H	H	

Normal Turn Around Time (TAT) = 10 Business Days — (YES) NO

TAT Requested (circle): 1 Day — 2 Day — 3 Day — 4 DAY — 5 DAY — Other: _____

SPECIAL INSTRUCTIONS:
** BTEX/MTBE by EPA 8260B
* - DRO with silica gel cleanup
*** DgME = diethylene glycol monomethyl ether by modified (reporting limits) 8260B

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Signature: _____ Printed Name: _____ Company: _____ Date: _____ Time: _____

RECEIVED BY: Signature: _____ Printed Name: _____ Company: _____ Date: 2/5 Time: 1425

RELINQUISHED BY: Signature: _____ Printed Name: Lindsay Wells Company: Cascadia Associates Date: 2/5 Time: 1715

RECEIVED BY: Signature: _____ Printed Name: _____ Company: Apex Labs Date: 2-5-19 Time: 1725

RELINQUISHED BY: Signature: _____ Printed Name: _____ Company: _____ Date: _____ Time: _____

RECEIVED BY: Signature: _____ Printed Name: _____ Company: _____ Date: _____ Time: _____

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

APEX LABS

CHAIN OF CUSTODY

Lab # A9B0107 COC 2 of 4

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Associates
Project Mgr: Stephanie Salisbury
Project Name: Vannex Additional Investigation
Project # 0060-001-005
Address: 6915 SW Macadam Ave, # 250
Phone: 503-906-6577
Fax:
Email: ssalisbury@cascadiaassociates.com
Sampled by: Lindsay Wallis

Site Location: OR (WA)
Other:

ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx *	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Total Metals (8)	Al, Sb, As, Ba, Be, Cd Ca, Cr, Co, Cu, Fe, Pb Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200-COLS	1200-Z	BTEX **	MTBE **
B-19	1	1/29	1400	S	3		X	X													X	X
B-19-15	2	1/29	1440	GW	5																	
B-19-30	3	1/29	1600	GW	5																	
B-19-40	4	1/30	0930	GW	5																	
B-19-50	5	1/30	1200	GW	5																	
B-16-1	6	1/30	1335	S	3																	
B-16-2	7	1/30	1350	S	3																	
B-18-1	8	1/30	1330	S	3																	
B-18-2	9	1/30	1420	S	3																	
B-18-40	10	1/31	0830	GW	5		↓	↓													↓	↓

Normal Turn Around Time (TAT) = 7-10 Business Days

TAT Requested (circle): 24 HR 48 HR 72 HR 4 DAY 5 DAY Other: ______

SPECIAL INSTRUCTIONS:
* - Dx with silica gel cleanup
** BTEX / MTBE by EPA 8260B

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 2/5	Signature: [signature] Date: 2-5-19	Signature: Date:	Signature: Date:
Printed Name: Lindsay Wallis Time: 1425	Printed Name: M. Machnik Time: 1425	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

Apex Laboratories

[signature]

Lisa Domenighini, Client Services Manager

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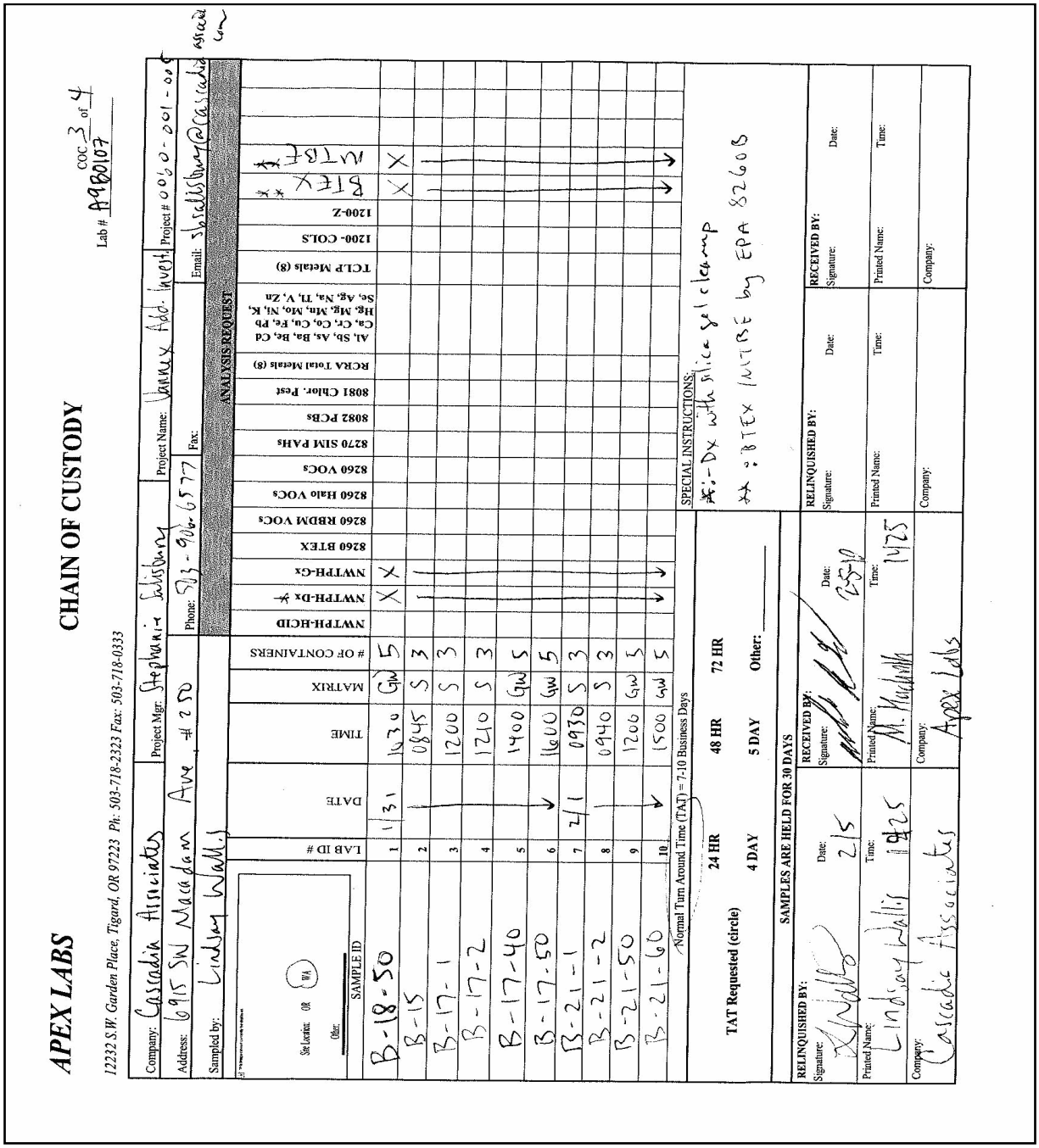
Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**



APEX LABS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

CHAIN OF CUSTODY

Lab # A9B0107 COC 3 of 4

Company: Cascadia Associates | Project Mgr: Stephanie Salisbury | Project Name: Vannex Add. Invest | Project # 0060-001-005

Address: 6915 SW Macadam Ave #250 | Phone: 503-977-6577 | Fax: | Email: ssalisbury@cascadia

Sampled by: Lindsay Wallis | ANALYSIS REQUEST

Set Location: OR WA | Other:

LAB ID #	SAMPLE ID	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx *	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Total Metals (8)	Al, Sb, As, Ba, Be, Cd Ca, Cr, Co, Cu, Fe, Pb He, Mg, Mn, Mo, Ni, K Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200- COLS	1200-Z	BTEX **	MTBE **
1	B-18-50	11/31	1030	GW	5		X														X	X
2	B-15		0845	S	3																	
3	B-17-1		1200	S	3																	
4	B-17-2		1210	S	3																	
5	B-17-40		1400	GW	5																	
6	B-17-50		1600	GW	5																	
7	B-21-1	11/1	0930	S	3																	
8	B-21-2		0940	S	3																	
9	B-21-50		1200	GW	5																	
10	B-21-60		1500	GW	5																	

Normal Turn Around Time (TAT) = 7-10 Business Days

TAT Requested (circle): 24 HR | 48 HR | 72 HR | 4 DAY | 5 DAY | Other: ____

SPECIAL INSTRUCTIONS:
*: - Dx with silica gel cleanup
**: BTEX MTBE by EPA 8260B

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	Date:	Time:	RECEIVED BY:	Date:	Time:	RELINQUISHED BY:	Date:	Time:	RECEIVED BY:	Date:	Time:
Signature:	11/1	215	Signature:			Signature:			Signature:		
Printed Name:	Lindsay Wallis	1925	Printed Name:	M. Hall	1125	Printed Name:			Printed Name:		
Company:	Cascadia Associates		Company:	Apex Labs		Company:			Company:		

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9B0107 - 04 05 19 0831**

APEX LABS

CHAIN OF CUSTODY

COC 4 of 4

Lab # A9B0107

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Associates | Project Mgr: Stephanie Salisbury | Project Name: Vannex AI | Project # 0060-001-005

Address: 6915 SW Macadam Ave, #210 | Phone: 503-906-6577 | Fax: | Email: sbsalisbury@cascadiaassociates.com

Sampled by: Lindsay Wallis

Site Location: OR WA (WA circled)

Other:

ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx *	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Total Metals (8)	Al, Sb, As, Ba, Be, Cd Ca, Cr, Co, Cu, Fe, Pb Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200- COLS	1200-Z	BTEX **	MTBE **	Benzene, TCLP		
B-20-1	1	2/4	0930	S	3		X	X													X	X			
B-20-2	2	↓	0940	S	3		↓	↓													↓	↓			
B-20-50	3	↓	1230	GW	5		↓	↓													↓	↓			
B-20-60	4	↓	1500	GW	5		↓	↓													↓	↓			
IDW	5	↓	1530	S	2		↓	↓													↓	↓	X		
Trip Blank	6			W	5																X				
	7																								
	8																								
	9																								
	10																								

Normal Turn Around Time (TAT) = 7-10 Business Days

TAT Requested (circle): 24 HR 48 HR 72 HR 4 DAY 5 DAY Other: ______

SPECIAL INSTRUCTIONS:
* -Dx with silica gel cleanup
** BTEX/MTBE by EPA 8260B

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: L Wallis Date: 2/5	Signature: [signature] Date: 2-5-19	Signature: Date:	Signature: Date:
Printed Name: Lindsay Wallis Time: 1425	Printed Name: M. [illegible] Time: 1425	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Wednesday, March 6, 2019

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A9B0609 - Nustar Vannex - 0060-001-005

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A9B0609, which was received by the laboratory on 2/19/2019 at 4:04:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

cooler#1	3.5 degC	Cooler#2	3.8 degC
Cooler#3	2.4 degC		

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-6	A9B0609-01	Water	02/18/19 09:10	02/19/19 16:04
MW-5D	A9B0609-02	Water	02/18/19 09:50	02/19/19 16:04
MW-5	A9B0609-03	Water	02/18/19 10:10	02/19/19 16:04
MW-4	A9B0609-04	Water	02/18/19 11:00	02/19/19 16:04
MW-9	A9B0609-05	Water	02/18/19 11:40	02/19/19 16:04
MW-8D	A9B0609-06	Water	02/18/19 12:10	02/19/19 16:04
MW-8	A9B0609-07	Water	02/18/19 12:40	02/19/19 16:04
MW-3	A9B0609-08	Water	02/18/19 13:40	02/19/19 16:04
MW-7	A9B0609-09	Water	02/19/19 08:00	02/19/19 16:04
MW-10	A9B0609-10	Water	02/19/19 08:40	02/19/19 16:04
MW-11	A9B0609-11	Water	02/19/19 09:30	02/19/19 16:04
MW-1	A9B0609-12	Water	02/19/19 09:55	02/19/19 16:04
MW-2	A9B0609-13	Water	02/19/19 10:40	02/19/19 16:04
Trip Blank#1962	A9B0609-14	Water	02/18/19 00:00	02/19/19 16:04

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9B0609-01)				**Matrix: Water**		**Batch: 9021153**		
Diesel	**2.15**	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	**F-20**
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 68 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-5D (A9B0609-02)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0748	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-5 (A9B0609-03)				**Matrix: Water**		**Batch: 9021153**		
Diesel	**1.06**	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-4 (A9B0609-04)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 79 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-9 (A9B0609-05)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0748	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 80 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-8D (A9B0609-06)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 78 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-8 (A9B0609-07)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-3 (A9B0609-08)				**Matrix: Water**		**Batch: 9021153**		
Diesel	ND	---	0.0755	mg/L	1	03/02/19	NWTPH-Dx/SGC	

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9B0609-08)				**Matrix: Water**			**Batch: 9021153**	
Oil	ND	---	0.151	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 73 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-7 (A9B0609-09)				**Matrix: Water**			**Batch: 9021153**	
Diesel	ND	---	0.0748	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 81 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-10 (A9B0609-10)				**Matrix: Water**			**Batch: 9021153**	
Diesel	ND	---	0.0748	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 63 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-11 (A9B0609-11)				**Matrix: Water**			**Batch: 9021153**	
Diesel	ND	---	0.0748	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 75 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-1 (A9B0609-12)				**Matrix: Water**			**Batch: 9021153**	
Diesel	ND	---	0.0762	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Oil	ND	---	0.152	mg/L	1	03/02/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 68 %*		*Limits: 50-150 %*	*1*	*03/02/19*	*NWTPH-Dx/SGC*	
MW-2 (A9B0609-13)				**Matrix: Water**			**Batch: 9021153**	
Diesel	ND	---	0.0755	mg/L	1	03/01/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	03/01/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 54 %*		*Limits: 50-150 %*	*1*	*03/01/19*	*NWTPH-Dx/SGC*	

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9B0609-01)				**Matrix: Water**		**Batch: 9020940**		
Gasoline Range Organics	**18.2**	---	1.00	mg/L	10	02/21/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*	*Limits: 50-150 %*		*1*	*02/21/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*108 %*	*50-150 %*	*1*	*02/21/19*	*NWTPH-Gx (MS)*	
MW-5D (A9B0609-02RE1)				**Matrix: Water**		**Batch: 9021007**		
Gasoline Range Organics	**0.165**	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*	*Limits: 50-150 %*		*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*99 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-5 (A9B0609-03)				**Matrix: Water**		**Batch: 9020940**		
Gasoline Range Organics	**29.2**	---	1.00	mg/L	10	02/21/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*02/21/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*02/21/19*	*NWTPH-Gx (MS)*	
MW-4 (A9B0609-04)				**Matrix: Water**		**Batch: 9020987**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*	*Limits: 50-150 %*		*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*105 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-9 (A9B0609-05)				**Matrix: Water**		**Batch: 9020987**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 105 %*	*Limits: 50-150 %*		*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-8D (A9B0609-06)				**Matrix: Water**		**Batch: 9020987**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*	*Limits: 50-150 %*		*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-8 (A9B0609-07)				**Matrix: Water**		**Batch: 9020987**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*	*Limits: 50-150 %*		*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*107 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-3 (A9B0609-08)				**Matrix: Water**		**Batch: 9020987**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

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Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9B0609-08)				**Matrix: Water**			**Batch: 9020987**	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 107 %*	*Limits: 50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-7 (A9B0609-09)				**Matrix: Water**			**Batch: 9020987**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 106 %*	*Limits: 50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*105 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-10 (A9B0609-10)				**Matrix: Water**			**Batch: 9020987**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 107 %*	*Limits: 50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*107 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-11 (A9B0609-11)				**Matrix: Water**			**Batch: 9021036**	
Gasoline Range Organics	**0.727**	---	0.100	mg/L	1	02/24/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 106 %*	*Limits: 50-150 %*	*1*	*02/24/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*02/24/19*	*NWTPH-Gx (MS)*	
MW-1 (A9B0609-12)				**Matrix: Water**			**Batch: 9021007**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 105 %*	*Limits: 50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*104 %*	*50-150 %*	*1*	*02/22/19*	*NWTPH-Gx (MS)*	
MW-2 (A9B0609-13)				**Matrix: Water**			**Batch: 9020940**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	02/21/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 91 %*	*Limits: 50-150 %*	*1*	*02/21/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*02/21/19*	*NWTPH-Gx (MS)*	

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12232 S.W. Garden Place
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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank#1962 (A9B0609-14)				**Matrix: Water**		**Batch: 9020940**		
Benzene	ND	---	0.200	ug/L	1	02/21/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/21/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/21/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/21/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits: 80-120 %*	*1*	*02/21/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*	

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9B0609-01)				**Matrix: Water**		**Batch: 9020940**		
Benzene	**249**	---	2.00	ug/L	10	02/21/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	02/21/19	EPA 8260C	
Toluene	**40.8**	---	10.0	ug/L	10	02/21/19	EPA 8260C	
Xylenes, total	**577**	---	15.0	ug/L	10	02/21/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*109 %*	*Limits:*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*93 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
MW-6 (A9B0609-01RE1)				**Matrix: Water**		**Batch: 9020940**		
Ethylbenzene	**1740**	---	50.0	ug/L	100	02/21/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*97 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
MW-5D (A9B0609-02RE1)				**Matrix: Water**		**Batch: 9021007**		
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits:*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*
Toluene-d8 (Surr)			*98 %*		*80-120 %*	*1*	*02/22/19*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*	*1*	*02/22/19*	*EPA 8260C*
MW-5 (A9B0609-03)				**Matrix: Water**		**Batch: 9020940**		
Benzene	ND	---	2.00	ug/L	10	02/21/19	EPA 8260C	
Ethylbenzene	**187**	---	5.00	ug/L	10	02/21/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	02/21/19	EPA 8260C	
Toluene	ND	---	10.0	ug/L	10	02/21/19	EPA 8260C	
Xylenes, total	**1060**	---	15.0	ug/L	10	02/21/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits:*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*92 %*		*80-120 %*	*1*	*02/21/19*	*EPA 8260C*
MW-4 (A9B0609-04)				**Matrix: Water**		**Batch: 9020987**		
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	

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Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-4 (A9B0609-04)				**Matrix: Water**			**Batch: 9020987**	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-9 (A9B0609-05)				**Matrix: Water**			**Batch: 9020987**	
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-8D (A9B0609-06)				**Matrix: Water**			**Batch: 9020987**	
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-8 (A9B0609-07)				**Matrix: Water**			**Batch: 9020987**	
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9B0609-08)				**Matrix: Water**		**Batch: 9020987**		
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-7 (A9B0609-09)				**Matrix: Water**		**Batch: 9020987**		
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-10 (A9B0609-10)				**Matrix: Water**		**Batch: 9020987**		
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*108 %*	*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-11 (A9B0609-11)				**Matrix: Water**		**Batch: 9021036**		
Benzene	**1.62**	---	0.200	ug/L	1	02/24/19	EPA 8260C	
Ethylbenzene	**83.0**	---	0.500	ug/L	1	02/24/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/24/19	EPA 8260C	
Toluene	**1.76**	---	1.00	ug/L	1	02/24/19	EPA 8260C	
Xylenes, total	**65.2**	---	1.50	ug/L	1	02/24/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*98 %*	*Limits: 80-120 %*	*1*	*02/24/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*02/24/19*	*EPA 8260C*	

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

ANALYTICAL SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-11 (A9B0609-11)				**Matrix: Water**			**Batch: 9021036**	
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*02/24/19*	*EPA 8260C*	
MW-1 (A9B0609-12)				**Matrix: Water**			**Batch: 9021007**	
Benzene	ND	---	0.200	ug/L	1	02/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*02/22/19*	*EPA 8260C*	
MW-2 (A9B0609-13)				**Matrix: Water**			**Batch: 9020940**	
Benzene	ND	---	0.200	ug/L	1	02/21/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	02/21/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	**1.21**	---	1.00	ug/L	1	02/21/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	02/21/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	02/21/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 107 %*		*Limits: 80-120 %*	*1*	*02/21/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*02/21/19*	*EPA 8260C*	

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9021153 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel								**Water**				
Blank (9021153-BLK1)		Prepared: 02/28/19 07:18		Analyzed: 03/01/19 23:45								
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)		*Recovery: 90 %*		*Limits: 50-150 %*		*Dilution: 1x*						
LCS (9021153-BS1)		Prepared: 02/28/19 07:18		Analyzed: 03/02/19 00:05								
NWTPH-Dx/SGC												
Diesel	0.384	---	0.0800	mg/L	1	0.500	---	77	58-115%	---	---	
Surr: o-Terphenyl (Surr)		*Recovery: 89 %*		*Limits: 50-150 %*		*Dilution: 1x*						
LCS Dup (9021153-BSD1)		Prepared: 02/28/19 07:18		Analyzed: 03/02/19 00:25								**Q-19**
NWTPH-Dx/SGC												
Diesel	0.415	---	0.0800	mg/L	1	0.500	---	83	58-115%	8	20%	
Surr: o-Terphenyl (Surr)		*Recovery: 87 %*		*Limits: 50-150 %*		*Dilution: 1x*						

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020940 - EPA 5030B									Water			
Blank (9020940-BLK1)		Prepared: 02/21/19 08:30		Analyzed: 02/21/19 11:12								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 93 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*109 %*		*50-150 %*			*"*					
LCS (9020940-BS2)		Prepared: 02/21/19 08:30		Analyzed: 02/21/19 10:45								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.486	---	0.100	mg/L	1	0.500	---	97	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 93 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*102 %*		*50-150 %*			*"*					
Duplicate (9020940-DUP1)		Prepared: 02/21/19 10:19		Analyzed: 02/21/19 14:24								
QC Source Sample: MW-6 (A9B0609-01)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**17.3**	---	1.00	mg/L	10	---	18.2	---	---	5	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*104 %*		*50-150 %*			*"*					

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020987 - EPA 5030B									Water			
Blank (9020987-BLK1)		Prepared: 02/22/19 08:00		Analyzed: 02/22/19 10:31								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 105 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*106 %*		*50-150 %*			*"*					
LCS (9020987-BS2)		Prepared: 02/22/19 08:00		Analyzed: 02/22/19 10:03								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.430	---	0.100	mg/L	1	0.500	---	86	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*97 %*		*50-150 %*			*"*					
Duplicate (9020987-DUP1)		Prepared: 02/22/19 09:58		Analyzed: 02/22/19 12:00								
QC Source Sample: MW-4 (A9B0609-04)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 107 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*105 %*		*50-150 %*			*"*					

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9021007 - EPA 5030B									Water			
Blank (9021007-BLK1)		Prepared: 02/22/19 14:37		Analyzed: 02/22/19 18:01								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*104 %*		*50-150 %*			*"*				
LCS (9021007-BS2)		Prepared: 02/22/19 14:37		Analyzed: 02/22/19 17:34								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.440	---	0.100	mg/L	1	0.500	---	88	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 100 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*98 %*		*50-150 %*			*"*				

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9021036 - EPA 5030B									Water			
Blank (9021036-BLK1)		Prepared: 02/23/19 18:30		Analyzed: 02/23/19 21:18								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 105 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*104 %*		*50-150 %*			*"*				
LCS (9021036-BS2)		Prepared: 02/23/19 18:30		Analyzed: 02/23/19 20:51								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.454	---	0.100	mg/L	1	0.500	---	91	80-120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*96 %*		*50-150 %*			*"*				

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QUALITY CONTROL (QC) SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020940 - EPA 5030B												**Water**
Blank (9020940-BLK1)		Prepared: 02/21/19 08:30		Analyzed: 02/21/19 11:12								
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 109 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*104 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*102 %*		*80-120 %*			*"*					
LCS (9020940-BS1)		Prepared: 02/21/19 08:30		Analyzed: 02/21/19 10:17								
EPA 8260C												
Benzene	21.2	---	0.200	ug/L	1	20.0	---	106	80-120%	---	---	
Toluene	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Ethylbenzene	20.5	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Xylenes, total	60.4	---	1.50	ug/L	1	60.0	---	101	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*89 %*		*80-120 %*			*"*					
Duplicate (9020940-DUP1)		Prepared: 02/21/19 10:19		Analyzed: 02/21/19 14:24								
QC Source Sample: MW-6 (A9B0609-01)												
EPA 8260C												
Benzene	**236**	---	2.00	ug/L	10	---	249	---	---	5	30%	
Toluene	**41.7**	---	10.0	ug/L	10	---	40.8	---	---	2	30%	
Ethylbenzene	**2120**	---	5.00	ug/L	10	---	2120	---	---	0.09	30%	E
Xylenes, total	**582**	---	15.0	ug/L	10	---	577	---	---	0.9	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
Matrix Spike (9020940-MS1)		Prepared: 02/21/19 10:19		Analyzed: 02/21/19 16:13								
QC Source Sample: MW-2 (A9B0609-13)												
EPA 8260C												

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Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020940 - EPA 5030B							**Water**					
Matrix Spike (9020940-MS1)		Prepared: 02/21/19 10:19		Analyzed: 02/21/19 16:13								
QC Source Sample: MW-2 (A9B0609-13)												
Benzene	23.3	---	0.200	ug/L	1	20.0	ND	116	79-120%	---	---	
Toluene	21.1	---	1.00	ug/L	1	20.0	ND	105	80-121%	---	---	
Ethylbenzene	22.2	---	0.500	ug/L	1	20.0	ND	111	79-121%	---	---	
Xylenes, total	64.9	---	1.50	ug/L	1	60.0	ND	108	79-121%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*91 %*		*80-120 %*			*"*					

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020940 - EPA 5030B												**Water**
Blank (9020940-BLK1)			Prepared: 02/21/19 08:30		Analyzed: 02/21/19 11:12							
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 109 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*104 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*102 %*		*80-120 %*			*"*				
LCS (9020940-BS1)			Prepared: 02/21/19 08:30		Analyzed: 02/21/19 10:17							
EPA 8260C												
Benzene	21.2	---	0.200	ug/L	1	20.0	---	106	80-120%	---	---	
Ethylbenzene	20.5	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	17.9	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Toluene	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Xylenes, total	60.4	---	1.50	ug/L	1	60.0	---	101	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*89 %*		*80-120 %*			*"*				
Duplicate (9020940-DUP1)			Prepared: 02/21/19 10:19		Analyzed: 02/21/19 14:24							
QC Source Sample: MW-6 (A9B0609-01)												
EPA 8260C												
Benzene	**236**	---	2.00	ug/L	10	---	249	---	---	5	30%	
Ethylbenzene	**2120**	---	5.00	ug/L	10	---	2120	---	---	0.09	30%	E
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Toluene	**41.7**	---	10.0	ug/L	10	---	40.8	---	---	2	30%	
Xylenes, total	**582**	---	15.0	ug/L	10	---	577	---	---	0.9	30%	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*105 %*		*80-120 %*			*"*				

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Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020940 - EPA 5030B												**Water**
Duplicate (9020940-DUP1)			Prepared: 02/21/19 10:19 Analyzed: 02/21/19 14:24									
QC Source Sample: MW-6 (A9B0609-01)												
Surr: 4-Bromofluorobenzene (Surr)			*Recovery: 95 %*	*Limits: 80-120 %*			*Dilution: 1x*					
Matrix Spike (9020940-MS1)			Prepared: 02/21/19 10:19 Analyzed: 02/21/19 16:13									
QC Source Sample: MW-2 (A9B0609-13)												
EPA 8260C												
Benzene	23.3	---	0.200	ug/L	1	20.0	ND	116	79-120%	---	---	
Ethylbenzene	22.2	---	0.500	ug/L	1	20.0	ND	111	79-121%	---	---	
Methyl tert-butyl ether (MTBE)	20.7	---	1.00	ug/L	1	20.0	1.21	98	71-124%	---	---	
Toluene	21.1	---	1.00	ug/L	1	20.0	ND	105	80-121%	---	---	
Xylenes, total	64.9	---	1.50	ug/L	1	60.0	ND	108	79-121%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 105 %*	*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)			*97 %*	*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)			*91 %*	*80-120 %*			*"*					

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Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020987 - EPA 5030B												**Water**
Blank (9020987-BLK1)			Prepared: 02/22/19 08:00		Analyzed: 02/22/19 10:31							
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 107 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*			*"*				
LCS (9020987-BS1)			Prepared: 02/22/19 08:00		Analyzed: 02/22/19 09:36							
EPA 8260C												
Benzene	18.4	---	0.200	ug/L	1	20.0	---	92	80-120%	---	---	
Ethylbenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Toluene	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Xylenes, total	59.0	---	1.50	ug/L	1	60.0	---	98	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 96 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*96 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*			*"*				
Duplicate (9020987-DUP1)			Prepared: 02/22/19 09:58		Analyzed: 02/22/19 12:00							
QC Source Sample: MW-4 (A9B0609-04)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Toluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Xylenes, total	ND	---	1.50	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 106 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*98 %*		*80-120 %*			*"*				

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9020987 - EPA 5030B												**Water**
Duplicate (9020987-DUP1)	Prepared: 02/22/19 09:58 Analyzed: 02/22/19 12:00											
QC Source Sample: MW-4 (A9B0609-04)												
Surr: 4-Bromofluorobenzene (Surr)	*Recovery: 102 %*		*Limits: 80-120 %*		*Dilution: 1x*							

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9021007 - EPA 5030B									Water			
Blank (9021007-BLK1)		Prepared: 02/22/19 14:37		Analyzed: 02/22/19 18:01								
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Isopropylbenzene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Naphthalene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trimethylbenzene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,3,5-Trimethylbenzene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*101 %*		*80-120 %*			*"*					
LCS (9021007-BS1)		Prepared: 02/22/19 14:37		Analyzed: 02/22/19 17:07								
EPA 8260C												
Benzene	18.4	---	0.200	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Ethylbenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Isopropylbenzene	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	19.5	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Naphthalene	16.5	---	2.00	ug/L	1	20.0	---	83	80-120%	---	---	
Toluene	18.5	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,4-Trimethylbenzene	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,3,5-Trimethylbenzene	18.7	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Xylenes, total	58.2	---	1.50	ug/L	1	60.0	---	97	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 97 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*96 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*99 %*		*80-120 %*			*"*					

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

QUALITY CONTROL (QC) SAMPLE RESULTS

Selected Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9021036 - EPA 5030B									Water			
Blank (9021036-BLK1)		Prepared: 02/23/19 18:30		Analyzed: 02/23/19 21:18								
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	---	---	---	---	---	
Ethylbenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Naphthalene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
Toluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Xylenes, total	ND	---	1.50	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*100 %*		*80-120 %*			*"*					
LCS (9021036-BS1)		Prepared: 02/23/19 18:30		Analyzed: 02/23/19 20:24								
EPA 8260C												
Benzene	18.3	---	0.200	ug/L	1	20.0	---	91	80-120%	---	---	
Ethylbenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Methyl tert-butyl ether (MTBE)	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Naphthalene	16.7	---	2.00	ug/L	1	20.0	---	84	80-120%	---	---	
Toluene	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Xylenes, total	57.5	---	1.50	ug/L	1	60.0	---	96	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*98 %*		*80-120 %*			*"*					

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

SAMPLE PREPARATION INFORMATION

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Prep: EPA 3510C (Fuels/Acid Ext.) w/Silica Gel

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9021153							
A9B0609-01	Water	NWTPH-Dx/SGC	02/18/19 09:10	02/28/19 07:18			0.94
A9B0609-02	Water	NWTPH-Dx/SGC	02/18/19 09:50	02/28/19 07:18			0.94
A9B0609-03	Water	NWTPH-Dx/SGC	02/18/19 10:10	02/28/19 07:18			0.94
A9B0609-04	Water	NWTPH-Dx/SGC	02/18/19 11:00	02/28/19 07:18			0.94
A9B0609-05	Water	NWTPH-Dx/SGC	02/18/19 11:40	02/28/19 07:18			0.94
A9B0609-06	Water	NWTPH-Dx/SGC	02/18/19 12:10	02/28/19 07:32			0.94
A9B0609-07	Water	NWTPH-Dx/SGC	02/18/19 12:40	02/28/19 07:32			0.94
A9B0609-08	Water	NWTPH-Dx/SGC	02/18/19 13:40	02/28/19 07:32			0.94
A9B0609-09	Water	NWTPH-Dx/SGC	02/19/19 08:00	02/28/19 07:32			0.94
A9B0609-10	Water	NWTPH-Dx/SGC	02/19/19 08:40	02/28/19 07:32			0.94
A9B0609-11	Water	NWTPH-Dx/SGC	02/19/19 09:30	02/28/19 07:32			0.94
A9B0609-12	Water	NWTPH-Dx/SGC	02/19/19 09:55	02/28/19 13:34			0.95
A9B0609-13	Water	NWTPH-Dx/SGC	02/19/19 10:40	02/28/19 13:34			0.94

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020940							
A9B0609-01	Water	NWTPH-Gx (MS)	02/18/19 09:10	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
A9B0609-03	Water	NWTPH-Gx (MS)	02/18/19 10:10	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
A9B0609-13	Water	NWTPH-Gx (MS)	02/19/19 10:40	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
Batch: 9020987							
A9B0609-04	Water	NWTPH-Gx (MS)	02/18/19 11:00	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-05	Water	NWTPH-Gx (MS)	02/18/19 11:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-06	Water	NWTPH-Gx (MS)	02/18/19 12:10	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-07	Water	NWTPH-Gx (MS)	02/18/19 12:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-08	Water	NWTPH-Gx (MS)	02/18/19 13:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-09	Water	NWTPH-Gx (MS)	02/19/19 08:00	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-10	Water	NWTPH-Gx (MS)	02/19/19 08:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
Batch: 9021007							
A9B0609-02RE1	Water	NWTPH-Gx (MS)	02/18/19 09:50	02/22/19 17:00	5mL/5mL	5mL/5mL	1.00
A9B0609-12	Water	NWTPH-Gx (MS)	02/19/19 09:55	02/22/19 17:00	5mL/5mL	5mL/5mL	1.00
Batch: 9021036							
A9B0609-11	Water	NWTPH-Gx (MS)	02/19/19 09:30	02/23/19 19:12	5mL/5mL	5mL/5mL	1.00

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6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

SAMPLE PREPARATION INFORMATION

Gasoline Range Hydrocarbons (Benzene through Naphthalene) by NWTPH-Gx

BTEX Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020940							
A9B0609-14	Water	EPA 8260C	02/18/19 00:00	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00

Selected Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9020940							
A9B0609-01	Water	EPA 8260C	02/18/19 09:10	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
A9B0609-01RE1	Water	EPA 8260C	02/18/19 09:10	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
A9B0609-03	Water	EPA 8260C	02/18/19 10:10	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
A9B0609-13	Water	EPA 8260C	02/19/19 10:40	02/21/19 10:19	5mL/5mL	5mL/5mL	1.00
Batch: 9020987							
A9B0609-04	Water	EPA 8260C	02/18/19 11:00	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-05	Water	EPA 8260C	02/18/19 11:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-06	Water	EPA 8260C	02/18/19 12:10	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-07	Water	EPA 8260C	02/18/19 12:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-08	Water	EPA 8260C	02/18/19 13:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-09	Water	EPA 8260C	02/19/19 08:00	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
A9B0609-10	Water	EPA 8260C	02/19/19 08:40	02/22/19 09:58	5mL/5mL	5mL/5mL	1.00
Batch: 9021007							
A9B0609-02RE1	Water	EPA 8260C	02/18/19 09:50	02/22/19 17:00	5mL/5mL	5mL/5mL	1.00
A9B0609-12	Water	EPA 8260C	02/19/19 09:55	02/22/19 17:00	5mL/5mL	5mL/5mL	1.00
Batch: 9021036							
A9B0609-11	Water	EPA 8260C	02/19/19 09:30	02/23/19 19:12	5mL/5mL	5mL/5mL	1.00

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

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E	Estimated Value. The result is above the calibration range of the instrument.
F-18	Result for Diesel (Diesel Range Organics, C12-C24) is due to overlap from Gasoline or a Gasoline Range product.
F-20	Result for Diesel is Estimated due to overlap from Gasoline Range Organics or other VOCs.
Q-19	Blank Spike Duplicate (BSD) sample analyzed in place of Matrix Spike/Duplicate samples due to limited sample amount available for analysis.

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.

ND Analyte NOT DETECTED at or above the detection or reporting limit.

NR Result Not Reported

RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.

" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.

" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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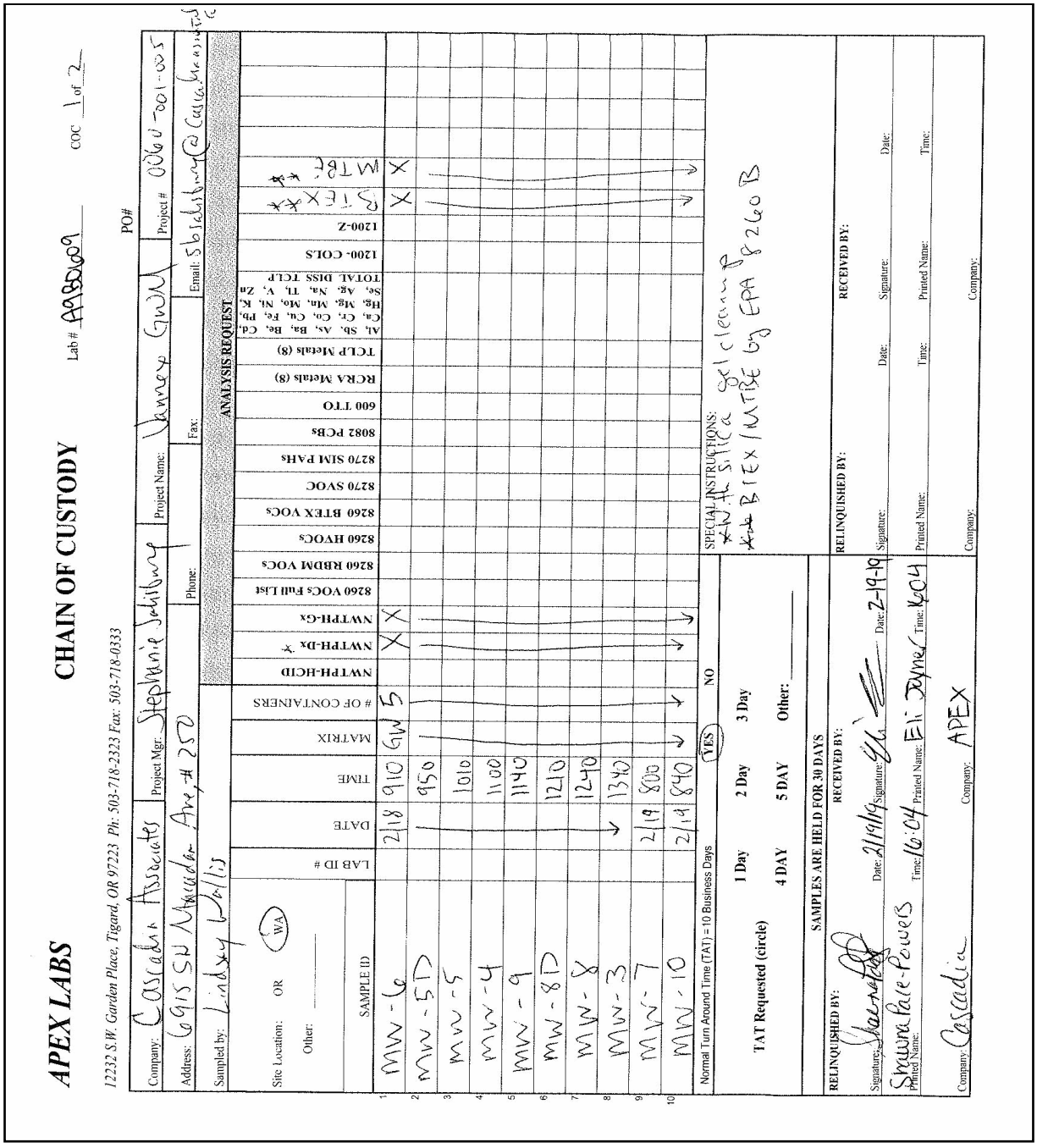
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**



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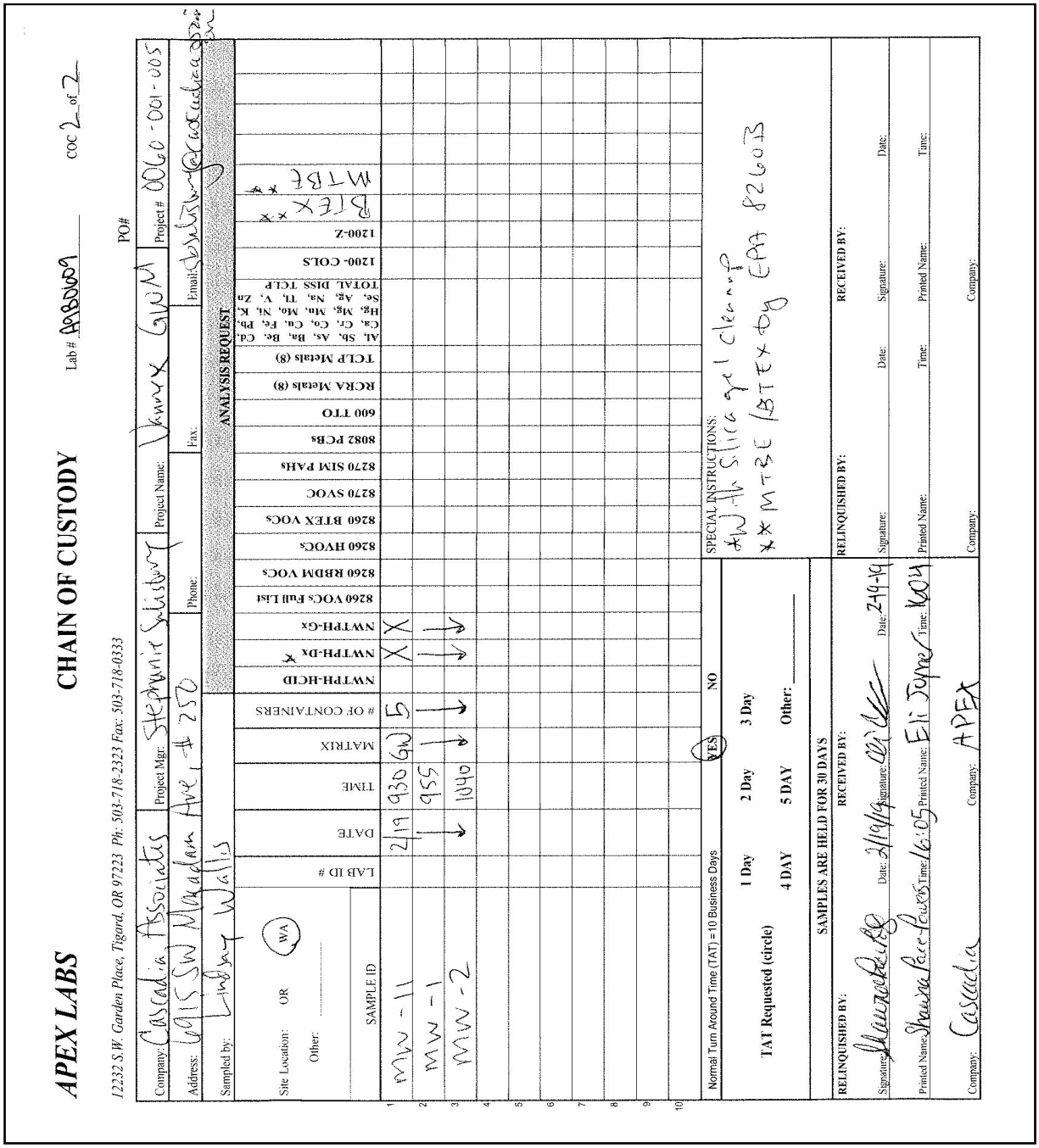

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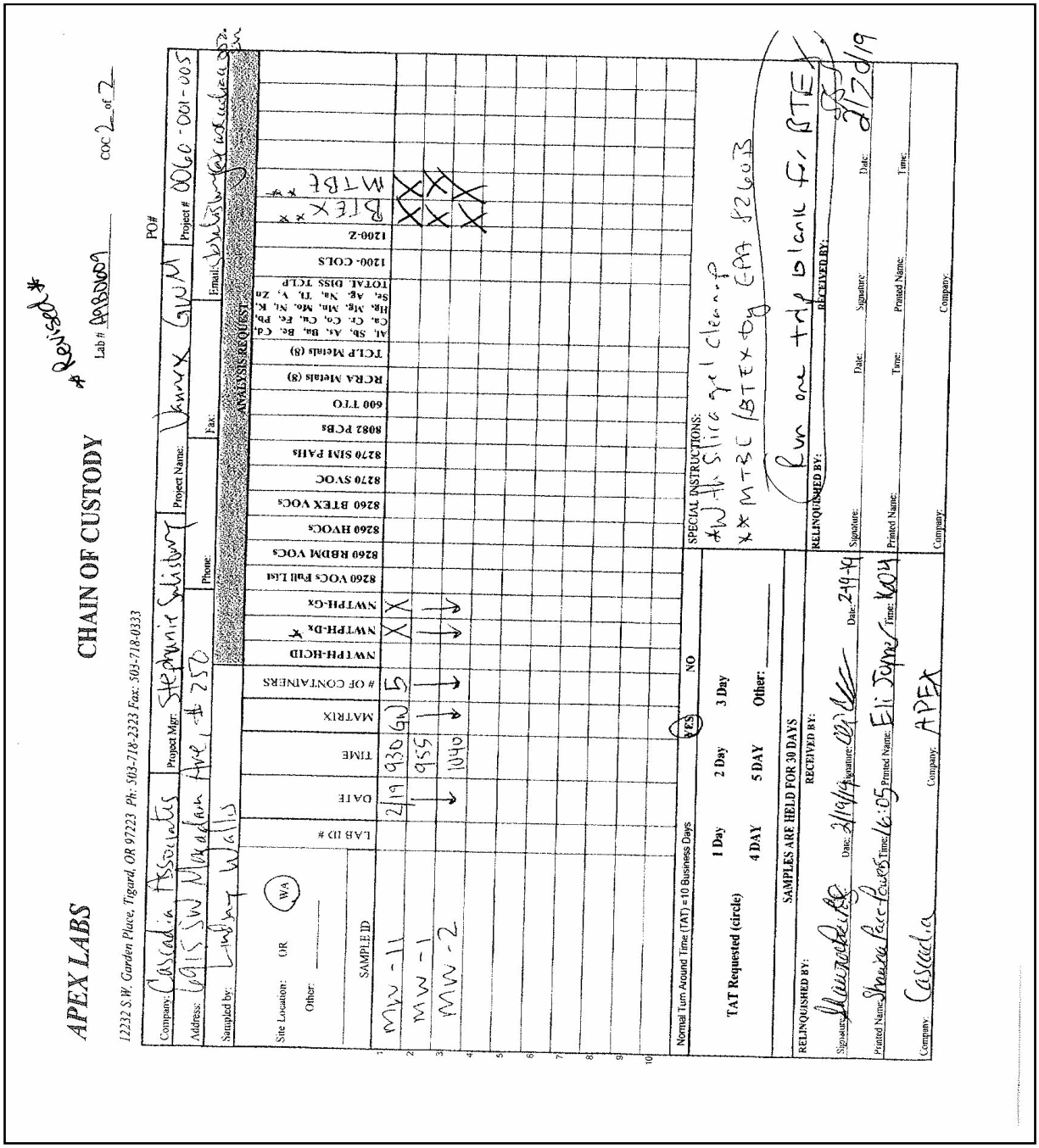
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**



Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Associates Element WO#: A9B0609

Project/Project #: Vannex GWM 0060-001-005

Delivery Info:

Date/time received: 2-19-19 @ 1604 By: EJ

Delivered by: Apex X Client ___ ESS ___ FedEx ___ UPS ___ Swift ___ Senvoy ___ SDS ___ Other ___

Cooler Inspection Date/time inspected: 2-19-19 @ 1645 By: EJ

Chain of Custody included? Yes X No ___ Custody seals? Yes ___ No X

Signed/dated by client? Yes X No ___

Signed/dated by Apex? Yes X No ___

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	3.5	3.8	2.4				
Received on ice? (Y/N)	Y	Y	Y				
Temp. blanks? (Y/N)	Y	Y	Y				
Ice type: (Gel/Real/Other)	Real	Real	Real				
Condition:	Good	Good	Good				

Cooler out of temp? (Y/N) Possible reason why:

If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA

Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 2/19/19 @ 1850 By: AKK

All samples intact? Yes X No ___ Comments:

Bottle labels/COCs agree? Yes ___ No X Comments: (5) Trip Blanks #1962 provided not on COC.

COC/container discrepancies form initiated? Yes ___ No ___ NA X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments:

Do VOA vials have visible headspace? Yes ___ No X NA ___

Comments

Water samples: pH checked: Yes X No ___ NA ___ pH appropriate? Yes ___ No X NA ___

Comments: MW-7 & MW-10 1/2 Ambers pH~7.

Additional information:

Labeled by: TM Witness: AKK Cooler Inspected by: AKK See Project Contact Form: Y

April 23, 2019 Service Request No:K1900833.01

Stephanie Salisbury
Cascadia Associates, LLC
6915 SW Macadam Ave.
Suite 250
Portland, OR 97219

Laboratory Results for: Vannex Additional Investigation

Dear Stephanie,

Enclosed is the revised report for the sample(s) submitted to our laboratory January 30, 2019. For your reference, these analyses have been assigned our service request number **K1900833.**

Results for Naphthalene added per client request.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris
Project Manager

ADDRESS 1317 S. 13th Avenue, Kelso, WA 98626
PHONE +1 360 577 7222 | FAX +1 360 636 1068
ALS Group USA, Corp.
dba ALS Environmental

REVISED
9:02 am, Apr 23, 2019

Narrative Documents

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: Apex Companies, LLC
Project: Vannex Additional Investigation
Sample Matrix: Ground Water

Service Request: K1900833
Date Received: 01/30/2019

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

One ground water sample was received for analysis at ALS Environmental on 01/30/2019. The sample was received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Semivoa GC:

Method NWTPH-Dx, Diesel and Residual Range Organics - Silica Gel Treated 2/04/19: Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD for these samples.

Volatiles by GC/MS:

No significant anomalies were noted with this analysis.

Approved by _____ Date 04/23/2019

SAMPLE DETECTION SUMMARY

CLIENT ID: B-22	Lab ID: K1900833-001					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Gasoline Range Organics-NWTPH	18800			12500	ug/L	NWTPH-Gx
Benzene	17	D	0.31	2.5	ug/L	8260C
Toluene	18	D	0.27	2.5	ug/L	8260C
Ethylbenzene	2200	D	2.5	25	ug/L	8260C
m,p-Xylenes	2500	D	5.5	25	ug/L	8260C
Diesel Range Organics (DRO)	500	L	11	250	ug/L	NWTPH-Dx

Sample Receipt Information

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: Apex Companies, LLC **Service Request:**K1900833

Project: Vannex Additional Investigation

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K1900833-001	B-22	1/29/2019	1200

~~APEX LABS~~ ALS

CHAIN OF CUSTODY

Lab # _____ COC ___ of ___

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# K1900833

Company: Cascadia Associates	Project Mgr: Stephanie Salisbury	Project Name: Vannex Additional Investigation	Project # —
Address: 6915 SW Macadam Ave #252	Phone: 503-906-6577 x110	Fax: —	Email: ssalisbury@cascadiaassociates.com
Sampled by: Lindsey Wallis			

Site Location: OR (WA)

Other: _____

ANALYSIS REQUEST

	SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx *	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn TOTAL DISS TCLP	1200- COLS	1200-Z	BTEX /MTBE **
1	B-22		1/29	1200	GW	5		X	X													X
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle) 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:
* Dx with silica gel cleanup
** BTEX and MTBE by 8260B
Rush TAT

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 1/30/19	Date: 1/30/19	Date: 1/30/19	Date: 1-30-19
Printed Name: Kirsten White	Printed Name: BRIAN MAN	Printed Name: BRIAN MAN	Printed Name:
Time: 753	Time: 0753	Time: 1015	Time: 1015
Company: Cascadia	Company:	Company:	Company: ALS-K

PC MH

Cooler Receipt and Preservation Form

Client Cascadia Associates Service Request K19 00833

Received: 1-30-19 Opened: 1-30-19 By: DSP Unloaded: 1-30-19 By: DSP

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* (*Courier*) *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other*_____ *NA*
3. Were custody seals on coolers? NA Y (N) If yes, how many and where?_____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected. Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number (NA)	Filed
4.9	4.7	3.3	3.1	-0.2	3C0			

4. Packing material: *Inserts* (*Baggies*) *Bubble Wrap* *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves*_____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA (Y) N
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA (Y) N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

*Notes, Discrepancies, & Resolutions:*_____

RUSH

Miscellaneous Forms

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Sample Results

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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www.alsglobal.com

Volatile Organic Compounds by GC/MS

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

REVISED
9:02 am, Apr 23, 2019

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Collected:**	01/29/19 12:00
Sample Matrix:	Ground Water	**Date Received:**	01/30/19 10:15
Sample Name:	B-22	**Units:**	ug/L
Lab Code:	K1900833-001	**Basis:**	NA

Volatile Organic Compounds

Analysis Method: 8260C
Prep Method: EPA 5030B

Analyte Name	Result		MRL	Dil.	Date Analyzed	Date Extracted	Q
Methyl tert-Butyl Ether	ND	U	2.5	5	01/30/19 14:55	1/30/19	
Benzene	**17**	**D**	2.5	5	01/30/19 14:55	1/30/19	
Toluene	**18**	**D**	2.5	5	01/30/19 14:55	1/30/19	
Ethylbenzene	**2200**	**D**	25	50	01/30/19 15:21	1/30/19	
m,p-Xylenes	**2500**	**D**	25	50	01/30/19 15:21	1/30/19	
o-Xylene	ND	U	2.5	5	01/30/19 14:55	1/30/19	
Naphthalene	ND	U	10	5	01/30/19 14:55	1/30/19	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
Dibromofluoromethane	111 D	73 - 122	01/30/19 14:55	
Toluene-d8	116 D	65 - 144	01/30/19 14:55	
4-Bromofluorobenzene	103 D	68 - 117	01/30/19 14:55	

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation	**Date Collected:**	01/29/19 12:00
Sample Matrix:	Ground Water	**Date Received:**	01/30/19 10:15
Sample Name:	B-22	**Units:**	ug/L
Lab Code:	K1900833-001	**Basis:**	NA

Volatile Petroleum Products Method for Soil and Water for the Northwest

Analysis Method: NWTPH-Gx
Prep Method: None

Analyte Name	Result	MRL	Dil.	Date Analyzed	Q
Gasoline Range Organics-NWTPH	**18800**	12500	50	01/30/19 15:10	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
1,4-Difluorobenzene	91	50 - 150	01/30/19 15:10	

Semivolatile Organic Compounds by GC

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Collected:**	01/29/19 12:00
Sample Matrix:	Ground Water	**Date Received:**	01/30/19 10:15
Sample Name:	B-22	**Units:**	ug/L
Lab Code:	K1900833-001	**Basis:**	NA

Diesel and Residual Range Organics - Silica Gel Treated

Analysis Method: NWTPH-Dx
Prep Method: EPA 3510C

Analyte Name	Result		MRL	Dil.	Date Analyzed	Date Extracted	Q
Diesel Range Organics (DRO)	**500**	**L**	250	1	02/04/19 12:59	1/30/19	
Residual Range Organics (RRO)	ND	U	490	1	02/04/19 12:59	1/30/19	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
o-Terphenyl	85	50 - 150	02/04/19 12:59	
n-Triacontane	81	50 - 150	02/04/19 12:59	

QC Summary Forms

ALS Environmental—Kelso Laboratory
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www.alsglobal.com

Volatile Organic Compounds by GC/MS

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: Apex Companies, LLC **Service Request:** K1900833
Project: Vannex Additional Investigation/
Sample Matrix: Ground Water

SURROGATE RECOVERY SUMMARY
Volatile Organic Compounds

Analysis Method: 8260C
Extraction Method: EPA 5030B

Sample Name	Lab Code	4-Bromofluorobenzene 68 - 117	Dibromofluoromethane 73 - 122	Toluene-d8 65 - 144
Batch QC	K1900813-002	104	111	115
B-22	K1900833-001	103 D	111 D	116 D
Batch QC MS	KWG1900546-1	105	107	120
Batch QC DMS	KWG1900546-2	108	111	117
Lab Control Sample	KWG1900546-3	110	109	117
Method Blank	KWG1900546-4	106	108	114

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Collected:**	N/A
Sample Matrix:	Ground Water	**Date Received:**	N/A
		Date Analyzed:	01/30/19
		Date Extracted:	01/30/19

Duplicate Matrix Spike Summary
Volatile Organic Compounds

Sample Name:	Batch QC	**Units:**	ug/L
Lab Code:	K1900813-002	**Basis:**	NA
Analysis Method:	8260C		
Prep Method:	EPA 5030B		

		Matrix Spike			Duplicate Matrix Spike					
		KWG1900546-1			KWG1900546-2					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Methyl tert-Butyl Ether	ND U	10.8	10.0	108	10.5	10.0	105	54-126	3	30
Benzene	ND U	10.8	10.0	108	10.1	10.0	101	63-144	7	30
Toluene	ND U	10.9	10.0	109	9.91	10.0	99	71-136	10	30
Ethylbenzene	ND U	11.2	10.0	112	9.98	10.0	100	66-136	12	30
m,p-Xylenes	ND U	21.4	20.0	107	19.6	20.0	98	67-135	9	30
o-Xylene	ND U	10.5	10.0	105	9.80	10.0	98	67-127	6	30
Naphthalene	ND U	8.86	10.0	89	9.14	10.0	91	52-147	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Collected:**	NA
Sample Matrix:	Ground Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1900546-4	**Basis:**	NA

Volatile Organic Compounds

Analysis Method: 8260C
Prep Method: EPA 5030B

Analyte Name	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Methyl tert-Butyl Ether	ND U	0.50	1	01/30/19 13:36	1/30/19	
Benzene	ND U	0.50	1	01/30/19 13:36	1/30/19	
Toluene	ND U	0.50	1	01/30/19 13:36	1/30/19	
Ethylbenzene	ND U	0.50	1	01/30/19 13:36	1/30/19	
m,p-Xylenes	ND U	0.50	1	01/30/19 13:36	1/30/19	
o-Xylene	ND U	0.50	1	01/30/19 13:36	1/30/19	
Naphthalene	ND U	2.0	1	01/30/19 13:36	1/30/19	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
Dibromofluoromethane	108	73 - 122	01/30/19 13:36	
Toluene-d8	114	65 - 144	01/30/19 13:36	
4-Bromofluorobenzene	106	68 - 117	01/30/19 13:36	

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Analyzed:**	01/30/19
Sample Matrix:	Ground Water	**Date Extracted:**	01/30/19

Lab Control Sample Summary
Volatile Organic Compounds

Analysis Method:	8260C	**Units:**	ug/L
Prep Method:	EPA 5030B	**Basis:**	NA
		Analysis Lot:	KWG1900545

Lab Control Sample
KWG1900546-3

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Benzene	8.24	10.0	82	69-124
Ethylbenzene	7.79	10.0	78	67-121
m,p-Xylenes	15.8	20.0	79	69-121
Methyl tert-Butyl Ether	10.2	10.0	102	54-126
Naphthalene	7.94	10.0	79	64-126
o-Xylene	8.43	10.0	84	71-119
Toluene	7.98	10.0	80	69-124

Client: Apex Companies, LLC **Service Request:** K1900833
Project: Vannex Additional Investigation
Sample Matrix: Ground Water

SURROGATE RECOVERY SUMMARY

Volatile Petroleum Products Method for Soil and Water for the Northwest

Analysis Method: NWTPH-Gx
Extraction Method: None

Sample Name	Lab Code	1,4-Difluorobenzene 50-150
B-22	K1900833-001	91
Method Blank	KQ1901263-05	89
Lab Control Sample	KQ1901263-03	95
Duplicate Lab Control Sample	KQ1901263-04	93

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation	**Date Collected:**	NA
Sample Matrix:	Ground Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KQ1901263-05	**Basis:**	NA

Volatile Petroleum Products Method for Soil and Water for the Northwest

Analysis Method: NWTPH-Gx
Prep Method: None

Analyte Name	Result	MRL	Dil.	Date Analyzed	Q
Gasoline Range Organics-NWTPH	ND U	250	1	01/30/19 13:06	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
1,4-Difluorobenzene	89	50 - 150	01/30/19 13:06	

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation	**Date Analyzed:**	01/30/19
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Duplicate Lab Control Sample Summary
Volatile Petroleum Products Method for Soil and Water for the Northwest

Analysis Method:	NWTPH-Gx	**Units:**	ug/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	623652

	Lab Control Sample KQ1901263-03			Duplicate Lab Control Sample KQ1901263-04					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Gasoline Range Organics-NWTPH	488	500	98	491	500	98	80-119	<1	30

Semivolatile Organic Compounds by GC

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Client: Apex Companies, LLC **Service Request:** K1900833
Project: Vannex Additional Investigation/
Sample Matrix: Ground Water

SURROGATE RECOVERY SUMMARY
Diesel and Residual Range Organics - Silica Gel Treated

Analysis Method: NWTPH-Dx
Extraction Method: EPA 3510C

Sample Name	Lab Code	n-Triacontane 50 - 150	o-Terphenyl 50 - 150
B-22	K1900833-001	81	85

Client: Apex Companies, LLC **Service Request:** K1900833
Project: Vannex Additional Investigation/
Sample Matrix: Water

SURROGATE RECOVERY SUMMARY
Diesel and Residual Range Organics - Silica Gel Treated

Analysis Method: NWTPH-Dx
Extraction Method: EPA 3510C

Sample Name	Lab Code	n-Triacontane 50 - 150	o-Terphenyl 50 - 150
Lab Control Sample	KWG1900543-1	88	92
Duplicate Lab Control Sample	KWG1900543-2	96	103
Method Blank	KWG1900543-3	92	93

Analytical Report

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1900543-3	**Basis:**	NA

Diesel and Residual Range Organics - Silica Gel Treated

Analysis Method: NWTPH-Dx
Prep Method: EPA 3510C

Analyte Name	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Diesel Range Organics (DRO)	ND U	250	1	02/04/19 12:37	1/30/19	
Residual Range Organics (RRO)	ND U	490	1	02/04/19 12:37	1/30/19	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
o-Terphenyl	93	50 - 150	02/04/19 12:37	
n-Triacontane	92	50 - 150	02/04/19 12:37	

Client:	Apex Companies, LLC	**Service Request:**	K1900833
Project:	Vannex Additional Investigation/	**Date Analyzed:**	02/04/19
Sample Matrix:	Water	**Date Extracted:**	01/30/19

Duplicate Lab Control Sample Summary
Diesel and Residual Range Organics - Silica Gel Treated

Analysis Method:	NWTPH-Dx	**Units:**	ug/L
Prep Method:	EPA 3510C	**Basis:**	NA
		Analysis Lot:	KWG1900616

	Lab Control Sample KWG1900543-1			Duplicate Lab Control Sample KWG1900543-2					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Diesel Range Organics (DRO)	1300	1600	82	1480	1600	93	46-140	13	30
Residual Range Organics (RRO)	713	800	89	784	800	98	45-159	9	30

APPENDIX E

FIELD SAMPLING FORMS

Project: Vanner GWM
Client: Mustar
Sampler: LW

Date: 2/18/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-10	758	—	18.42	—	
MW-6	0808	—	16.99	—	
MW-7	0809	—	11.41	—	
MW-5D	0813	—	16.43	—	
MW-5	0814	—	16.70	—	
MW-8	0817	—	17.28	—	
MW-8D	0818	—	17.59	—	
MW-9	0820	—	19.13	—	
MW-2	0827	—	28.04	—	
MW-4	0832	—	30.04	—	
MW-3	0835	—	28.94	—	
MW-11	0837	—	17.27	—	
MW-1	0840	—	16.51	—	

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-6	Job Number:	
Client:	Nustar	Date:	2/18/19
Project:	Vannex Glum	Sampler:	LW
Weather:	Overcast, 30°F	Time In/Out:	0858 / 0925

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	18.01	Water Column Length:	—
Well Cap Lock Present:	Yes (No)	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 | 2-inch = 0.162 | 4-inch = 0.653 | 1 gal = 3.785 liters

PURGING DATA

Purge Method: PP LF

Sampling Method:

Pump Intake Depth: NS

Tubing Material & Type: LDPE

(NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0857			18.01	0.2	6.48	11.55	743	10.05	-24.7	clear
0900			18.22	↓	6.51	11.85	749	5.34	-36.0	↓
0903			18.35		6.51	12.12	751	3.64	-44.6	
0906			18.48		6.51	12.11	751	2.95	-44.5	
0909			18.59		6.51	11.85	747	2.61	-46.9	
0912			18.62	↓	6.51	11.82	746	2.58	-47.7	↓

PURGING DATA

Sample ID:	MW-6	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	910	Final Depth to Water:	18.81		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40mL	HCl	VOCs	N	—		
2x1L	HCl	TPH	N	—		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5D	Job Number:	
Client:	Nustar	Date:	2/18/19
Project:	Vancex Grove	Sampler:	LW
Weather:	overcast, 30°F	Time In/Out:	0930 / 1000

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other: gravel	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	16.48	Water Column Length:	—
Well Cap Lock Present:	Yes / No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)				
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP	Pump Intake Depth:	NS
Sampling Method:	LF	Tubing Material & Type:	LDPE (NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0937			16.48	0.2	7.28	11.57	294	17.61	-59.6	clear
0940			16.51	↓	7.15	12.80	294	3.57	-30.3	↓
943			16.50		7.05	12.68	307	3.02	-30.7	
0946			16.49		6.99	12.58	362	2.57	-20.9	
0949			16.48		6.99	12.56	374	2.20	-18.6	
0952			16.47	↓	6.98	12.53	376	2.08	-17.9	↓

PURGING DATA

Sample ID:	MW-5D	Sampling Flow Rate:	0.2			Analytical Laboratory:	APEX
Sample Time:	950	Final Depth to Water:	16.49			Did Well Dewater:	NS
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40mL	HCl	VOCs	N	—			
2x1L	HCl	TPH	N	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	
Client:	Nultar	Date:	2/18/19
Project:	Vannex GWM	Sampler:	LW
Weather:	overcast, 30	Time In/Out:	1000 / 1025

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	17.94	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)				
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP / LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE

NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1000			17.94	0.2	6.78	12.78	424	3.44	-20.7	clear
1003			18.48	↓	6.75	13.34	436	2.26	-35.6	↓
1006			19.74		6.74	13.63	444	1.90	-57.1	
1009			20.04	↓	6.74	13.55	444	1.92	-55.1	↓

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1010	Final Depth to Water:	20.42		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40ml	HCl	VOCs	N	—		
2x1L	HCl	TDH	N	—		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-4	Job Number:	
Client:	Nustar	Date:	2/18
Project:	Tanner GWM	Sampler:	LW
Weather:	overcast, 30°F	Time In/Out:	1030 / 1110

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	30.01	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE — NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1046			30.02	0.2	6.44	12.08	166	11.52	60.7	clear
1049			30.02	↓	6.32	12.67	167	10.30	79.1	↓
1052			30.02	↓	6.23	13.11	168	10.22	102.9	↓
1055			30.02	↓	6.21	13.15	168	9.57	108.9	↓
1058			30.02	↓	6.20	13.31	168	7.41	118.2	↓
1101			30.03	↓	6.19	13.35	167	6.80	123.0	↓
1104			30.03	↓	6.19	13.38	167	6.40	124.4	↓
1107			30.04	↓	6.19	13.36	167	6.21	125.1	↓

PURGING DATA

Sample ID:	MW-4	Sampling Flow Rate:	0.2	Analytical Laboratory:		Apex
Sample Time:	1100	Final Depth to Water:	30.03	Did Well Dewater:		NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2x1L	HCl	TPH	N	—		
3x40mL	HCl	VOCs	N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	
Client:	NuStar	Date:	2/18/19
Project:	Connex GWM	Sampler:	LW
Weather:	overcast, 36°F	Time In/Out:	1120 / 1158

WELL DATA

Monument Type:	Flushmount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	19.20	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	DP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE (NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1124			19.20	0.2	6.28	12.67	109	11.01	137.0	clear
1127			19.18	↓	6.29	12.43	90	10.17	137.8	↓
1130			19.19		6.28	13.17	87	9.98	141.4	
1133			19.19		6.28	13.23	85	9.71	142.1	
1136			19.18	↓	6.28	13.30	86	9.61	144.1	↓

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	1140	Final Depth to Water:	19.20			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40mL	HCl	VOCs	N				
2x1L	HCl	TPH	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8D	Job Number:	
Client:	Nvidia	Date:	2/15/19
Project:	Tanner GWM	Sampler:	LW
Weather:	Overcast, 30°F	Time In/Out:	1150 / 1220

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	17.79	Water Column Length:	—
Well Cap Lock Present:	Yes / No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP / LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE

(NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1157			17.79	0.2	6.94	12.00	96	3.27	102.9 / 505.3	clear
1200			17.77	↓	7.15	11.54	92	1.41	105.6	↓
1203			17.78		7.21	11.68	92	1.57	103.8	
1206			17.79	↓	7.32	11.82	93	1.08	96.3	

PURGING DATA

Sample ID:	MW-8D	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1210	Final Depth to Water:	17.79		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40mL	HCl	VOCs	N			
2x1L	HCl	TPH	N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	Nustar	Date:	2/18/19
Project:	Vanner Circuit	Sampler:	LW
Weather:	Overcast	Time In/Out:	1220 / 1300

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	17.89	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP LF	Pump Intake Depth:	NS
Sampling Method:		Tubing Material & Type:	LDPE — (NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1224			17.89	0.3	6.06	12.49	70	6.44	106.5	clear
1227			19.80	↓	6.00	12.55	70	6.59	119.5	↓
1230			20.90	↓	5.97	12.34	70	7.26	137.1	
1233			21.40	0.15	5.97	12.30	70	7.47	139.7	
1236			22.51	0.1	5.99	12.28	70	7.49	139.1	

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	0.1		Analytical Laboratory:	Apex
Sample Time:	1240	Final Depth to Water:	22.49		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2x1L	HCl	TPH	N			
3x40mL	HCl	VOC	N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	Nustar	Date:	2/18/19
Project:	Vannoy AWM	Sampler:	LW
Weather:	overcast 38°F	Time In/Out:	1315 / 1355

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.59	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1323			29.65	0.2	6.25	13.57	190	6.98	126.1	clear
1326			29.91	0.2	6.29	13.65	191	6.04	59.5	
1329			29.91	0.15	6.28	13.77	186	4.15	53.7	
1332			29.91	0.15	6.27	13.78	184	2.83	55.0	
1335			29.91	↓	6.27	13.77	182	2.98	57.5	
1338			29.91	↓	6.26	13.78	180	3.89	59.4	↓

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	0.15			Analytical Laboratory:	Apex
Sample Time:	1340	Final Depth to Water:	29.91			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size		MS/MSD	Duplicate ID
2x1L	HCl	TPH	N				
3x40mL	HCl	VOCs	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	Nustar	Date:	2/19/19
Project:	Vanalex GWM	Sampler:	LW
Weather:	overcast, 40° F	Time In/Out:	730/ 810

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	~	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	11.51	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE (NEW / DEDICATED)

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
747			11.51	0.2	6.60	12.71	505	5.62	98.4	clear
750			11.54	↓	6.55	13.22	513	2.64	49.1	↓
753			11.58		6.54	13.44	516	2.30	28.4	
756			11.62		6.54	13.46	516	1.34	24.2	
759			11.64		6.54	13.47	516	1.30	22.7	
802			11.68	↓	6.54	13.48	515	1.22	22.4	↓

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	800	Final Depth to Water:	11.69	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40mL	HCl	VOCs	N				
2x1L	HCl	TPH	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-10	Job Number:	
Client:	Nustar	Date:	2/19/19
Project:	Vanmax Crown	Sampler:	LW
Weather:	overcast, 40	Time In/Out:	0820/855

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	18.39	Water Column Length:	—
Well Cap Lock Present:	Yes / No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE — NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0825			18.37	0.15	6.51	12.47	111	10.24	33.7	clear
0828			18.35	↓	6.37	12.27	85	9.44	65.4	↓
831			18.36	↓	6.32	12.32	79	9.10	81.7	↓
834			18.36	↓	6.28	12.50	77	8.78	100.6	↓
837			18.36	↓	6.28	12.68	77	8.75	106.9	↓
840			18.36	↓	6.28	12.66	76	8.69	107.9	↓

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	0.15			Analytical Laboratory:	Apex
Sample Time:	840	Final Depth to Water:	18.36			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40mL	HCl	VOCs	N	—			
2x1L	HCl	TPH	N	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-11	Job Number:	
Client:	Nustar	Date:	2/19/19
Project:	Vannex GWM	Sampler:	LW
Weather:	Rain, 40° F	Time In/Out:	910 / 935

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	17.29	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	FP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE

NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
917			17.35	0.15	6.56	13.47	186	4.50	48.5	clear
920			17.36	↓	6.51	14.10	179	1.44	38.7	↓
923			17.36		6.51	14.11	179	1.36	37.1	
926			17.36	↓	6.50	14.13	179	1.26	35.2	↓

PURGING DATA

Sample ID:	MW-11	Sampling Flow Rate:	0.15		Analytical Laboratory:		Apex
Sample Time:	930	Final Depth to Water:	17.36		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x1L	HCl	TPH	N				
3x40mL	HCl	VOCs	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	
Client:	Nustar	Date:	2/19
Project:	Vannex GWM	Sampler:	LW
Weather:	Rain, 40°	Time In/Out:	940 / 1010

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	
Monument Condition:	good	Depth to Water:	16.43	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—
Comments:					

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)				
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	PE (NEW) / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
943			16.44	0.15	6.87	13.68	2	1.88	8	clear
946			16.45	↓	6.53		4	1.41		↓
949			16.45		6.44	14		0.70	86	
952			16.45	↓	28	1.95	234		88.6	↓
955			16.45		6.9	3	233	0.61	89.7	
958			16.4	↓	6.31	13.94	233	56	90.9	↓

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apex	
Sample Time:	955	Final Depth to Water:	16.46	Did Well Dewater:	NO	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40ml	HCl	VOC	X				
2x	HCl	TPH	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	
Client:	Nustar	Date:	2/19/19
Project:	Vanmex GWM	Sampler:	LW
Weather:	Rain, 40	Time In/Out:	1020 / 1110

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	27.94	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	PP / LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE

NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1027			27.94	0.15	6.11	13.85	182	5.46	119.1	clear
1030			27.99	↓	6.09	13.89	183	4.09	123.6	↓
1033			28.00		6.07	13.91	185	3.53	124.6	
1036			28.00		6.06	13.94	187	1.92	125.7	
1039			28.01	↓	6.05	13.98	189	1.69	127.6	↓
1042			28.01		6.05	13.98	192	1.14	130.1	
1045			28.01		6.04	13.99	193	1.09	131.7	
1048			28.01	↓	6.04	13.99	192	1.01	132.7	↓

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	0.15		Analytical Laboratory:		Apex
Sample Time:	1040	Final Depth to Water:	28.01		Did Well Dewater:		no
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x1L	HCl	TPH	N				
3x40mL	HCl	VOCs	N				

NOTES/ADDITIONAL COMMENTS


Cascadia
Associates, LLC