February 24, 2020

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

Subject: **2019 Groundwater Monitoring Report**
NuStar Vancouver Annex Facility
5420 NW Fruit Valley Road
Vancouver, Washington
0060-001-005

Dear Mr. Smith:

Enclosed, please find the *2019 Groundwater Monitoring Report* that has been prepared on behalf of NuStar Terminals Services, Inc. (NuStar) by Cascadia Associates, LLC. (Cascadia). The enclosed report presents the results of four quarters of groundwater monitoring conducted in 2019 at the NuStar Vancouver Annex Facility.

If you have any questions or would like to discuss this further, please contact me at (503) 906-6577 (ext. 107) or Stephanie Bosze Salisbury (ext. 110).

Sincerely,

Amanda Spencer
Principal Hydrogeologist

Enclosure
2019 Groundwater Monitoring Report (electronic via email and 2 hard copies)

cc: Renee Robinson, NuStar Energy, L.P. (electronic deliverable)
Aaron Flett, NuStar Energy, L.P. (electronic deliverable)
Zack Chaffin, NuStar Energy, L.P. (electronic deliverable)
Chris Chan, NuStar Energy, L.P. (electronic deliverable)

2019 Groundwater Monitoring Report

NuStar Vancouver Annex Terminal

5420 NW Fruit Valley Road

Vancouver, Washington

Prepared for:

NuStar Terminals Operations Partnership, L.P.
19003 IH-10 West
San Antonio, Texas 78257

Prepared by:

Cascadia Associates, LLC
5820 SW Kelly Avenue, Suite B
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Project No. 0060-001-005
February 24, 2020

2019 Groundwater Monitoring 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

February 7, 2020

Prepared by:

Amanda Spencer

Principal, Cascadia Associates

Stephanie Bosze Salisbury, L.G.

Senior Associate Geologist, Cascadia Associates

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This groundwater monitoring report was prepared by Cascadia Associates, LLC (Cascadia) on behalf of NuStar Terminals Services, Inc. (NuStar) for groundwater monitoring conducted in 2019 at the NuStar Terminals Operations Partnership, L.P. 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. Results of the additional investigation 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 (Apex, 2015). Seven additional monitoring wells (MW-5 through MW-10 and MW-8D) were installed at the locations shown on Figure 2 for continued groundwater monitoring. In addition, a pilot study was conducted in one of these areas in 2017 to evaluate the efficacy of injecting chemical oxidants to address the petroleum hydrocarbons (Cascadia, 2019a).

NuStar initiated quarterly monitoring at the site in the fourth quarter of 2017. This report presents the results of the quarterly monitoring program conducted in 2019.

1.1 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 aboveground storage tanks (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 remains on-site but is 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.

1.2 GEOLOGY AND HYDROGEOLOGY

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

1.2.1 Geology

Regional Geology. The regional geology is summarized below and is based on reports prepared by Pacific Groundwater Group (PGG; 2001) and AMEC (2002). 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.

1.2.2 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 13 to 32 feet bgs.

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, 2002; SECOR, 2003; Ash Creek, 2009).

2.0 GROUNDWATER MONITORING - 2019

A comprehensive quarterly groundwater monitoring program was conducted in 2019 to monitor groundwater conditions at the site. The monitoring included the gauging and sampling of shallow monitoring wells MW-1 through MW-11, and deeper monitoring wells MW-5D and MW-8D using the Standard Operating Procedures (SOPs) included as Appendix A. The quarterly events were conducted from February 18 through 19; May 20 through 21; August 28 through 29; and November 18 through 19, 2019. Wells MW-3 and MW-4 were not sampled during the August 2019 monitoring event due to low water conditions.

2.1 GROUNDWATER ELEVATION MEASUREMENTS

Fluid level measurements were recorded to the nearest 0.01 foot from the surveyed top of monitoring well casing. (Note: well MW-11 was installed in February 2019 and the top of casing has not been surveyed; however, depth to groundwater measurements were recorded during each monitoring event). Depth to groundwater was measured using an electronic water level indicator probe. Although separate phase hydrocarbons (SPH) have not been observed at the site, the wells are assessed using an electronic water/hydrocarbon interface probe to document their absence.

Depth to groundwater and groundwater elevations for 2019 are provided in Table 1. Historical groundwater elevation data collected from 2007 through 2019 are included in Appendix B. Copies of the well gauging forms are provided in Appendix C.

2.1.1 SPH

SPH or sheen have not been observed in Facility wells and were not observed during 2019.

2.1.2 Groundwater Elevation

Groundwater gradient is generally flat at the site with a magnitude that ranged between 0.0001 to 0.0005 in 2019. The following subsections discuss the depth to groundwater and groundwater gradients observed for each quarterly event.

First Quarter 2019

Depths to groundwater ranged from 16.51 to 30.04 feet bgs in wells MW-1 through MW-4 located in the eastern portion of the Facility, corresponding to a range in groundwater elevations of 10.21 to 10.19 feet above Mean Sea Level (MSL). Depths to groundwater in wells MW- 5 through MW-10, located in the western tank area, ranged from 11.41 to 19.13 feet bgs, corresponding to elevations of 10.26 to 10.34 feet above MSL.

Figure 3 provides a groundwater elevation contour map for the depth to groundwater measurements collected in February 2019 during the first quarter 2019 monitoring event. As shown on Figure 3, a groundwater high is present in the northwestern portion of the site near well

MW-8. East of well MW-8, groundwater flows to the east-southeast at an approximate gradient of 0.0003. West of well MW-8, groundwater appears to flow westerly.

Second Quarter 2019

Depths to groundwater ranged from 13.22 to 26.74 feet bgs in wells MW-1 through MW-4 located in the eastern portion of the Facility, corresponding to a range in groundwater elevations of 13.50 to 13.49 feet above MSL. Depths to groundwater in wells MW-5 through MW-10, located in the western tank area ranged from 7.73 to 14.76 feet bgs, corresponding to elevations of 13.94 to 13.95 feet above MSL.

Figure 4 provides a groundwater elevation contour map for the depth to groundwater measurements collected in May 2019 during the second quarter 2019 monitoring event. As shown on Figure 4, the groundwater gradient is approximately 0.0005 across the site, with a variable flow direction that generally flows to the east-southeast. Measured groundwater elevations in wells MW-9 and MW-3 were markedly different than other nearby wells (1.01 feet higher, and 0.35 foot lower, respectively). These measurements were considered anomalous based on historical conditions and not used in contouring Figure 4.

Third Quarter 2019

Depths to groundwater ranged from 19.04 to 32.59 feet bgs in wells MW-1 through MW-4 located in the eastern portion of the site, corresponding to a range in groundwater elevations of 7.68 to 7.64 feet above MSL). Depths to groundwater in wells MW-5 through MW-10, located in the western tank area ranged from 13.99 to 21.74 feet bgs, corresponding to elevations of 7.68 to 7.65 feet above MSL.

Figure 5 provides a groundwater elevation contour map for the depth to groundwater measurements collected in August 2019 during the third quarter 2019 monitoring event. As shown on Figure 5, the groundwater gradient is essentially flat, measuring approximately 0.0001 across the site. A slightly higher groundwater elevation was measured in well MW-8 than other monitoring wells, indicating a slight flow direction to the west, south, and east.

Fourth Quarter 2019

Depths to groundwater ranged from 18.64 to 32.09 feet bgs in wells MW-1 through MW-4 located in the eastern portion of the site, corresponding to a range in groundwater elevations of 8.08 to 8.14 feet above MSL. Depths to groundwater in wells MW- 5 through MW-10, located in the western tank area ranged from 13.76 to 21.28 feet bgs, corresponding to elevations of 7.91 to 8.11 feet above MSL.

Figure 6 provides a groundwater elevation contour map for the depth to groundwater measurements collected in November 2019 during the fourth quarter 2019 monitoring event. Consistent with the third quarter event, groundwater gradient was flat, measuring just 0.0001 to the west across the site and 0.0004 to the southwest between wells MW-8 and MW-7.

2.2 GROUNDWATER SAMPLING AND ANALYSIS

The following describes the field methods, analytical results and quality assurance/quality control (QA/QC) procedures for groundwater sampling conducted at the Facility in 2019.

2.2.1 Methods and Procedures

Samples were collected from each well in accordance with the low-flow sampling SOPs provided in Appendix A. In brief, Facility monitoring wells were purged prior to sample collection, utilizing a peristaltic pump with the intake of the tubing placed midway within the screened interval of the monitoring well. Monitoring wells were purged until field parameters (pH, conductivity, temperature, oxidation-reduction potential [ORP], and dissolved oxygen [DO]) stabilized. Following stabilization of parameters, groundwater samples were collected directly from the discharge tube of the peristaltic pump into laboratory-supplied containers. Field sampling forms are provided in Appendix C.

Samples were labeled and placed in ice-cooled chests for transport, under chain of custody, to Apex Laboratories of Tigard, Oregon, for the following analyses:

- Benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert-butyl ether (MTBE), and naphthalene by U.S. Environmental Protection Agency (EPA) Method 8260C; and
- Total petroleum hydrocarbons gasoline (TPHg) by Method NWTPH-Gx and total petroleum hydrocarbons diesel (TPHd) by Method NWTPH-Dx (with silica gel cleanup).

2.2.2 Analytical Results

Analytical results for the 2019 groundwater monitoring events are summarized in Table 2. Historical analytical groundwater data collected from 2007 through 2019 are tabulated in Appendix D. Copies of the laboratory analytical reports are contained in Appendix E.

Groundwater analytical results for 2019 for BTEX/MTBE and TPHg and TPHd concentrations are displayed for each Facility monitoring well on Figures 7 and 8, respectively.

Eastern Area (Wells MW-1 through MW-4, and MW-11)

With the exception of detections slightly above the method reporting limit of MTBE in well MW-2 and ethylbenzene and xylenes in well MW-3, BTEX, MTBE, and naphthalene concentrations were all non-detect in wells MW-1 through MW-4. Well MW-11 was installed in January 2019, and the initial sampling of the well in February 2019 indicated detectable concentrations of TPHg, TPHd, and BTEX; however, the concentrations were below MTCA Method A Cleanup Levels. Results for the second, third, and fourth quarter events indicated variable TPHg, benzene, ethylbenzene, xylenes, and/or naphthalene concentrations, with some results above MTCA Method A Cleanup Levels. MTBE concentrations were not identified above method reporting limits in well M-11 and toluene concentrations were below MTCA Method A Cleanup Levels. As shown on Figures 7 and 8, MW-11

is surrounded by wells MW-1 through MW-4, demonstrating that the area of detectable TPH and BTEX concentrations is limited in extent.

Western Area (Shallow Wells MW-5 through MW-10, and Deeper Wells MW-5D and MW-8D)

TPH, BTEX, MTBE, and naphthalene were not detected in wells MW-7 through MW-10, MW-5D, and MW-8D, with the exception of TPHg slightly above method reporting limits in well MW-5D. Benzene, toluene, MTBE, and total petroleum hydrocarbons in the motor oil carbon range (TPHo) were not detected in well MW-5 and ethylbenzene was not detected above MTCA Method A Cleanup Levels. Consistent with previous results, TPHg, TPHd, xylenes, and naphthalene were detected in well MW-5 at concentrations above MTCA Method A Cleanup Levels.

TPHo and MTBE were not detected above method reporting limits in well MW-6 and toluene and xylene concentrations were below MTCA Method A Cleanup Levels. TPHg, TPHd, benzene, ethylbenzene, and naphthalene were detected above MTCA Method A Cleanup Levels. However, concentrations observed in the fourth quarter 2019 event were lower than the previous three quarters, and continued monitoring results will be evaluated to assess whether this is a consistent decreasing trend in concentrations in well MW-6.

The monitoring results confirm previous results that indicate the dissolved-phase hydrocarbons are limited both vertically and laterally, and appear to be two distinct and separate plumes, each localized around wells MW-5 and MW-6, respectively.

2.2.3 Quality Assurance/Quality Control (QA/QC)

QA/QC samples consisted of field duplicate samples, field trip blanks, laboratory method blanks, matrix spike/matrix spike duplicates (MS/MSD), laboratory control samples (LCS), and surrogate spike samples. The field and laboratory QA/QC results and an evaluation of the results to ascertain the usability of the data are included with the laboratory data sheets in Appendix E.

The QA/QC review of the data indicates:

- Samples were received by the analytical laboratory on ice below 4^0C, in good condition and in the appropriate laboratory-supplied sample containers.
- The samples were analyzed within their respective method holding times.
- The recovery for the MS sample was within control limits.
- The recovery for the LCS sample was within control limits.
- Surrogate recoveries were within the acceptable range.
- No compounds were detected in the trip blanks or laboratory method blanks.

The data were reviewed by Cascadia and found to be acceptable for use.

3.0 FUTURE WORK

Quarterly monitoring will continue in 2020. A revised feasibility study is in preparation and is scheduled to be submitted to Ecology by March 31, 2020.

4.0 REFERENCES

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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	02/18/19	26.72	14.5-24.5	--	16.51	--	10.21
	05/20/19	26.72		--	13.22	--	13.50
	08/28/19	26.72		--	19.04	--	7.68
	11/18/19	26.72		--	18.64	--	8.08
MW-2	02/18/19	38.27	20-35	--	28.04	--	10.23
	05/20/19	38.27		--	24.73	--	13.54
	08/28/19	38.27		--	30.63	--	7.64
	11/18/19	38.27		--	30.16	--	8.11
MW-3	02/18/19	39.17	24.5-34.5	--	28.94	--	10.23
	05/20/19	39.17		--	26.03	--	13.14
	08/28/19	39.17		--	31.51	--	7.66
	11/18/19	39.17		--	31.06	--	8.11
MW-4	02/18/19	40.23	20-35	--	30.04	--	10.19
	05/20/19	40.23		--	26.74	--	13.49
	08/28/19	40.23		--	32.59	--	7.64
	11/18/19	40.23		--	32.09	--	8.14
MW-5	02/18/19	27.03	10-25	--	16.70	--	10.33
	05/20/19	27.03		--	13.19	--	13.84
	08/28/19	27.03		--	19.31	--	7.72
	11/18/19	27.03		--	18.92	--	8.11
MW-5D	02/18/19	26.71	35-45	--	16.43	--	10.28
	05/20/19	26.71		--	12.72	--	13.99
	08/28/19	26.71		--	19.01	--	7.70
	11/18/19	26.71		--	18.62	--	8.09
MW-6	02/18/19	27.33	10-25	--	16.99	--	10.34
	05/20/19	27.33		--	13.56	--	13.77
	08/28/19	27.33		--	19.66	--	7.67
	11/18/19	27.33		--	19.31	--	8.02
MW-7	02/18/19	21.67	10-25	--	11.41	--	10.26
	05/20/19	21.67		--	7.73	--	13.94
	08/28/19	21.67		--	13.99	--	7.68
	11/18/19	21.67		--	13.76	--	7.91
MW-8	02/18/19	27.68	10-25	--	17.28	--	10.40
	05/20/19	27.68		--	13.93	--	13.75
	08/28/19	27.68		--	19.94	--	7.74
	11/18/19	27.68		--	19.57	--	8.11

Please see 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-8D	02/18/19	27.87	35-45	--	17.59	--	10.28
	05/20/19	27.87		--	13.90	--	13.97
	08/28/19	27.87		--	20.21	--	7.66
	11/18/19	27.87		--	19.80	--	8.07
MW-9	02/18/19	29.39	10-25	--	19.13	--	10.26
	05/20/19	29.39		--	14.63	--	14.76
	08/28/19	29.39		--	21.74	--	7.65
	11/18/19	29.39		--	21.28	--	8.11
MW-10	02/18/19	28.71	10-25	--	18.42	--	10.29
	05/20/19	28.71		--	14.76	--	13.95
	08/28/19	28.71		--	21.02	--	7.69
	11/18/19	28.71		--	20.67	--	8.04
MW-11	02/18/19	NS	10-25	--	17.27	--	NS
	05/20/19	NS		--	14.32	--	NS
	08/28/19	NS		--	19.55	--	NS
	11/18/19	NS		--	19.36	--	NS

Notes:

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

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)	Naphthalene (mg/L)
MW-1	02/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/20/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/19/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-2	02/19/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	0.00121	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	0.0031	--
	08/29/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00069	<0.00075	0.00125	<0.002
	11/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-3	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	--	--	--	--	--	--	--	--	--
	11/19/19	0.114	<0.0769	<0.154	<0.0002	<0.001	0.00661	0.0113	<0.001	<0.002
MW-4	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00150	<0.001	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	--	--	--	--	--	--	--	--	--
	11/19/19	<0.100	<0.0784	<0.157	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-5	02/18/19	**29.2**	**1.06 F-18**	<0.151	<0.00200	<0.0100	0.187	**1.06**	<0.010	--
	05/21/19	**22**	**0.722**	<0.0784	<0.002	<0.01	0.252	**1.04**	<0.010	--
	08/28/19	**24.8**	**0.963**	<0.0769	<0.002	<0.01	0.239	**1.1**	<0.01	**2.07**
	8/28/2019 DUP	**21.7**	**0.879**	<0.0769	<0.002	<0.01	0.179	0.836	<0.01	**1.44**
	11/18/19	**23.5**	**0.771**	<0.152	<0.004	<0.02	0.257	**1.19**	<0.02	**1.62**
	11/18/2019 DUP	**20.0**	**0.696**	<0.152	<0.01	<0.05	0.284	**1.46**	<0.05	**1.51**
MW-5D	02/18/19	0.165	<0.0748	<0.150	<0.000200	<0.00100	<0.00050	<0.00150	<0.001	--
	05/21/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	0.309	<0.0374	<0.0748	<0.0001	<0.0005	0.00078	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-6	02/18/19	**18.2**	**2.15 F-20**	<0.151	**0.249**	0.0408	**1.74**	0.577	<0.010	--
	05/20/19	**20**	**1.23**	<0.0755	**0.218**	0.0426	**1.86**	0.937	<0.010	--
	08/29/19	**16.8**	**1.64**	<0.0755	**0.177**	0.0394	**1.69**	0.585	<0.01	**0.561**
	11/19/19	**6.30**	**1.95**	<0.150	**0.0712**	<0.02	**0.709**	0.127	<0.02	**0.163**
MW-7	02/19/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0388	<0.0777	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-8	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0412	<0.0825	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-8D	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002

Please see notes at end of table.

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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)	Naphthalene (mg/L)
MW-9	02/18/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.0015	<0.001	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-10	02/19/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/21/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-11	02/19/19	0.727	<0.0748	<0.150	0.00162	0.00176	0.083	0.0652	<0.001	--
	05/21/19	**3.05**	<0.0374	<0.0748	**0.0643**	0.00843	0.359	0.0355	<0.0005	--
	08/29/19	**17.4**	0.094	<0.0748	0.0038	0.24	**1.18**	**2.52**	<0.005	0.121
	11/19/19	**45.0**	0.239	<0.151	**0.0526**	0.159	**4.33**	**7.73**	<0.02	**0.414**
Washington DOE MTCA Method A Cleanup Level		0.8	0.5	0.5	0.005	1	0.7	1	0.02	0.16

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

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.

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FIGURES

Source: USGS Map obtained from Esri ArcGIS Online

Site Parcel

0 1,000 2,000
Feet

Site Location Map

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure

1

Project:
Produced By: ErikStrandhagen Approved By:
Print Date: 2/6/2020
Path: C:\DATA\C0060_005_NuStar_VannexProjects\GWM_2019\VicinityMap.mxd

Document Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\GWM_2019\site_plan.mxd

Notes:
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.

Source:
Aerial from Mapbox.

- Groundwater Monitoring Well Location (MW-5D and MW-8D are Deep Monitoring Well Locations)
- Grab Groundwater Sample Location
- Deeper Direct-Push Geoprobe Location
- Historical Temporary Well Location (Approximate)
- Historical Hand Auger Location (Approximate)
- Historical Direct-Push Boring Location (Approximate)
- Soil Boring Location (2014)
- Soil Boring Location (2015)
- Soil Boring Location (2019)

0 25 50 100 Feet

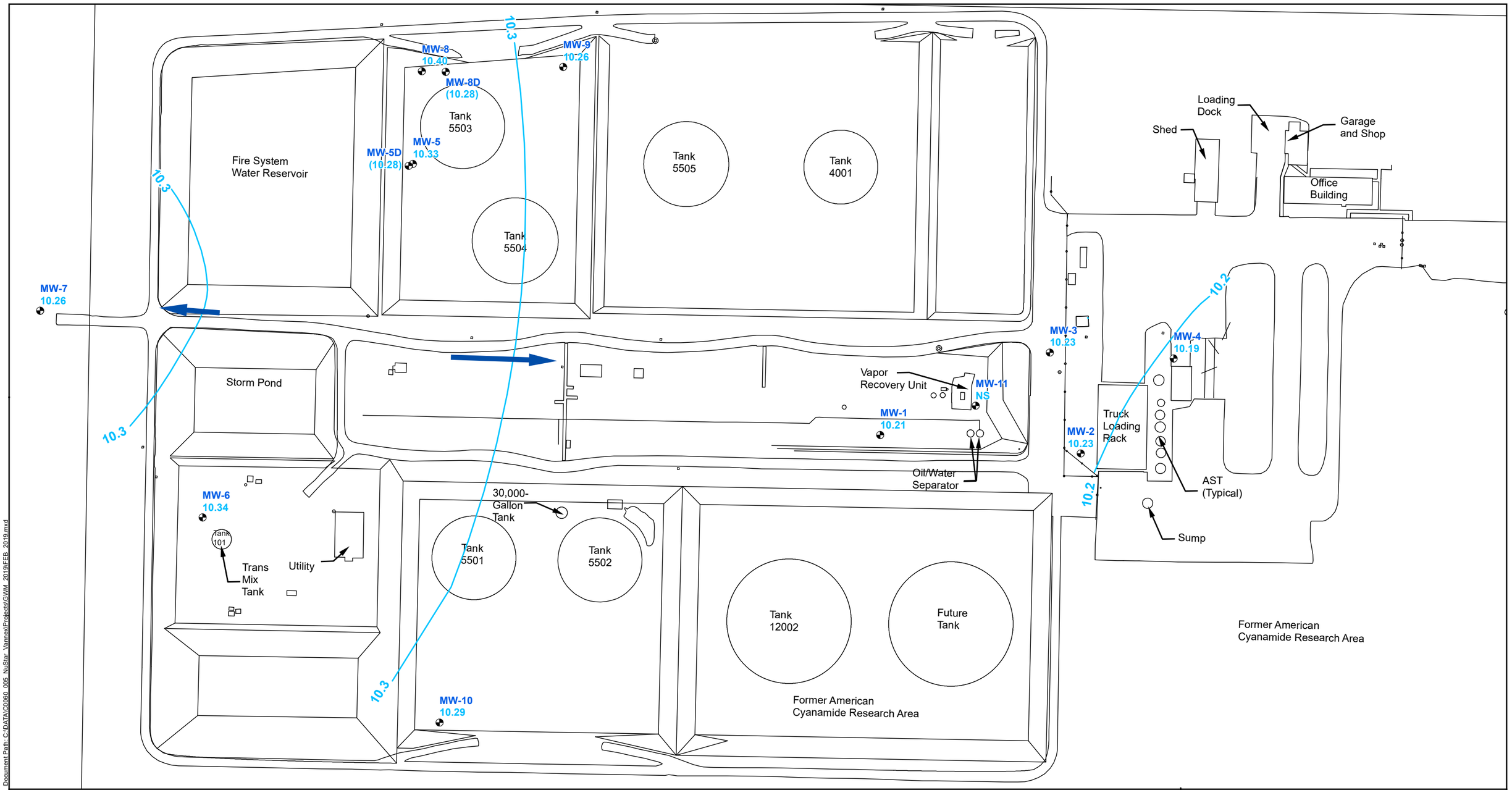
Site Plan

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure 2

2/6/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS



Document Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\GWM_2019\FEB_2019.mxd

MW-1 — Groundwater Monitoring Well Location

Groundwater Elevation Contour (Dashed Where Inferred)

10.28 — Groundwater Elevation in Feet Above Mean Sea Limit (MSL)

(10.28) — Deep Well Groundwater Elevation in Feet MSL (Not Used for Contouring)

NS — Not Surveyed

Inferred Groundwater Flow Direction

Notes:
1. 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).

2. Locations of roads and containments are approximate.

3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

0 25 50 100 Feet

Groundwater Elevation Contour Map February 2019

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

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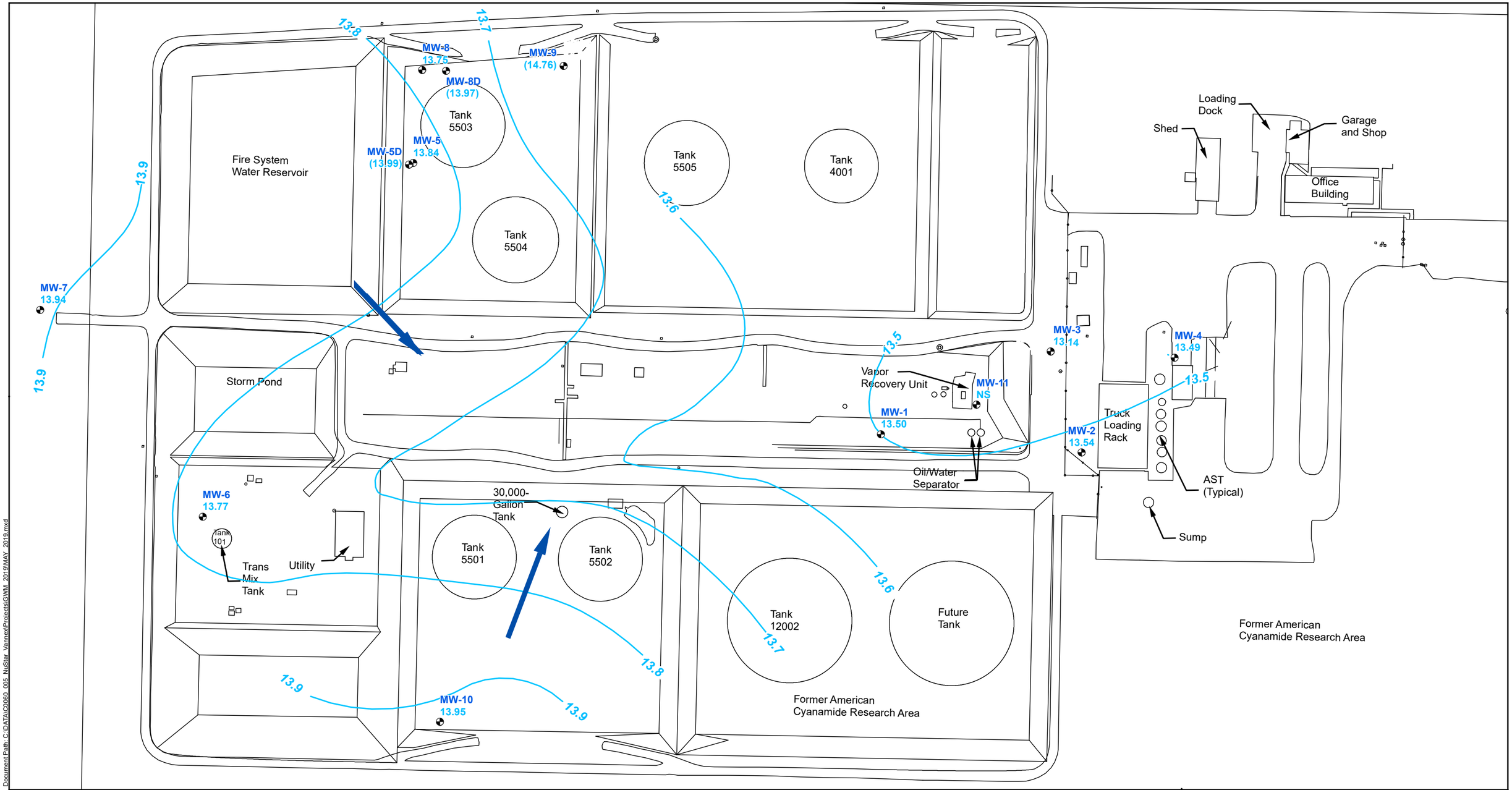
Figure 3

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS



MW-1 — Groundwater Monitoring Well Location

Groundwater Elevation Contour (Dashed Where Inferred)

10.28 — Groundwater Elevation in Feet Above Mean Sea Limit (MSL)

(10.28) — Well Groundwater Elevation in Feet MSL (Not Used for Contouring)

NS — Not Surveyed

Inferred Groundwater Flow Direction

Notes:
1. 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).

2. Locations of roads and containments are approximate.

3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

0 25 50 100 Feet

Groundwater Elevation Contour Map May 2019

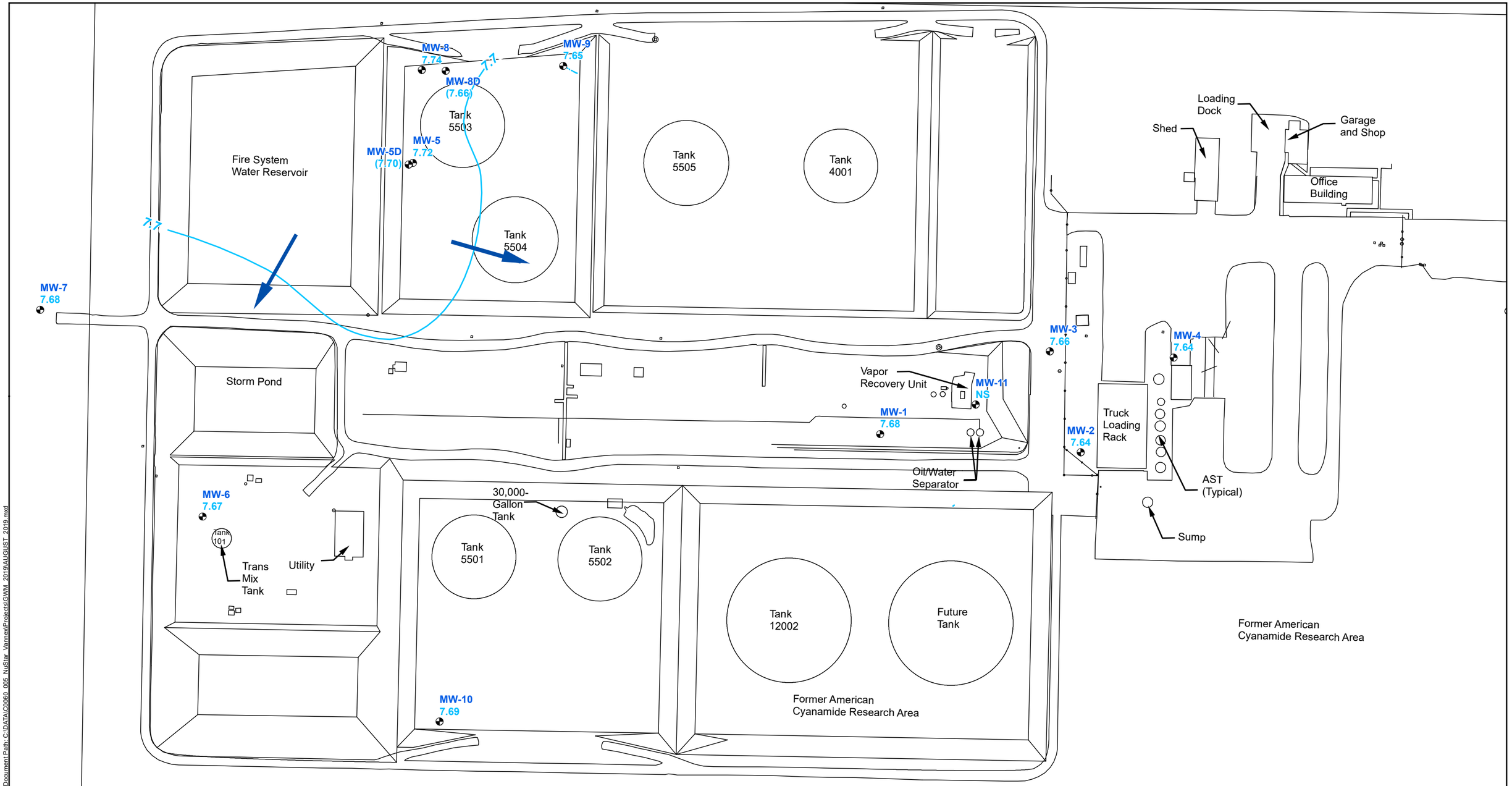
2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure 4

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS

Document Path: C:\DATA\C0060_005_NuStar_Vannet\Projects\GWM_2019\MAY_2019.mxd



Document Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\GWM_2019\AUGUST_2019.mxd

MW-1 — Groundwater Monitoring Well Location

Groundwater Elevation Contour (Dashed Where Inferred)

10.28 — Groundwater Elevation in Feet Above Mean Sea Limit (MSL)

(10.28) — Deep Well Groundwater Elevation in Feet MSL (Not Used for Contouring)

NS — Not Surveyed

Inferred Groundwater Flow Direction

Notes:
1. 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).

2. Locations of roads and containments are approximate.

3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

0 25 50 100 Feet

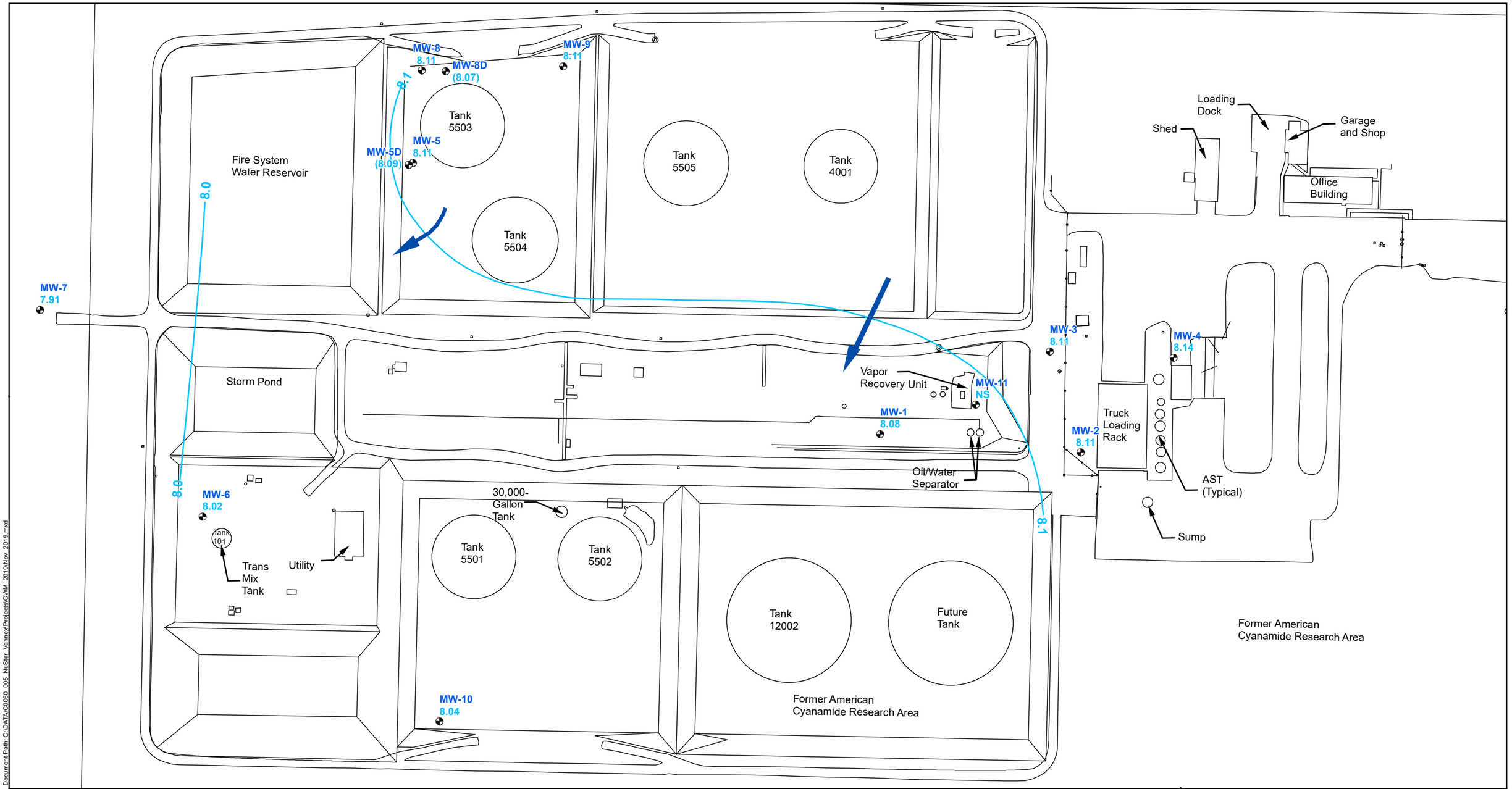
Groundwater Elevation Contour Map August 2019

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure 5

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS



MW-1 — Groundwater Monitoring Well Location

Groundwater Elevation Contour (Dashed Where Inferred)

10.28 — Groundwater Elevation in Feet Above Mean Sea Limit (MSL)

(10.28) — Deep Well Groundwater Elevation in Feet MSL (Not Used for Contouring)

NS — Not Surveyed

Inferred Groundwater Flow Direction

Notes:
1. 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).

2. Locations of roads and containments are approximate.

3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

0 25 50 100 Feet

Groundwater Elevation Contour Map November 2019

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

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Figure 6

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS

Document Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\GWM_2019\Nov_2019.mxd

MW-8	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-8D	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-7	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-6	Q1	Q2	Q3	Q4
B	**0.249**	**0.218**	**0.177**	**0.0712**
T	0.0408	0.0426	0.0394	<0.02
E	**1.74**	**1.86**	**1.69**	**0.709**
X	0.577	0.937	0.585	0.127
N	--	--	**0.561**	**0.163**

MW-9	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.0015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-5	Q1	Q2	Q3	Q4
B	<0.00200	<0.002	<0.002	<0.004
T	<0.0100	<0.01	<0.01	<0.02
E	0.187	0.252	0.239	0.257
X	**1.06**	**1.04**	**1.10**	**1.46**
N	--	--	**2.07**	**1.62**

MW-5D	Q1	Q2	Q3	Q4
B	<0.000200	<0.0001	<0.0001	<0.0002
T	<0.00100	<0.0005	<0.0005	<0.001
E	<0.00050	<0.00025	0.00078	<0.0005
X	<0.00150	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-1	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-10	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	<0.00025	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

MW-11	Q1	Q2	Q3	Q4
B	0.00162	**0.0643**	0.0038	**0.0526**
T	0.00176	0.00843	0.24	0.159
E	0.083	0.359	**1.18**	**4.33**
X	0.0652	0.0355	**2.52**	**7.73**
N	--	--	0.121	**0.414**

MW-3	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	--	<0.0002
T	<0.001	<0.0005	--	<0.001
E	<0.0005	<0.00025	--	0.00661
X	<0.00015	<0.00075	--	0.0113
N	--	--	--	<0.002

MW-4	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	--	<0.0002
T	<0.001	<0.0005	--	<0.001
E	<0.0005	<0.00025	--	<0.0005
X	<0.00150	<0.00075	--	<0.0015
N	--	--	--	<0.002

MW-2	Q1	Q2	Q3	Q4
B	<0.0002	<0.0001	<0.0001	<0.0002
T	<0.001	<0.0005	<0.0005	<0.001
E	<0.0005	<0.00025	0.00069	<0.0005
X	<0.00015	<0.00075	<0.00075	<0.0015
N	--	--	<0.002	<0.002

Abbreviations		MTCA Method A Cleanup Level (mg/L)
B	Benzene	0.005
T	Toluene	1.00
E	Ethylbenzene	0.70
X	Xylenes	1.00
N	Naphthalene	0.16

Tank 5503
Tank 4001
Tank 5504
Tank 5501
Tank 5502
Tank 12002
Loading Dock
Shed
Garage and Shop
Office Building
Vapor Recovery Unit
Oil/Water Separator
Truck Loading Rack
AST (Typical)
Former American Cyanamide Research Area

Groundwater Monitoring Well Location

Location Sampled → MW-5
Analyte Sampled → E: 0.187
Monitoring Time Period → Q1
< = Non-Detected
Highlighted Concentration Exceeds MTCA Method A Cleanup Level

Notes:
1. 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).
2. Locations of roads and containments are approximate.
3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

0 25 50 100 Feet

BTEX and Naphthalene in Groundwater from Monitoring Wells 2019

2019 Groundwater Monitoring Report
NuStar Terminals Operations Partnership L.P. - Annex Terminal
Vancouver, Washington

Cascadia Associates, LLC

Figure 7

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS

Document Path: C:\DATA\C0060_005_NuStar_Vannex\Projects\GWM_2019\BTEX.mxd

MW-8	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0755	<0.0374	<0.0412	<0.0755

MW-8D	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0755	<0.0374	<0.0377	<0.0762

MW-9	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0748	<0.0374	<0.0374	<0.0762

MW-5	Q1	Q2	Q3	Q4
TPH-g	**29.2**	**22**	**24.8**	**23.5**
TPH-d	**1.06***	**0.722**	**0.963**	**0.771**

MW-5D	Q1	Q2	Q3	Q4
TPH-g	0.165	<0.05	0.309	<0.100
TPH-d	<0.0748	<0.0377	<0.0374	<0.0755

MW-3	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	--	0.114
TPH-d	<0.0755	<0.0377	--	<0.0769

MW-7	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0748	<0.0377	<0.0388	<0.0748

MW-6	Q1	Q2	Q3	Q4
TPH-g	**18.2**	**20**	**16.8**	**6.30**
TPH-d	**2.15***	**1.23**	**1.64**	**1.95**

MW-1	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0762	<0.0374	<0.0374	<0.0755

MW-11	Q1	Q2	Q3	Q4
TPH-g	0.727	**3.05**	**17.4**	**45.0**
TPH-d	<0.0748	<0.0374	0.094	0.239

MW-10	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0748	<0.0377	<0.0374	<0.0762

MW-4	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	--	<0.100
TPH-d	<0.0755	<0.0377	--	<0.0784

MW-2	Q1	Q2	Q3	Q4
TPH-g	<0.100	<0.05	<0.05	<0.100
TPH-d	<0.0755	<0.0377	<0.0377	<0.0762

Tank 5503
Tank 5505
Tank 4001
Storm Pond
Vapor Recovery Unit
Oil/Water Separator
30,000-Gallon Tank
Tank 5501
Tank 5502
Tank 12002
Future Tank
Tank 101
Trans Mix Tank
Utility
Loading Dock
Shed
Garage and Shop
Office Building
Truck Loading Rack
AST (Typical)
Sump
Former American Cyanamide Research Area
Former American Cyanamide Research Area

Abbreviations		MTCA Method A Cleanup Level (mg/L)
TPH-g	Total Petroleum Hydrocarbons Gasoline-Range	**0.800**
TPH-d	Total Petroleum Hydrocarbons Diesel-Range	**0.500**

Groundwater Monitoring Well Location

Location Sampled — MW-11 | Q1 | Q2 — Monitoring Time Period
TPH-g | 0.727 | **3.05** — Highlighted Concentration Exceeds MTCA Method A Cleanup Level
Analyte Sampled — TPH-d | <0.0748 | <0.0374 — < = Non-Detected

Notes:
1. 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).
2. Locations of roads and containments are approximate.
3. Wells MW-1 through MW-11 are shallow wells screened across first encountered groundwater. Wells MW-5D and MW-8D are deeper monitoring well locations.

* Estimated Value

0 25 50 100 Feet

TPHg and TPHd in Groundwater from Monitoring Wells - 2019

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

Cascadia Associates, LLC

Figure 8

2/7/2020	Project No.: 0060-001-005	Drawn by: ES	Checked by: SS

Document Path: C:\DATA\20060_005 NuStar Vannex\Projects\GWM_2019\TPH_2019.mxd

APPENDIX A

CASCADIA STANDARD OPERATING PROCEDURES (SOPS)

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 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 B

HISTORICAL GROUNDWATER ELEVATION DATA

Table B-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
	05/20/19	26.72		--	13.22	--	13.50
	08/28/19	26.72		--	19.04	--	7.68
	11/18/19	26.72		--	18.64	--	8.08
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
	05/20/19	38.27		--	24.73	--	13.54
	08/28/19	38.27		--	30.63	--	7.64
	11/18/19	38.27		--	30.16	--	8.11

Please refer to notes at end of table.

Cascadia Associates, LLC

Table B-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
	05/20/19	39.17		--	26.03	--	13.14
	08/28/19	39.17		--	31.51	--	7.66
	11/18/19	39.17		--	31.06	--	8.11
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
	05/20/19	40.23		--	26.74	--	13.49
	08/28/19	40.23		--	32.59	--	7.64
	11/18/19	40.23		--	32.09	--	8.14
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
	05/20/19	27.03		--	13.19	--	13.84
	08/28/19	27.03		--	19.31	--	7.72
	11/18/19	27.03		--	18.92	--	8.11

Please refer to notes at end of table.

Cascadia Associates, LLC

Table B-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
	05/20/19	26.71		--	12.72	--	13.99
	08/28/19	26.71		--	19.01	--	7.70
	11/18/19	26.71		--	18.62	--	8.09
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
	05/20/19	27.33		--	13.56	--	13.77
	08/28/19	27.33		--	19.66	--	7.67
	11/18/19	27.33		--	19.31	--	8.02
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
	05/20/19	21.67		--	7.73	--	13.94
	08/28/19	21.67		--	13.99	--	7.68
	11/18/19	21.67		--	13.76	--	7.91
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
	05/20/19	27.68		--	13.93	--	13.75
	08/28/19	27.68		--	19.94	--	7.74
	11/18/19	27.68		--	19.57	--	8.11
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
	05/20/19	27.87		--	13.9	--	13.97
	08/28/19	27.87		--	20.21	--	7.66
	11/18/19	27.87		--	19.80	--	8.07

Please refer to notes at end of table.

Cascadia Associates, LLC

Table B-1
Groundwater Elevation Data
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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-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
	05/20/19	29.39		--	14.63	--	14.76
	08/28/19	29.39		--	21.74	--	7.65
	11/18/19	29.39		--	21.28	--	8.11
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
	05/20/19	28.71		--	14.76	--	13.95
	08/28/19	28.71		--	21.02	--	7.69
	11/18/19	28.71		--	20.67	--	8.04
MW-11	02/18/19	NS	10 - 25	--	17.27	--	NS
	05/20/19	NS		--	14.32	--	NS
	08/28/19	NS		--	19.55	--	NS
	11/18/19	NS		--	19.36	--	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

APPENDIX C

FIELD GAUGING AND 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

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-06	Job Number:	
Client:	NuStar Yarnell	Date:	5/20
Project:	Yarnell GWM	Sampler:	LW/NW
Weather:	Overcast	Time In/Out:	1025 - 1050

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:	14.99	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	
1003	2 L/m		14.32	0.2	6.28	13.1	668	6.6	243.6	Clear
1006			14.65		6.32	13.2	661	1.1	235.5	
1010			14.96		6.36	13.2	650	0.59	160.5	
1013			14.96		6.36	13.3	640	0.40	94.6	
1016			14.96		6.35	13.4	639	0.37	79.5	
1019			↓	↓	6.38	13.4	638	0.32	62.3	
1022			14.99		6.39	13.5	627	0.32	53.0	

PURGING DATA

Sample ID:	MW-06	Sampling Flow Rate:	0.2 L/m			Analytical Laboratory:	Apex
Sample Time:	1025	Final Depth to Water:	14.99			Did Well Dewater:	N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	N	—			
2 x 1 L	HCl	TPH	N	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	Nustar Vannex	Date:	5/20/19
Project:	GWM	Sampler:	LW/JW
Weather:	overcast	Time In/Out:	1050 / 1130

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:		Water Column Length:	—
Well Cap Lock Present:	(Yes) No New	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	
1107			26.05	0.25	6.70	14.5	161.4	3.22	56.5	cle
1110			26.06	0.2	6.50	14.5	159.3	0.78	69.7	↓
1113			26.07	↓	6.41	14.4	158.7	0.55	76.2	
1116			26.07		6.36	14.5	162.7	0.43	80.8	
1119										

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	0.2		Analytical Laboratory:	AP
Sample Time:	1130	Final Depth to Water:	26.07		Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2X40	HCl	VOCs				
1X1L	HCl	TPH				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-4	Job Number:	
Client:	Nustar Vanmex	Date:	5/20
Project:	GWM	Sampler:	LW
Weather:	Overcast	Time In/Out:	1140 / 1215

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:	26.71	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:	~5
Sampling Method:	LF	Tubing Material & Type:	LDP
			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	
1145			26.72	0.2	6.24	16.2	1333	6.44	123.3	e
1148			26.72	↓	6.40	14.2	159.6	6.39	99.7	↓
1151			↓	↓	6.16	13.2	153.6	~~6.16~~	114.7	
1154			↓	↓	6.06	13.2	154.2	~~5.65~~ 5.53	119.3	
1157			↓	↓	6.00	13.1	154.0	5.47	123.4	↓
1200			↓	↓	6.00	13.2	153.9	45	124.4	↓

PURGING DATA

Sample ID:	MW-4	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	1200	Final Depth to Water:	26.72			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x1L	HCl	TPH					
3x40	HCl	VOCs					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	
Client:	Nustar Vannex	Date:	5/20/19
Project:	GWM	Sampler:	LW
Weather:	Overcast	Time In/Out:	1220 / 1250

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:	24.66	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	
1226			24.66	0.2	5.94	14.2	157.1	4.53	142.9	clear
1229			24.68		5.82	14.1	189.3	0.86	146.4	
1232			24.69		5.80	14.1	189.4	0.54	146.1	
1235			24.70		5.78	14.1	188.0	0.43	149.4	
1238										

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1240	Final Depth to Water:	24.72		Did Well Dewater:	ND
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2x1L	HCl	TPH	—			
3x40mL	HCl	VOCs	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	Nustar Vancouver	Date:	5/20/19
Project:	GW M	Sampler:	LW
Weather:	Overcast / Rain	Time In/Out:	1300 / 1330

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:	7.94	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	
1309			7.94	0.2	6.38	13.4	436.9	3.09	146.7	clear
1312			7.98	↓	6.41	13.3	436.2	0.95	124.4	↓
1315			8.01		6.43	13.4	435.4	0.55	122	
1318			8.04		6.43	13.3	434.6	0.40	121.0	
1321			8.07		6.43	13.3	434.3	0.37	120.8	

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1320	Final Depth to Water:	8.11	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2x1L	HCl	TPH	—			
3x40mL	HCl	VOCs	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	
Client:	NuStar Vannex	Date:	JW/LW 5/24
Project:	GWM	Sampler:	
Weather:	PT Cloudy	Time In/Out:	0715 - 0750

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:	13.09	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments: New Well Cap

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 Low Flow	Pump Intake Depth:	Mid Screen
Sampling Method:	PP	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	
7:27			13.09	0.2	6.72	14.0	192.0	0.91	193.5	clea
7:30			↓	↓	6.48	14.0	192.6	0.53	195.5	↓
7:33					6.37	14.0	192.5	0.41	188.5	
7:36					6.29	14.0	192.6	0.35	180.5	
7:39					6.27	14.0	191.5	0.32	177.8	

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	0.2 L/min	Analytical Laboratory:		Apex
Sample Time:	0740	Final Depth to Water:	13.09	Did Well Dewater:		N

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40	HCl	VOC	N	—	—	
2 x 1 L	HCl	TPH	N	—	—	

NOTES/ADDITIONAL COMMENTS

Cascadia Associates, LLC

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Monument Type:	Flush-mount/Stick-up	
	Other:	
Monument Condition:	Good	
Well Cap Lock Present:	Yes No	
Comments:		
Purge Volume = (Water Height) X (Multiplier) X (# Casing Vol		
Water height multipliers (gal):	1-inch well = 0.041	

Purge Method:	PP
Sampling Method:	Low Flow

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purg (L/
0803			14.28	0.
0806				
0809				
0812				
0815				
0818				

Sample ID:	MW-11	Samp
Sample Time:	0820	Final
No. of Containers/Type	Preservative	Analy
3x 40	HCl	
2x 1L	HCl	

WELL MONITORING DATA

Cascadia Associates, LLC

Well ID:	MW-10
Client:	Nustar
Project:	GWM
Weather:	Overcast

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:
	Other:	Well Depth:
Monument Condition:	Good	Depth to Water:
Well Cap Lock Present:	Yes No	Screened Interval:
Comments:		
Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)		
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162

PURGING DATA

Purge Method:	PP	Pump Intake Depth:
Sampling Method:	LF	Tubing Material & Type

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)
					+/-0.1	+/-0.5 °
0910			14.81	0.25	8.20	12.(
0913			14.81		7.40	12.(
0916			14.81		6.94	12.-
0919			14.81		6.75	12.-
0922			14.81		6.46	12.8
0925			14.81		6.42	12.8
0928			14.81		6.32	12
0931			14.81		6.27	12.8
0934			14.81		6.22	12.

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	
Sample Time:	0930	Final Depth to Water:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filte
3X40	HCl	VOCs	N
2X 1L	HCl	TPH	N

NOTES/ADDITIONAL COMI

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5D	Job Number:	
Client:	Nustar Vancex	Date:	5/21/19
Project:	GWM	Sampler:	LW / JW
Weather:	Sun	Time In/Out:	0840 / 0910

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good - missing 1 tab	Depth to Water:	12.68	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	
0844			12.68	0.2	6.89	14.0	246.0	3.78	515	clear
0847			12.69	↓	7.00	13.9	249.5	3.96	44.1	↓
0850			12.69	↓	6.94	13.9	255.4	2.93	49.5	↓
853			12.69	↓	6.93	13.9	259.6	2.09	51.3	↓
0856			12.69	↓	6.91	13.9	265.1	1.61	53.3	↓
0859			12.69	↓	6.91	13.9	266.5	1.59	53.3	↓

PURGING DATA

Sample ID:	MW-5D	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	0855	Final Depth to Water:	12.69		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3X40	HCl	VOCs	—				
1X1	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	
Client:	Winstar Commerce	Date:	5/21/19
Project:	GWM	Sampler:	LW / JW
Weather:	Sun	Time In/Out:	0900 / 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:	13.11	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	
0906			13.11	0.25	6.80	14.0	356.0	2.79	69.2	clear
0909			13.55	"	6.72	14.0	354.1	0.57	53.1	"
0912			14.05	"	6.71	13.9	352.1	0.42	45.9	"

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	0.2 L/min			Analytical Laboratory:	Apex
Sample Time:	0920	Final Depth to Water:	15.01			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

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8D	Job Number:	
Client:	Nu Star Vannex	Date:	5/21/15
Project:	GWM	Sampler:	LW/JW
Weather:	Sun	Time In/Out:	0930 - 955

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:	13.85	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:	Low Flow	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	
0933			13.85	0.2	7.09	12.7	87.3	4.12	19.9	clear
0936			13.85	↓	6.99	12.7	86.4	3.65	29.2	↓
0939			13.85	↓	6.78	12.7	86.7	3.64	43.7	↓
0942			↓	↓	6.86	12.7	86.3	3.77	42.6	↓
0945			↓	↓	6.93	12.7	86.9	3.63	40.8	↓
0948			↓	↓	6.96	12.7	87.4	3.53	40.4	↓

PURGING DATA

Sample ID:	MW-8D	Sampling Flow Rate:	0.2 L/min		Analytical Laboratory:	Apex
Sample Time:	0940	Final Depth to Water:	13.85		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40	HCl	VOC	—			
2 x 1L	HCl	TPH	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	Nustar Valero	Date:	5/21/19
Project:	GWM	Sampler:	JW/CW
Weather:	Sun	Time In/Out:	1005 - 1030

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:	13.75	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	
1001			13.78	0.2	6.99	12.3	68.9	3.92	81.8	Clear
1004				6.6	[illegible]	12.3	68.4	3.52	104.2	↓
1007			14.52	0.2	6.31	12.2	67.5	3.54	115.0	
1010			14.70	↓	6.1	12.2	66.8	3.57	123.7	
1013					6.04	12.2	67.6	3.70	125.8	
1015			14.75	↓	5.98	12.2	65.7	3.71	127.4	
1018					5.95	12.2	66.1	3.71	130.8	

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:			Analytical Laboratory:	Apex
Sample Time:	1020	Final Depth to Water:	14.75		Did Well Dewater:	N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40	HCl	VOC	N	—	—	
2 x 1L	HCl	TPH	N	—	—	

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	
Client:	Nu Star Nanonex	Date:	5/21/19
Project:	GWM	Sampler:	JW/GW
Weather:	Sun	Time In/Out:	1035 - 1100

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:	15.52	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	
1038			15.52	0.2	6.12	13.5	82.5	4.17	127.4	clear
1041			↓	↓	6.09	13.4	82.1	4.18	130.2	↓
1044			↓	↓	6.06	13.4	82.4	4.06	133.1	↓

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	1050	Final Depth to Water:	15.52			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	N	—			
2 x 1L	HCl	TPH	N	—			

NOTES/ADDITIONAL COMMENTS

Project: Vannex GWM
Client: Nustar
Sampler: LW / JW

Date: 5/20/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-6	0755	—	13.56	—	
MW-7	0803	—	7.73	—	
MW-8D	0806	—	13.90	—	
MW-5D	0808	—	12.72	—	
MW-5	0811	—	13.19	—	Missing bolt
MW-8	0815	—	13.93	—	
MW-9	0819	—	14.63	—	Missing bolt
MW-4	0829	—	26.74	—	
MW-2	0832	—	24.73	—	
MW-3	0837	—	26.03	—	
MW-11	0842	—	14.32	—	
MW-1	0850	—	13.22	—	
MW-10	0854	—	14.76	—	

Project: Vanner GWM
Client: Nu Star
Sampler: GW

Date: 8/20/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-4	0715	—	32.59		
MW-2	0720	-	30.63		bolt missing
MW-3	0727	-	31.51		
MW-11	0741	-	19.55		color hut no ~~casing~~
MW-1	0746	-	19.04		
MW-6	0757	-	19.66		
MW-10	0812	-	21.02		
MW-7	0829	-	13.99		
MW-5D	0850	-	19.01		
MW-5	0855	-	19.31		
MW-8	0901	-	19.94		
MW-8D	0906	-	20.21		
MW-9	0911	-	21.74		No bolts

Cascadia
Associates, LLC

6915 SW Macadam Ave, Suite 250 | Portland, Oregon 97219 | Office (503) 906.6577 | Fax (503) 906.6567

DAILY FIELD REPORT

Job No. —
Report By: JW
Date of Work: 8/28/14

Project Name and Address: GWM - Nannex

Client/Owner: NuStar Nannex

Page 1 of 1

Project Manager: SS

Weather: Sun - Hot

Description of Work: GWM

Field Staff: JW

Report: JW onsite 0645

HASP - Traffic, PPE. Heat → Regular shade/hydration break. Every 30 min at least when 90°+. [temp 91° @ 1330, begin extra breaks]

0700 receive permit, 0715 begin gaging

0915 Begin sampling

1230 - MW8 dewatering. 3x attempt to ameliorate. ~1300 call SS. → Wait, sample MW-8D, complete MW-8 @ 1400

~~1.25~~ Approx 5 gal IDW in lower garage (2 buckets)

JW sign out, offsite 1515

Site Status: —

Drum Inventory (Quantity, Media, Location On-Site): —

Time of Arrival On-Site: 0645

Total Mileage: —

Time of Departure from Site: 1515

Attachments: —

Cascadia
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DAILY FIELD REPORT

Job No.	—
W/O No.	—
Date of Work:	8/29

Project Name and Address	Client/Owner:	Page 1 of 1
GWM - Vannex	NuStar	
	Project Manager: SS	Weather Rain/Sunn 80

Description of Work: GWM

Field Staff: JW

Report: JW onsite 0645
HASP - traffic, IDW handling [PPE, Seal drum, Sticker]
0700 receive permit (#9314)
0715 Begin sampling. MW-4 pump won't draw. Call SS, check if FEI has bladder pump - no. Discuss & SS determined that sample wouldn't represent GW conditions if obtainable.
1250 MW-3 same as MW-4.
1330 MW-2 able to obtain sample. ~~X~~ diffient to get flows. Some air bubbles.
1415 - New drum of sticker (15 gal.). Dispose approx 11 gal. IDW
1430 ~ JW sign out & off site

Site Status: —

Drum Inventory: 1 new 15 gal

Sr. Tech Hours: prep: job: travel: —

Sr. Tech Hours: prep: job: travel: —

Total Mileage
Truck Car

Report By: JW

Copy Given To:

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	—
Client:	Nustar	Date:	8/28
Project:	Vannet GWM 3Q19	Sampler:	LW
Weather:	Sun	Time In/Out:	0915 - 1005

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:	21.74'	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	
0927	—		21.75	0.2	6.45	15.17	156.1	12.71	64.0	clear
0930	—		"	"	6.01	14.74	95	11.13	76.4	"
0933	—		"	"	6.00	14.64	94	10.45	89.2	"
0936	—		21.76	0.2	6.04	14.63	95	10.41	95.6	"
0939	—		21.77	.2	6.06	14.55	94	10.37	96.6	"

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	0940	Final Depth to Water:	21.77'		Did Well Dewater:	N

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1x 1L	HCl	TPH	—				
1x 1L	HCl	TPH	—				
3x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	—
Client:	Nustar	Date:	8/29/19
Project:	Vernonia GWM 3Q19	Sampler:	JW
Weather:	Sun 90°	Time In/Out:	1020 1105

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:	19.41	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:	NA
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	
1026			19.41	.2	6.52	15.49	451	10.20	89.1	clear
1029			19.91	.15	6.59	15.58	462	2.97	75.1	"
1032			20.25	.1	6.64	15.63	463	1.95	74.9	"
1035			20.63	.1	6.626	15.65	464	1.81	74.7	"
1038			20.85	1	6.67	15.69	468	1.67	72.8	"

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	1		Analytical Laboratory:		Apex
Sample Time:	1039	Final Depth to Water:	22.06		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x 1L	HCl	TPH	—				
3x 40	HCl	VOC	—				
2x 1L	HCl	TPH	—			MW-5	Dup
3x 40	HCl	VOC	—			MW-5	Dup

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5D	Job Number:	
Client:	Nustar	Date:	8/28
Project:	Vancouver GWM 3Q19	Sampler:	JW
Weather:	Sun 92°	Time In/Out:	1110 - 1250

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:	19.18	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	
1124			19.18	.2	6.71	18.41	445	10.52	67.2	clear
1127			↓	↓	6.95	16.00	410	9.25	106.7	
1130			↓	↓	6.95	15.80	408	8.40	110.1	
1133			19.20	.2	6.97	15.76	410	7.98	108.6	
1136			↓	↓	6.98	15.65	418	7.77	107.8	
1139			↓	↓	6.97	15.56	426	7.64	106.9	↓

PURGING DATA

Sample ID:	MW-5D	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	1139	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	
2 x 1L	HCl	TPH	—				
3x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	NuStar	Date:	8/20
Project:	Vannex GWM 3Q19	Sampler:	TW
Weather:	Sun 95	Time In/Out:	205 / 14

WELL DATA

Monument Type:	Flush-mount/Stick up	Well Diameter:	2"		—
	Other:	Well Depth:	—		
Monument Condition:	good	Depth to Water:	21.42		—
Well Cap Lock Present:	Yes (No)	Screened Interval:			

Comments: 3 bolts

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)			
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	

PURGING DATA

Purge Method:	PP LF	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type	LDPE

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Tem (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color/Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1212			21.42	.25	6.92	14.92	137	3.4	8.7	clear
1215			21.81	.2	6.44	14.21	86	.44	91.2	↓
1218			22.14	↓	6.27	14.32	77	3.49	86.	↓
1221			22.33	↓	6.21	14.41	78	3.54	84.0	↓
1224			22.92	.15	6.24	14.47	78	3.61	82.9	cloudy

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	0.1				Apex
Sample Time:	1350 1226	Final Depth to Water:	23.15				Y S
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

Well dewatering during sampling 23.5' DTW
Recharge to 22.60, Resume sampling, dewatered. Called PM
Resumed Sampling @ 1350 DTW 22.36
Pumped ~1.5 L, well dewater + sediment @ 23
Resume Sampling at 1405

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8D	Job Number:	
Client:	Nustar	Date:	8/28
Project:	Vannex GWM 3Q19	Sampler:	AW
Weather:	Sun 95	Time In/Out:	1315 - 1400

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:	20.45	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	
1321			20.45	.25	7.02	15.42	104	6.35	130.6	clear
1324			20.46	1	6.83	15.01	104	6.79	140.0	1
1327			20.46	1	6.74	14.96	105	6.76	133.1	↓
1330			1	.25	6.79	14.89	105	6.81	129.4	

PURGING DATA

Sample ID:	MW-8D	Sampling Flow Rate:	.25			Analytical Laboratory:	Apex
Sample Time:	1330	Final Depth to Water:	20.46			Did Well Dewater:	N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2 x 1L	HCl	TPH	—		—	—	—
3 x 40	HCl	VOC	—		—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	T
Client:	Mustar	Date:	8/28
Project:	Vanner GWM 3Q19	Sampler:	JH
Weather:	Sun	Time In/Out:	1420 - 1510

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:	14.39	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:	QPP	Pump Intake Depth:	MS
Sampling Method:	QPP	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	
1430			14.39	.2	6.53	16.41	553	1.83	103.8	clear
1433			↓	↓	6.53	16.32	556	.56	93.9	↓
1436			14.45	↓	6.58	16.21	567	.46	89.8	↓
1439			14.50	↓	6.61	15.95	567	.40	90.2	↓

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	.2		Analytical Laboratory:	Apex
Sample Time:	1440	Final Depth to Water:	14.51		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 1 L	HCl	TPH	—			
3 x 40	HCl	VOC	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-4	Job Number:	
Client:	Nustar	Date:	8/29/19
Project:	Vanney GWM 3Q19	Sampler:	LH
Weather:	Cloud/Ltrain	Time In/Out:	0715-0830

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	35'	Free Product Thickness:	—
Monument Condition:	Cracked	Depth to Water:	32.45	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:		Pump Intake Depth:	
Sampling Method:		Tubing Material & Type:	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	
No Water Data										

PURGING DATA

Sample ID:		Sampling Flow Rate:			Analytical Laboratory:	
Sample Time:		Final Depth to Water:			Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
No Samples						

NOTES/ADDITIONAL COMMENTS

Unable to pump - Water column near End of Hole
Sediment + air pockets, not GW conditions
8x attempts, did not draw steady water

9914

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	—
Client:	NuStar	Date:	8/29
Project:	Vancouver Group 3Q19	Sampler:	JW
Weather:	It rain	Time In/Out:	0845-940

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:	18.96	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:	
Sampling Method:	PP	Tubing Material & Type:	~~HDPE~~ 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	
915			18.96	0.2	5.89	15.55	1044	7.74	137.1	clear
918			18.97	↓	5.78	15.39	1045	4.23	133.7	↓
921			↓	↓	5.78	15.33	1045	4.43	132.0	
924					5.82	15.14	1039	4.61	130.1	

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	0924	Final Depth to Water:	18.99	Did Well Dewater:	N	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x 1L	HCl	TPH	—				
3x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-11	Job Number:	
Client:	NuStar	Date:	8/29/19
Project:	Vancouver GWM 3Q19	Sampler:	fw
Weather:	Cloudy	Time In/Out:	945-1040

WELL DATA

Monument Type:	Flush-mount / Stick-up	Well Diameter:	2"		—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	20.17	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

PURGING DATA

Purge Method:	PP lb	Pump Intake Depth:	PAS
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)	
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm		
1002			20.17	0.25	6.43	16.01	309	2.45	107.6	clear
1005			20.18	15	6.41	15.50	309	2.42	110.6	
1008			↓		6.41	15.52	280	2.39	103.9	
1011			20.19		6.45	15.44	283	2.48	99.2	
1014			↓		6.50	15.37	301	2.16	93.7	
1017			20.2		6.52	15.35	311	2.21	90.6	
1020			20.2	↓	6.55	15.37	314	2.25	89.3	

PURGING DATA

Sample ID:	MW-11	Sampling Flow Rate:	.5		Analytical Laboratory:		Apex
Sample Time:	1021	Final Depth to Water:	20.2		Did Well Dewater:		N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x 1L	HCl	TPH					
3x 40	HCl	VOC					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-6	Job Number:	—
Client:	Nustar	Date:	8/23
Project:	Vannex GWM 3Q19	Sampler:	JW
Weather:	Overcast	Time In/Out:	1055-1140

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:	20.44	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:	PP	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	
1104			20.44	.2	6.81	16.09	772	4.83	60.7	clear
1107			20.71	.1	6.45	15.33	837	2.25	47.7	↓
1110			20.83	.1	6.47	15.65	839	2.06	39.4	
1113			21.08	.1	6.49	15.58	844	1.97	33.4	

PURGING DATA

Sample ID:	MW-6	Sampling Flow Rate:	.1			Analytical Laboratory:	Apex
Sample Time:	1114	Final Depth to Water:	21.32			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2 x 1L	HCl	TPH	—				
3 x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-10	Job Number:	
Client:	NuStar	Date:	8/29
Project:	Vannex GWM 3Q19	Sampler:	AW
Weather:	Sun	Time In/Out:	115 / 1245

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:	20.92	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

PURGING DATA

Purge Method:	PP	Pump Intake Depth:	HS
Sampling Method:	PP	Tubing Material & Type	LDPE (NEW)

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)		ORP (mV)	
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm		
1206			20.92	.2	6.69	18.22	436	10.71	10.6	clear
1209			20.92	↓	6.53	16.64	220	7.76	42.0	↓
1212			↓	.2	6.39	16.16	149	8.45	56.1	
1215				.15	6.27	14.92	116	8.18	68.7	
1218			20.92	.15	6.28	15.51	113	8.14	73.1	
1221			↓	↓	6.31	15.56	112	8.19	75.3	
1224			20.92	.15	6.36	15.61	110	8.01	76.9	

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	.15		Analytical Laboratory:		Apex
Sample Time:	1224	Final Depth to Water:	20.92		Did Well Dewater:		N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x 1L	HCl	TPH	—				
3x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	NuStar	Date:	8/29
Project:	Vanner GWM 3Q19	Sampler:	AW
Weather:	Sun	Time In/Out:	1250 - 1315

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	35'	Free Product Thickness:	—
Monument Condition:	Cracks	Depth to Water:	31.33	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:		Pump Intake Depth:	
Sampling Method:		Tubing Material & Type:	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	
No H2O Data										

PURGING DATA

Sample ID:		Sampling Flow Rate:			Analytical Laboratory:		
Sample Time:		Final Depth to Water:			Did Well Dewater:		
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
No Samples							

NOTES/ADDITIONAL COMMENTS

Water column 3' from End of Hole
Pump unable to draw — B sediment, air pockets
5 attempts to get flow

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	—
Client:	NuStar	Date:	8/29
Project:	Vannex GWM 3919	Sampler:	JH
Weather:	Sun	Time In/Out:	1300 – 1415

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	35'	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	30.54	Water Column Length:	—
Well Cap Lock Present:	(Yes) No	Screened Interval:	—	Purge Volume:	—

Comments: 1 bolt

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:	TBS
Sampling Method:	PP	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	
1336				.15	6.19	17.59	151	7.79	133.2	clear
1339				↓	6.06	17.24	151	3.07	132.2	↓
1342				.1	6.03	16.51	151	2.51	128.1	
1345				↓	6.09	16.52	153	1.96	120.1	↓
1348					6.10	16.67	153	1.95	118.9	

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	0.1		Analytical Laboratory:		Apex
Sample Time:	1348	Final Depth to Water:	30.55		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2 x 1L	HCl	TPH	—	—	—	—	
3 x 40	HCl	VOC	—	—	—	—	

NOTES/ADDITIONAL COMMENTS

More air bubbles than common, but clear + steady flow

Project: Vanner GWM
Client: Nu Star
Sampler: GW

Date: 8/20/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-4	0715	—	32.59		
MW-2	0720	-	30.63		bolt missing
MW-3	0727	-	31.51		
MW-11	0741	-	19.55		color hut no ~~casing~~
MW-1	0746	-	19.04		
MW-6	0757	-	19.66		
MW-10	0812	-	21.02		
MW-7	0829	-	13.99		
MW-5D	0850	-	19.01		
MW-5	0855	-	19.31		
MW-8	0901	-	19.94		
MW-8D	0906	-	20.21		
MW-9	0911	-	21.74		No bolts

Project: Vanner GWM4Q19
Client: Nustar
Sampler: GW

Date: 11/18
Permit: #11265

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-4	0716	—	32.09	—	
MW-2	0727	—	30.16	—	
MW-3	0734	—	31.06	—	
MW-1	0751	—	18.64	—	
MW-11	0804	—	19.36	—	
MW-6	0811	—	19.31	—	
MW-10	0823	—	20.67	—	
MW-7	0829	—	13.76	—	
MW-9	0837	—	21.28	—	
MW-8D	0841	—	19.80	—	
MW-8	0848	—	19.57	—	Monument buried
MW-5D	0854	—	18.62	—	
MW-5	0859	—	18.92	—	

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5D	Job Number:	T
Client:	NuStar	Date:	11/18/19
Project:	GWM 4Q19	Sampler:	LD
Weather:	Cloudy	Time In/Out:	0915 / 1000

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:	18.61	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:	LL	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	
0930			18.61	.2	7.39	14.07	352	6.54	-34.7	clear
0933			↓	'	7.29	14.03	344	3.11	-43.1	↓
0936			↓	.15	7.18	13.98	331	1.72	-21.5	↓
0939			↓	↓	7.14	13.93	327	1.33	-20.3	↓
0942			↓	↓	7.13	13.92	325	1.19	-19.3	↓
0945			↓	↓	7.14	13.92	324	.99	-19.5	↓

PURGING DATA

Sample ID:	MW-5D	Sampling Flow Rate:	.15		Analytical Laboratory:	Apex	
Sample Time:	0945	Final Depth to Water:	18.63		Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	T
Client:	Nustar Vunmen	Date:	11/19
Project:	GWM4Q19	Sampler:	MW
Weather:	Cloudy	Time In/Out:	1005 - 1150

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:	19.21	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:	SS	Pump Intake Depth:	MS
Sampling Method:	SS	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	
1014			19.21	.2	6.96	14.04	358	2.77	2.9	clear
1017			19.25		6.90	14.10	382	2.35	-13.8	↓
1020			19.30	.1	6.85	14.09	399	1.41	-21.9	
1023			19.37		6.79	14.11	409	1.20	-32.3	
1027			19.45	.1	6.77	14.11	417	1.14	-39.1	↓

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	.1	Analytical Laboratory:		Apex
Sample Time:	1027	Final Depth to Water:	22.16	Did Well Dewater:		N

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40	HCl	VOC	—	—	—	—
2 x 1L	HCl	TPH	—	—	—	—
3 x 40	HCl	VOC	—	—	—	MW-5 DUP
2 x 1L	HCl	TPH	—	—	—	MW-5 DUP

NOTES/ADDITIONAL COMMENTS

Water drop, delay for recharge 1055 start again
Delay for Recharge 1140 start

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	Nu Star Vanner	Date:	11/18
Project:	GWM 4Q19	Sampler:	JW
Weather:	Cloudy	Time In/Out:	1130 - 1330

WELL DATA

Monument Type:	Flush-mount/Stick-up / Other:	Well Diameter:	2"	Depth to Free Product:	—
		Well Depth:		Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	19.60	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:	SB	Pump Intake Depth:	MS
Sampling Method:	SB	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	
1202			19.60	.2	6.54	13.24	364	5.27	-57.4	clear
1205					4.91	13.19	306	3.42	-51.2	↓
1208			20.71	.1	6.87	13.15	245	2.80	-43.9	
1211					6.79	13.09	259	2.96	-30.2	
1214			21.32	.1	6.81	13.07	251	3.01	-29.1	

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	.1		Analytical Laboratory:		Apex
Sample Time:	1214	Final Depth to Water:	21.95		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	—	—	—	—	—
2 x 1L	HCl	TPH	—	—	—	—	—

NOTES/ADDITIONAL COMMENTS

Monument buried under soil
1225 stop wait for recharge 1325 resume

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8D	Job Number:	
Client:	Nustar Vannex	Date:	11/18
Project:	GWM 4Q19	Sampler:	AW
Weather:	Rain	Time In/Out:	1240 - 1330

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:	19.80	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:	LL	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	
1250			19.80	.15	6.42	12.81	100	5.02	7.7	clear
1253					6.47	12.78	99	4.04	8.2	
1256					6.56	12.79	100	3.59	9.8	
1259			19.80		6.61	12.76	101	3.39	10.4	
1302				.15	6.65	12.75	100	3.04	11.1	
1305					6.92	12.73	101	2.19	5.1	
1309					6.95	12.71	100	2.01	4.9	
1311					6.96	12.73	100	1.93	4.5	

PURGING DATA

Sample ID:	MW-8D	Sampling Flow Rate:	.15			Analytical Laboratory:	Apex
Sample Time:	1311	Final Depth to Water:	19.82			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC					
2x1L	HCl	TPH					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	—
Client:	NuStar Vanmex	Date:	11/18
Project:	GWM 4Q19	Sampler:	AW
Weather:	Cloudy	Time In/Out:	1335 - 1410

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:	21.24	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:	BP	Pump Intake Depth:	MS
Sampling Method:	BP	Tubing Material & Type:	HDPE (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
				.2	+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1340			21.24	~~.2~~ ~~6.60~~	6.60	13.16	95	4.60	.4	clear
1343			1	~~.2~~ ~~6.64~~	6.64	13.13	97	4.58	.5	↓
1346			21.24	.2	6.57	13.18	95	4.90	3.2	
1349			1	1	6.52	13.23	93	~~5.85~~ 5.25	5.9	
1352			↓	↓	6.50	13.30	93	5.29	8.1	

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	.2			Analytical Laboratory:	Apex
Sample Time:	1352	Final Depth to Water:	21.25			Did Well Dewater:	ND
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl	VOC	—				
2x 1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	T
Client:	NuStar Vanwest	Date:	11/18
Project:	GWM 4Q19	Sampler:	KM
Weather:	Rain	Time In/Out:	1500

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:	13.79	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:	BP	Pump Intake Depth:	MS
Sampling Method:	BP	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	
1419			13.79	.2	6.38	13.55	358	7.81	26.9	clear
1422					6.44	13.60	390	7.17	22.5	↓
1425			13.79	.15	6.51	13.61	399	4.11	21.9	
1428			↓	↓	6.50	13.63	402	1.94	20.5	
1431					6.52	13.63	390	1.75	20.2	
1434					6.54	13.64	388	1.69	19.7	

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	.15	Analytical Laboratory:	Apex
Sample Time:	1434	Final Depth to Water:	13.82	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x 40	HCl	VOC	—			
2x 1L	HCl	TPH	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-6	Job Number:	—
Client:	Nu Star Yamine	Date:	11/19
Project:	GWM 4Q19	Sampler:	JW
Weather:	Pt Sun	Time In/Out:	0715 - 0810

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:	20.61	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:	SS	Pump Intake Depth:	
Sampling Method:	SS	Tubing Material & Type:	HDPE 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	
737			20.61	.15	6.80	13.58	739	14.75	-79.9	clear
740			20.72		6.73	13.60	787	6.51	-101.4	
743			20.79	.1	6.75	13.65	788	1.83	-101.2	"
746			20.87	"	6.76	13.63	789	1.69	-102.1	"
749			20.98	"	6.76	13.62	790	1.66	-101.8	"

PURGING DATA

Sample ID:	MW-6	Sampling Flow Rate:	.1	Analytical Laboratory:	Apex
Sample Time:	0749	Final Depth to Water:	21.76	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	
Client:	Master Vanner	Date:	11/19
Project:	GWM 4Q19	Sampler:	AJ
Weather:	Clear	Time In/Out:	845 - 935

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	~~Other:~~	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	gr D	Depth to Water:	18.59	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	Pump Intake Depth:	MS
Sampling Method:	LOPE	Tubing Material & Type:	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	
903			18.59	.2	6.71	13.21	609	10.69	-72.4	clear
906					6.72	13.30	582	5.83	-72.6	
909			18.45	.1	6.72	13.97	524	2.93	-66.0	
912			18.71		6.69	13.98	504	2.01	-59.6	
915					6.66	14.02	495	1.96	-55.7	
918			18.80	.1	6.61	14.06	486	2.00	-53.5	

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	.1		Analytical Laboratory:		Apex
Sample Time:	0918	Final Depth to Water:	18.82		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-11	Job Number:	
Client:	NuStar Vancouver	Date:	11/19
Project:	GWM 4Q19	Sampler:	fa
Weather:	Cloudy	Time In/Out:	940 -

WELL DATA

Monument Type:	Flush-mount / Stick-up / Other:	Well Diameter:	2"	Depth to Free Product:	—
Monument Condition:	good	Well Depth:	—	Free Product Thickness:	—
Well Cap Lock Present:	Yes / No	Depth to Water:	20.12	Water Column Length:	—
Comments:		Screened Interval:	—	Purge Volume:	—

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:	PBF	Pump Intake Depth:	NS
Sampling Method:	PBF	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	
0946			20.12	.2	6.37	13.84	290	12.42	95.9	clear
0949			1		6.42	14.26	398	8.57	45.9	
0952			20.12		6.90	14.36	564	3.78	-86.4	
0955					7.06	14.39	569	2.22	-123.7	
0958					7.08	14.40	570	2.01	-127.1	
1001					7.10	14.44	570	1.34	131.0	
1004					7.13	14.46	570	1.12	132.5	
1007					7.11	14.44	571	1.07	130.1	

PURGING DATA

Sample ID:	MW-11	Sampling Flow Rate:	.2			Analytical Laboratory:	Apex
Sample Time:	1007	Final Depth to Water:	20.10			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC					
2 x 1L	HCl	TPH					

NOTES/ADDITIONAL COMMENTS

Sample depth intake @ approx 22.5'

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-10	Job Number:	
Client:	NuStar Vonnage	Date:	11/19
Project:	GWM 4Q19	Sampler:	JW
Weather:	Cloudy	Time In/Out:	1025 - 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:	20.64	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:	PBL	Pump Intake Depth:	
Sampling Method:	PBL	Tubing Material & Type:	LDPE MS

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	
1035			20.64	.2	6.76	13.80	535	11.50	-111.0	clear
1038					6.86	13.66	447	9.19	-115.7	
1041			20.64		6.88	13.48	280	7.39	-92.5	
1044					6.82	13.47	210	6.81	-76.7	
1047					6.79	13.33	201	6.52	-53.1	
1050					6.75	13.28	196	6.46	-51.4	

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	.2		Analytical Laboratory:		Apex
Sample Time:	1050	Final Depth to Water:	20.65		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	—	—	—	—	—
2 x 1L	HCl	TPH	—	—	—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-4	Job Number:	—
Client:	NuStar Vapnea	Date:	11/19
Project:	GWM 4Q19	Sampler:	AD
Weather:	Cloudy	Time In/Out:	1125 - 1230

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:	32.09	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:	PBL	Pump Intake Depth:	MS
Sampling Method:	PBL	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	
1036			32.09	.1	6.37	13.81	154	7.97	27.7	clear
1039				↑	6.41	13.54	141	4.80	19.5	
1042				<.1	6.43	13.65	139	2.91	16.5	
1045				<.1	6.42	13.66	135	2.82	15.2	
1048				↓	6.44	13.68	135	2.75	14.9	↓

PURGING DATA

Sample ID:	MW-4	Sampling Flow Rate:	<.1			Analytical Laboratory:	Apex
Sample Time:	1148	Final Depth to Water:	32.15			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	—				—
2 x 1L	HCl	TPH	—				—

NOTES/ADDITIONAL COMMENTS

Difficult pumping → air bubbles, slow
Pump on max

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	T
Client:	NuStar Vamex	Date:	11/19
Project:	GWM 4Q19	Sampler:	JD
Weather:	~~Rain~~	Time In/Out:	1240

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:	31.01	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:	PP	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	
1251			31.01	.1	6.12	13.64	158	6.81	162.6	clear
1254					6.16	13.77	159	5.87	125.8	
1257					6.26	14.11	165	5.99	79.0	
1300					6.45	14.52	176	4.48	25.5	
1303					6.49	14.57	176	4.25	22.3	
1306				↓	6.50	14.60	177	4.16	21.9	↓

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	.1		Analytical Laboratory:		Apex
Sample Time:	1306	Final Depth to Water:	31.25		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

Air Bubblers - Sim to MW-4

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	
Client:	NuStar Vancouver	Date:	11/19
Project:	GWM 4Q19	Sampler:	JW
Weather:	Cloudy	Time In/Out:	1350 - 1440

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:	30.11	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:	PP	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	
1400			30.11	.15	6.45	14.53	82	7.33	224.1	clear
1403					6.26	14.30	153	5.72	187.3	
1406					6.33	14.27	155	4.75	103.2	
1409					6.34	14.27	156	2.40	61.4	
1412					6.40	14.24	154	2.11	59.1	
1415					6.41	14.20	154	2.07	62.6	

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	.15		Analytical Laboratory:		Apex
Sample Time:	1415	Final Depth to Water:	30.19		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
2x1L	HCl	TPH	—				

NOTES/ADDITIONAL COMMENTS

APPENDIX D

HISTORICAL GROUNDWATER ANALYTICAL DATA

Table D-1
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)	Naphthalene (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	--
	05/20/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/19/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	**0.0031**	--
	08/29/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	0.00069	<0.00075	0.00125	<0.002
	11/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--	--

Please refer to notes at end of table.

Cascadia Associates, LLC

Table D-1
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)	Naphthalene (mg/L)
MW-3	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	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	--	--	--	--	--	--	--	--	--
	11/19/19	0.114	<0.0769	<0.154	<0.0002	<0.001	0.00661	0.0113	<0.001	<0.002
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	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	--	--	--	--	--	--	--	--	--
	11/19/19	<0.100	<0.0784	<0.157	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--
	05/21/19	**22**	**0.722**	<0.0784	<0.002	<0.01	0.252	**1.04**	<0.010	--
	08/28/19	**24.8**	**0.963**	<0.0769	<0.002	<0.01	0.239	**1.1**	<0.01	**2.07**
	8/28/2019 DUP	**21.7**	**0.879**	<0.0769	<0.002	<0.01	0.179	0.836	<0.01	**1.44**
	11/18/19	**23.5**	**0.771**	<0.152	<0.004	<0.02	0.257	**1.19**	<0.02	**1.62**
	11/18/2019 DUP	**20.0**	**0.696**	<0.152	<0.01	<0.05	0.284	**1.46**	<0.05	**1.51**

Please refer to notes at end of table.

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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)	Naphthalene (mg/L)
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	--
	05/21/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	**0.309**	<0.0374	<0.0748	<0.0001	<0.0005	0.00078	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--
	05/20/19	**20**	**1.23**	<0.0755	**0.218**	0.0426	**1.86**	0.937	<0.010	--
	08/29/19	**16.8**	**1.64**	<0.0755	**0.177**	0.0394	**1.69**	0.585	<0.01	**0.561**
	11/19/19	**6.30**	**1.95**	<0.150	**0.0712**	<0.02	**0.709**	0.127	<0.02	**0.163**
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	--
	05/20/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0388	<0.0777	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0748	<0.150	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0412	<0.0825	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-8D	02/18/19	<0.100	<0.0755	<0.151	<0.0002	<0.001	<0.0005	<0.00015	<0.001	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002

Please refer to notes at end of table.

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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)	Naphthalene (mg/L)
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	--
	05/21/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/28/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/18/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
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	--
	05/21/19	<0.05	<0.0377	<0.0755	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	--
	08/29/19	<0.05	<0.0374	<0.0748	<0.0001	<0.0005	<0.00025	<0.00075	<0.0005	<0.002
	11/19/19	<0.100	<0.0762	<0.152	<0.0002	<0.001	<0.0005	<0.0015	<0.001	<0.002
MW-11	02/19/19	0.727	<0.0748	<0.150	0.00162	0.00176	0.083	0.0652	<0.001	--
	05/21/19	**3.05**	<0.0374	<0.0748	**0.0643**	0.00843	0.359	0.0355	<0.0005	--
	08/29/19	**17.4**	0.094	<0.0748	0.0038	0.24	**1.18**	**2.52**	<0.005	0.121
	11/19/19	**45.0**	0.239	<0.151	**0.0526**	0.159	**4.33**	**7.73**	<0.02	**0.414**
Washington DOE MTCA Method A Cleanup Level		0.8	0.5	0.5	0.005	1	0.7	1	0.02	0.16

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.

APPENDIX E

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 groundwater samples collected as part of the 2019 quarterly groundwater monitoring events 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
A9B0609	2/18/19-2/19/19	Groundwater monitoring event	Apex Labs - Portland, OR.
A9E0719	5/20/19-5/21/19	Groundwater monitoring event	Apex Labs - Portland, OR.
A9I0015	8/28/19-8/29/19	Groundwater monitoring event	Apex Labs - Portland, OR.
A9K0658	11/18/19-11/19/19	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.

A-01	Blank Spike recovery is below in-house lower QC limit but passes recommended NWTPH method limits. Data quality is unaffected.
E	Estimated Value. The result is above the calibration range of the instrument.
F-13, F-18, F-20	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-01	Spike recovery and/or RPD is outside acceptance limits.
Q-17	Relative percent difference (RPD) between original and duplicate is outside 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/matrix spike duplicate (MS/MSD) analysis was performed on sample and percent recovery or RPD was outside control limits.
T-02	The Batch QC sample was analyzed outside of the method specified 12-hour tune window. Results are estimated.

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) and Naphthalene by U.S. Environmental Protection Agency (EPA) Method 8260C.

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 8260C	Water	BTEX, MTBE and naphthalene	Hydrochloric Acid (HCl) to pH<2; No headspace; Glass VOA	14 days
NWTPH-Gx	Water	Gasoline Range Organics	Hydrochloric Acid (HCl) to pH<2; No headspace; Glass	14 days
NWTPH-Dx	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 MW-6 (batch A9I0015-10) and the % recovery or RPD for naphthalene 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.

The laboratory duplicate for source sample MW-11 (batch A9K0658-10) reported results for ethylbenzene and xylenes that were above the calibration limits of the instrument. The source sample MW-11 was re-extracted and QC methods were within acceptable 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

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

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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

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	

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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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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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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)*	

Apex Laboratories

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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

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*	

Apex Laboratories

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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-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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Apex Laboratories, LLC

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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-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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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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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-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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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

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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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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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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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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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**

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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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**
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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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

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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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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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**
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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Apex Laboratories, LLC
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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 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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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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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 %*			*"*					

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

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

Apex Laboratories

Lisa Domenighini, Client Services Manager

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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**

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

Apex Laboratories

Lisa A Domenighini

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**

QUALIFIER DEFINITIONS

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

Apex Laboratories

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.

Apex Laboratories

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

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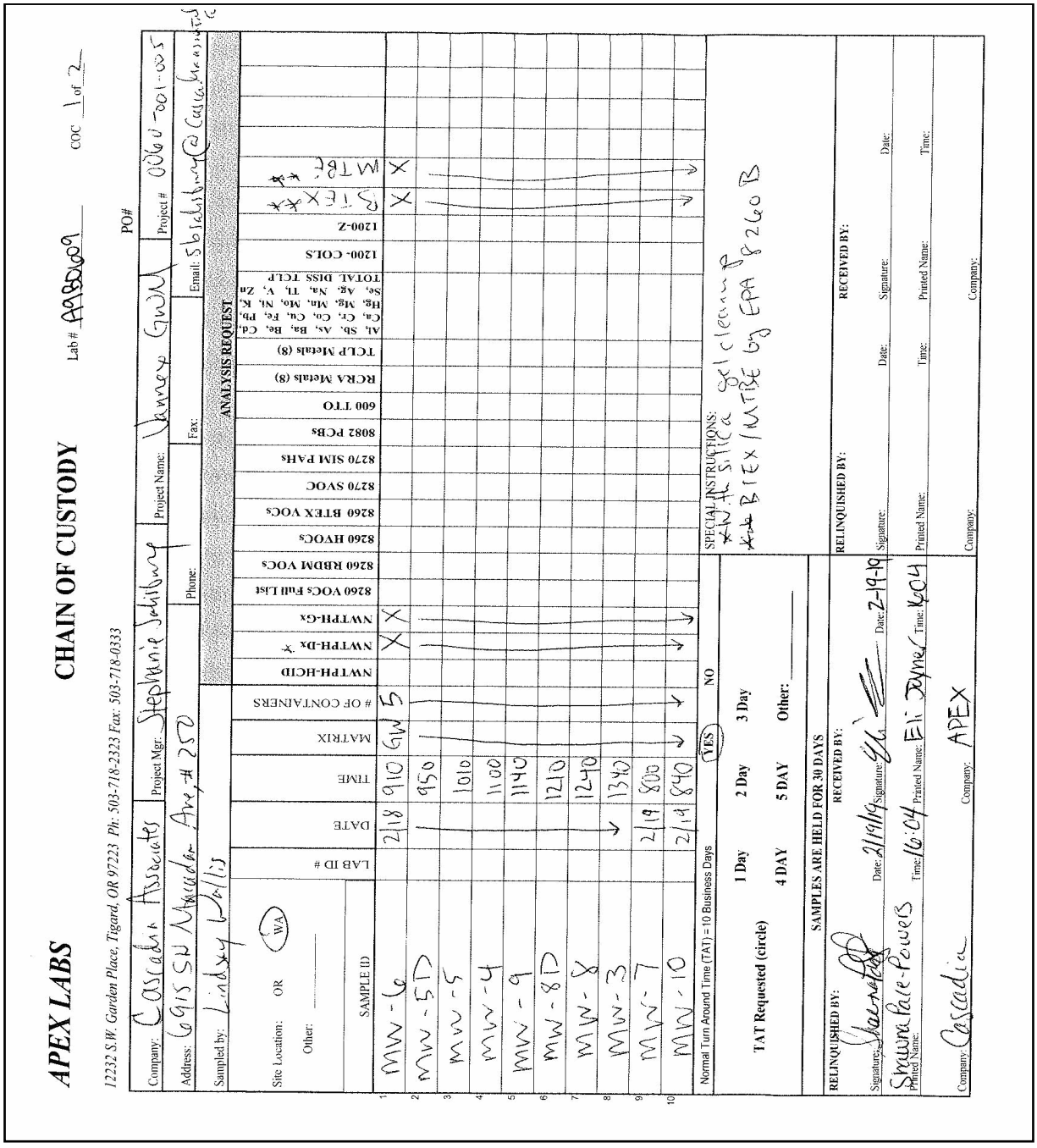
Cascadia Associates	Project: **Nustar Vannes**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**



Apex Laboratories

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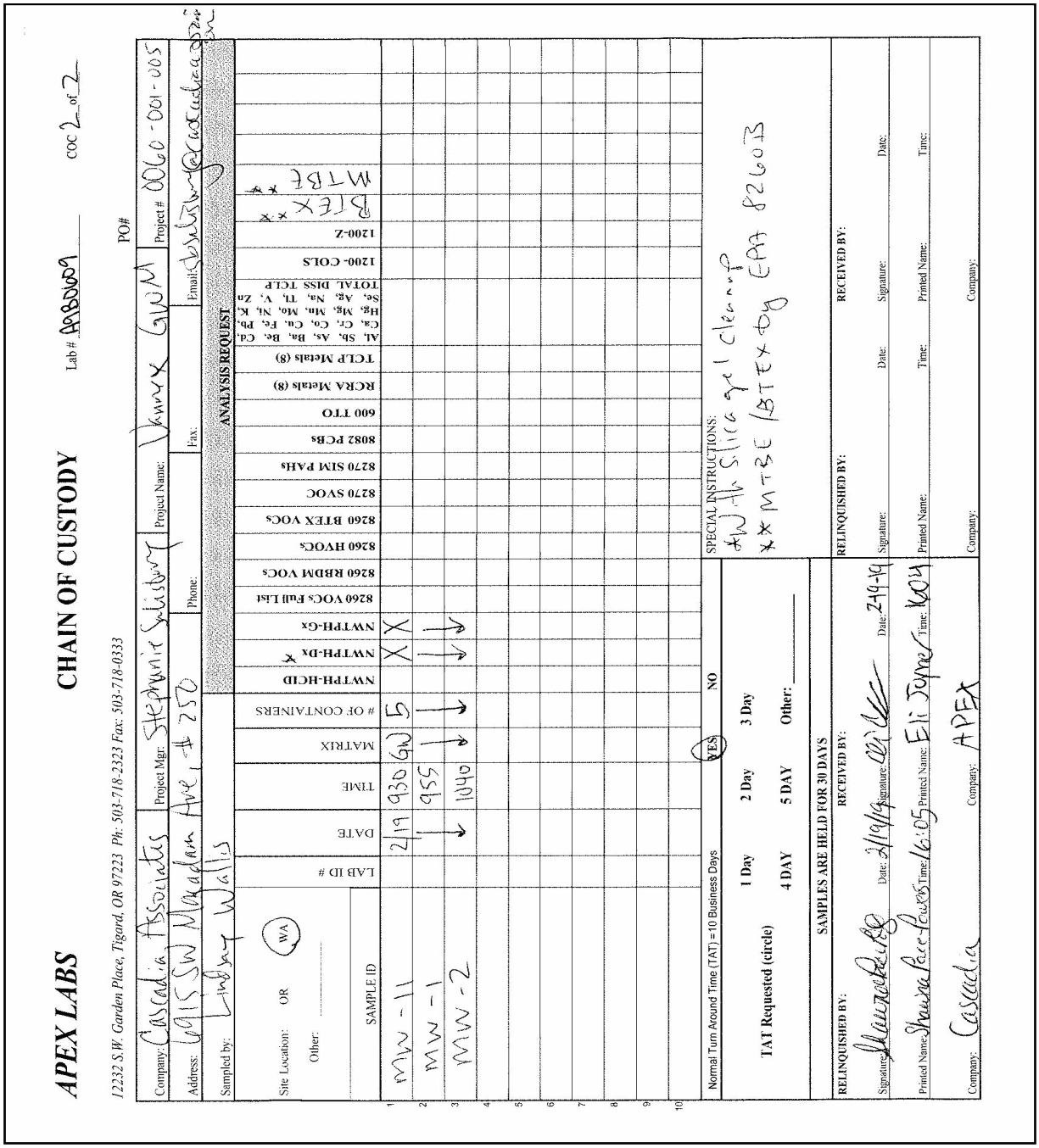
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**



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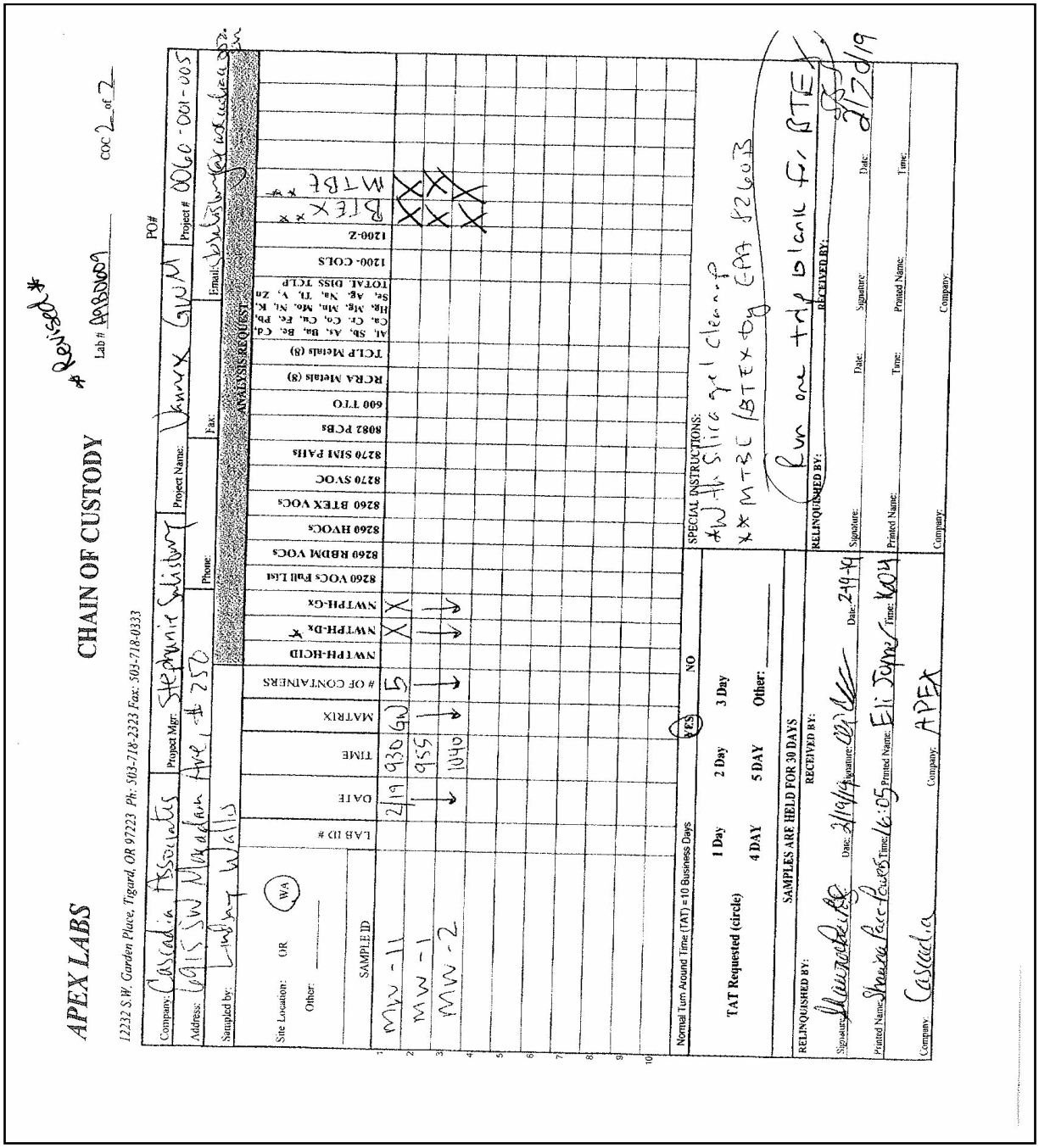

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Cascadia Associates	Project: **Nustar Vannex**	
6915 SW Macadam, Suite 250	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97219	Project Manager: **Stephanie Salisbury**	**A9B0609 - 03 06 19 1228**

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

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Tuesday, June 4, 2019

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

RE: A9E0719 - 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 A9E0719, which was received by the laboratory on 5/21/2019 at 3:10:00PM.

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	1.4 degC	Cooler#2	1.2 degC
Cooler#3	1.1 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

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6700 S.W. Sandburg Street
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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**	**A9E0719 - 06 04 19 1301**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-10	A9E0719-01	Water	05/20/19 09:30	05/21/19 15:10
MW-6	A9E0719-02	Water	05/20/19 10:25	05/21/19 15:10
MW-3	A9E0719-03	Water	05/20/19 11:20	05/21/19 15:10
MW-4	A9E0719-04	Water	05/20/19 12:00	05/21/19 15:10
MW-2	A9E0719-05	Water	05/20/19 12:40	05/21/19 15:10
MW-7	A9E0719-06	Water	05/20/19 13:20	05/21/19 15:10
MW-1	A9E0719-07	Water	05/21/19 07:40	05/21/19 15:10
MW-11	A9E0719-08	Water	05/21/19 08:20	05/21/19 15:10
MW-5D	A9E0719-09	Water	05/21/19 08:55	05/21/19 15:10
MW-5	A9E0719-10	Water	05/21/19 09:20	05/21/19 15:10
MW-8D	A9E0719-11	Water	05/21/19 09:40	05/21/19 15:10
MW-8	A9E0719-12	Water	05/21/19 10:20	05/21/19 15:10
MW-9	A9E0719-13	Water	05/21/19 10:50	05/21/19 15:10

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6700 S.W. Sandburg Street
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**	**A9E0719 - 06 04 19 1301**

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-10 (A9E0719-01)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0755	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 62 %*		*Limits: 50-150 %*	*1*	*05/28/19*	*NWTPH-Dx/SGC*	
MW-6 (A9E0719-02)				**Matrix: Water**		**Batch: 9051316**		
Diesel	**1.23**	---	0.0755	mg/L	1	05/28/19	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.151	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 60 %*		*Limits: 50-150 %*	*1*	*05/28/19*	*NWTPH-Dx/SGC*	
MW-3 (A9E0719-03)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0755	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 65 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-4 (A9E0719-04)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0755	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 66 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-2 (A9E0719-05)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0755	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 58 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-7 (A9E0719-06)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0755	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 73 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-1 (A9E0719-07)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0748	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 71 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-11 (A9E0719-08)				**Matrix: Water**		**Batch: 9051316**		
Diesel	ND	---	0.0748	mg/L	1	05/29/19	NWTPH-Dx/SGC	

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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**	**A9E0719 - 06 04 19 1301**

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-11 (A9E0719-08)				**Matrix: Water**			**Batch: 9051316**	
Oil	ND	---	0.150	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 61 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-5D (A9E0719-09)				**Matrix: Water**			**Batch: 9051316**	
Diesel	ND	---	0.0755	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	05/29/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 70 %*		*Limits: 50-150 %*	*1*	*05/29/19*	*NWTPH-Dx/SGC*	
MW-5 (A9E0719-10)				**Matrix: Water**			**Batch: 9051316**	
Diesel	**0.722**	---	0.0784	mg/L	1	05/28/19	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.157	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 51 %*		*Limits: 50-150 %*	*1*	*05/28/19*	*NWTPH-Dx/SGC*	
MW-8D (A9E0719-11)				**Matrix: Water**			**Batch: 9051316**	
Diesel	ND	---	0.0748	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	05/28/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 62 %*		*Limits: 50-150 %*	*1*	*05/28/19*	*NWTPH-Dx/SGC*	
MW-8 (A9E0719-12RE1)				**Matrix: Water**			**Batch: 9051344**	
Diesel	ND	---	0.0748	mg/L	1	05/30/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	05/30/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 67 %*		*Limits: 50-150 %*	*1*	*05/30/19*	*NWTPH-Dx/SGC*	
MW-9 (A9E0719-13RE1)				**Matrix: Water**			**Batch: 9051344**	
Diesel	ND	---	0.0748	mg/L	1	05/30/19	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	05/30/19	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 64 %*		*Limits: 50-150 %*	*1*	*05/30/19*	*NWTPH-Dx/SGC*	

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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**	**A9E0719 - 06 04 19 1301**

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-10 (A9E0719-01)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*107 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-6 (A9E0719-02)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	**20.0**	---	2.00	mg/L	20	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 99 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*106 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-3 (A9E0719-03)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*107 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-4 (A9E0719-04)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*107 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-2 (A9E0719-05)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 96 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*108 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-7 (A9E0719-06)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 97 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*108 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-1 (A9E0719-07)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery: 95 %*	*Limits: 50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)		*106 %*	*50-150 %*		*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-11 (A9E0719-08)				**Matrix: Water**		**Batch: 9051149**		
Gasoline Range Organics	**3.05**	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	

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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**	**A9E0719 - 06 04 19 1301**

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-11 (A9E0719-08)				**Matrix: Water**			**Batch: 9051149**	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 96 %*	*Limits: 50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*101 %*	*50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-5D (A9E0719-09RE1)				**Matrix: Water**			**Batch: 9051201**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/23/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 94 %*	*Limits: 50-150 %*	*1*	*05/23/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*107 %*	*50-150 %*	*1*	*05/23/19*	*NWTPH-Gx (MS)*	
MW-5 (A9E0719-10)				**Matrix: Water**			**Batch: 9051149**	
Gasoline Range Organics	**22.0**	---	2.00	mg/L	20	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 100 %*	*Limits: 50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*104 %*	*50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-8D (A9E0719-11)				**Matrix: Water**			**Batch: 9051149**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 96 %*	*Limits: 50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-8 (A9E0719-12)				**Matrix: Water**			**Batch: 9051149**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 96 %*	*Limits: 50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*106 %*	*50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
MW-9 (A9E0719-13)				**Matrix: Water**			**Batch: 9051149**	
Gasoline Range Organics	ND	---	0.100	mg/L	1	05/22/19	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 96 %*	*Limits: 50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*108 %*	*50-150 %*	*1*	*05/22/19*	*NWTPH-Gx (MS)*	

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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**	**A9E0719 - 06 04 19 1301**

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-10 (A9E0719-01)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-6 (A9E0719-02)				**Matrix: Water**		**Batch: 9051149**		
Benzene	**218**	---	4.00	ug/L	20	05/22/19	EPA 8260C	
Ethylbenzene	**1860**	---	10.0	ug/L	20	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	05/22/19	EPA 8260C	
Toluene	**42.6**	---	20.0	ug/L	20	05/22/19	EPA 8260C	
Xylenes, total	**937**	---	30.0	ug/L	20	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-3 (A9E0719-03)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-4 (A9E0719-04)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*108 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	

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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**	**A9E0719 - 06 04 19 1301**

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 (A9E0719-04)				**Matrix: Water**		**Batch: 9051149**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 102 %*	*Limits: 80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
MW-2 (A9E0719-05)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	**3.10**	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 109 %*	*Limits: 80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)		*104 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)		*103 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
MW-7 (A9E0719-06)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 108 %*	*Limits: 80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)		*103 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)		*102 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
MW-1 (A9E0719-07)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 107 %*	*Limits: 80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)		*104 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)		*103 %*	*80-120 %*		*1*	*05/22/19*	*EPA 8260C*	
MW-11 (A9E0719-08)				**Matrix: Water**		**Batch: 9051149**		
Benzene	**64.3**	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	**8.43**	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	**35.5**	---	1.50	ug/L	1	05/22/19	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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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**	**A9E0719 - 06 04 19 1301**

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 (A9E0719-08)				**Matrix: Water**		**Batch: 9051149**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*101 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-11 (A9E0719-08RE1)				**Matrix: Water**		**Batch: 9051201**		
Ethylbenzene	**359**	---	5.00	ug/L	10	05/23/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*103 %*	*Limits: 80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
MW-5D (A9E0719-09RE1)				**Matrix: Water**		**Batch: 9051201**		
Benzene	ND	---	0.200	ug/L	1	05/23/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/23/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/23/19	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	05/23/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/23/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/23/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*	*80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*05/23/19*	*EPA 8260C*	
MW-5 (A9E0719-10)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	4.00	ug/L	20	05/22/19	EPA 8260C	
Ethylbenzene	**252**	---	10.0	ug/L	20	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	05/22/19	EPA 8260C	
Toluene	ND	---	20.0	ug/L	20	05/22/19	EPA 8260C	
Xylenes, total	**1040**	---	30.0	ug/L	20	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-8D (A9E0719-11)				**Matrix: Water**		**Batch: 9051149**		
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	

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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**	**A9E0719 - 06 04 19 1301**

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-8D (A9E0719-11)				**Matrix: Water**			**Batch: 9051149**	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-8 (A9E0719-12)				**Matrix: Water**			**Batch: 9051149**	
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
MW-9 (A9E0719-13)				**Matrix: Water**			**Batch: 9051149**	
Benzene	ND	---	0.200	ug/L	1	05/22/19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	05/22/19	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	05/22/19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	05/22/19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*108 %*	*Limits: 80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*	*80-120 %*	*1*	*05/22/19*	*EPA 8260C*	

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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**	**A9E0719 - 06 04 19 1301**

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 9051316 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel									Water			
Blank (9051316-BLK1)			Prepared: 05/28/19 13:14		Analyzed: 05/28/19 22:34							
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 79 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS (9051316-BS1)			Prepared: 05/28/19 13:14		Analyzed: 05/28/19 22:55							
NWTPH-Dx/SGC												
Diesel	0.356	---	0.0800	mg/L	1	0.500	---	71	58 - 115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 78 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS Dup (9051316-BSD1)			Prepared: 05/28/19 13:14		Analyzed: 05/28/19 23:16							**Q-19**
NWTPH-Dx/SGC												
Diesel	0.339	---	0.0800	mg/L	1	0.500	---	68	58 - 115%	5	20%	
Surr: o-Terphenyl (Surr)			*Recovery: 73 %*		*Limits: 50-150 %*		*Dilution: 1x*					
Batch 9051344 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel									Water			
Blank (9051344-BLK1)			Prepared: 05/29/19 10:05		Analyzed: 05/30/19 00:51							
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 84 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS (9051344-BS1)			Prepared: 05/29/19 10:05		Analyzed: 05/30/19 01:14							
NWTPH-Dx/SGC												
Diesel	0.274	---	0.0800	mg/L	1	0.500	---	**55**	**58 - 115%**	---	---	A-01
Surr: o-Terphenyl (Surr)			*Recovery: 81 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS Dup (9051344-BSD1)			Prepared: 05/29/19 10:05		Analyzed: 05/30/19 01:37							**Q-19**
NWTPH-Dx/SGC												
Diesel	0.288	---	0.0800	mg/L	1	0.500	---	58	58 - 115%	5	20%	
Surr: o-Terphenyl (Surr)			*Recovery: 80 %*		*Limits: 50-150 %*		*Dilution: 1x*					

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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**	**A9E0719 - 06 04 19 1301**

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 9051149 - EPA 5030B									Water			
Blank (9051149-BLK1)		Prepared: 05/22/19 10:00		Analyzed: 05/22/19 13:27								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 95 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*106 %*		*50-150 %*		*"*					
LCS (9051149-BS2)		Prepared: 05/22/19 10:00		Analyzed: 05/22/19 13:00								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.485	---	0.100	mg/L	1	0.500	---	97	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*103 %*		*50-150 %*		*"*					
Duplicate (9051149-DUP1)		Prepared: 05/22/19 12:51		Analyzed: 05/22/19 20:39								
QC Source Sample: MW-6 (A9E0719-02)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**19.7**	---	2.00	mg/L	20	---	20.0	---	---	2	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 100 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*103 %*		*50-150 %*		*"*					
Duplicate (9051149-DUP2)		Prepared: 05/22/19 12:51		Analyzed: 05/22/19 22:00								
QC Source Sample: MW-5 (A9E0719-10)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**22.1**	---	2.00	mg/L	20	---	22.0	---	---	0.2	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*105 %*		*50-150 %*		*"*					

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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**	**A9E0719 - 06 04 19 1301**

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 9051201 - EPA 5030B									Water			
Blank (9051201-BLK1)		Prepared: 05/23/19 10:10		Analyzed: 05/23/19 13:06								
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)		*107 %*		*50-150 %*			*"*					
LCS (9051201-BS2)		Prepared: 05/23/19 10:10		Analyzed: 05/23/19 12:39								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.500	---	0.100	mg/L	1	0.500	---	100	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 95 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*105 %*		*50-150 %*			*"*					
Duplicate (9051201-DUP1)		Prepared: 05/23/19 12:00		Analyzed: 05/23/19 17:10								
QC Source Sample: MW-11 (A9E0719-08RE1)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**2.42**	---	1.00	mg/L	10	---	2.55	---	---	5	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 95 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*103 %*		*50-150 %*			*"*					

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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**	**A9E0719 - 06 04 19 1301**

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 9051149 - EPA 5030B									Water			
Blank (9051149-BLK1)		Prepared: 05/22/19 10:00		Analyzed: 05/22/19 13:27								
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: 106 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*102 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*102 %*		*80-120 %*			*"*					
LCS (9051149-BS1)		Prepared: 05/22/19 10:00		Analyzed: 05/22/19 12:33								
EPA 8260C												
Benzene	20.3	---	0.200	ug/L	1	20.0	---	101	80 - 120%	---	---	
Ethylbenzene	18.6	---	0.500	ug/L	1	20.0	---	93	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	18.0	---	1.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
Toluene	18.7	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Xylenes, total	57.0	---	1.50	ug/L	1	60.0	---	95	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*100 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					
Duplicate (9051149-DUP1)		Prepared: 05/22/19 12:51		Analyzed: 05/22/19 20:39								
QC Source Sample: MW-6 (A9E0719-02)												
EPA 8260C												
Benzene	**211**	---	4.00	ug/L	20	---	218	---	---	3	30%	
Ethylbenzene	**1850**	---	10.0	ug/L	20	---	1860	---	---	0.4	30%	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Toluene	**41.8**	---	20.0	ug/L	20	---	42.6	---	---	2	30%	
Xylenes, total	**938**	---	30.0	ug/L	20	---	937	---	---	0.1	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 103 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*101 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					

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6700 S.W. Sandburg Street
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**	**A9E0719 - 06 04 19 1301**

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 9051149 - EPA 5030B												**Water**
Duplicate (9051149-DUP2)		Prepared: 05/22/19 12:51 Analyzed: 05/22/19 22:00										
QC Source Sample: MW-5 (A9E0719-10)												
EPA 8260C												
Benzene	ND	---	4.00	ug/L	20	---	ND	---	---	---	30%	
Ethylbenzene	**255**	---	10.0	ug/L	20	---	252	---	---	1	30%	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Toluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Xylenes, total	**1060**	---	30.0	ug/L	20	---	1040	---	---	2	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9E0719 - 06 04 19 1301**

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 9051201 - EPA 5030B									Water			
Blank (9051201-BLK1)		Prepared: 05/23/19 10:10		Analyzed: 05/23/19 13:06								
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: 107 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*104 %*		*80-120 %*			*"*					
LCS (9051201-BS1)		Prepared: 05/23/19 10:10		Analyzed: 05/23/19 12:12								
EPA 8260C												
Benzene	19.8	---	0.200	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.1	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	21.3	---	0.500	ug/L	1	20.0	---	107	80 - 120%	---	---	
Ethylbenzene	18.3	---	0.500	ug/L	1	20.0	---	92	80 - 120%	---	---	
Isopropylbenzene	18.3	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	17.7	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
Naphthalene	16.5	---	2.00	ug/L	1	20.0	---	82	80 - 120%	---	---	
Toluene	18.4	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
1,2,4-Trimethylbenzene	19.0	---	1.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,3,5-Trimethylbenzene	18.5	---	1.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
Xylenes, total	55.7	---	1.50	ug/L	1	60.0	---	93	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*			*"*					
Duplicate (9051201-DUP1)		Prepared: 05/23/19 12:00		Analyzed: 05/23/19 17:10								

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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**	**A9E0719 - 06 04 19 1301**

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 9051201 - EPA 5030B							**Water**					
Duplicate (9051201-DUP1)		Prepared: 05/23/19 12:00		Analyzed: 05/23/19 17:10								
QC Source Sample: MW-11 (A9E0719-08RE1)												
EPA 8260C												
Benzene	**50.7**	---	2.00	ug/L	10	---	53.8	---	---	6	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Ethylbenzene	**345**	---	5.00	ug/L	10	---	359	---	---	4	30%	
Isopropylbenzene	**16.2**	---	10.0	ug/L	10	---	16.6	---	---	3	30%	
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Naphthalene	**27.8**	---	20.0	ug/L	10	---	28.4	---	---	2	30%	
Toluene	ND	---	10.0	ug/L	10	---	7.46	---	---	***	30%	
1,2,4-Trimethylbenzene	**59.3**	---	10.0	ug/L	10	---	62.0	---	---	4	30%	
1,3,5-Trimethylbenzene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Xylenes, total	**24.7**	---	15.0	ug/L	10	---	25.7	---	---	4	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*103 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*102 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*			*"*				

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9E0719 - 06 04 19 1301**

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: 9051316							
A9E0719-01	Water	NWTPH-Dx/SGC	05/20/19 09:30	05/28/19 13:14			0.94
A9E0719-02	Water	NWTPH-Dx/SGC	05/20/19 10:25	05/28/19 13:14			0.94
A9E0719-03	Water	NWTPH-Dx/SGC	05/20/19 11:20	05/28/19 13:14			0.94
A9E0719-04	Water	NWTPH-Dx/SGC	05/20/19 12:00	05/28/19 13:14			0.94
A9E0719-05	Water	NWTPH-Dx/SGC	05/20/19 12:40	05/28/19 13:14			0.94
A9E0719-06	Water	NWTPH-Dx/SGC	05/20/19 13:20	05/28/19 13:14			0.94
A9E0719-07	Water	NWTPH-Dx/SGC	05/21/19 07:40	05/28/19 13:14			0.94
A9E0719-08	Water	NWTPH-Dx/SGC	05/21/19 08:20	05/28/19 13:14			0.94
A9E0719-09	Water	NWTPH-Dx/SGC	05/21/19 08:55	05/28/19 13:14			0.94
A9E0719-10	Water	NWTPH-Dx/SGC	05/21/19 09:20	05/28/19 13:36			0.98
A9E0719-11	Water	NWTPH-Dx/SGC	05/21/19 09:40	05/28/19 13:36			0.94
Batch: 9051344							
A9E0719-12RE1	Water	NWTPH-Dx/SGC	05/21/19 10:20	05/29/19 10:05			0.94
A9E0719-13RE1	Water	NWTPH-Dx/SGC	05/21/19 10:50	05/29/19 10:05			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: 9051149							
A9E0719-01	Water	NWTPH-Gx (MS)	05/20/19 09:30	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-02	Water	NWTPH-Gx (MS)	05/20/19 10:25	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-03	Water	NWTPH-Gx (MS)	05/20/19 11:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-04	Water	NWTPH-Gx (MS)	05/20/19 12:00	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-05	Water	NWTPH-Gx (MS)	05/20/19 12:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-06	Water	NWTPH-Gx (MS)	05/20/19 13:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-07	Water	NWTPH-Gx (MS)	05/21/19 07:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-08	Water	NWTPH-Gx (MS)	05/21/19 08:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-10	Water	NWTPH-Gx (MS)	05/21/19 09:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-11	Water	NWTPH-Gx (MS)	05/21/19 09:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-12	Water	NWTPH-Gx (MS)	05/21/19 10:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-13	Water	NWTPH-Gx (MS)	05/21/19 10:50	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
Batch: 9051201							
A9E0719-09RE1	Water	NWTPH-Gx (MS)	05/21/19 08:55	05/23/19 12:00	5mL/5mL	5mL/5mL	1.00

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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
Batch: 9051149							
A9E0719-01	Water	EPA 8260C	05/20/19 09:30	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-02	Water	EPA 8260C	05/20/19 10:25	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-03	Water	EPA 8260C	05/20/19 11:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-04	Water	EPA 8260C	05/20/19 12:00	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-05	Water	EPA 8260C	05/20/19 12:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-06	Water	EPA 8260C	05/20/19 13:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-07	Water	EPA 8260C	05/21/19 07:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-08	Water	EPA 8260C	05/21/19 08:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-10	Water	EPA 8260C	05/21/19 09:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-11	Water	EPA 8260C	05/21/19 09:40	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-12	Water	EPA 8260C	05/21/19 10:20	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
A9E0719-13	Water	EPA 8260C	05/21/19 10:50	05/22/19 12:51	5mL/5mL	5mL/5mL	1.00
Batch: 9051201							
A9E0719-08RE1	Water	EPA 8260C	05/21/19 08:20	05/23/19 12:00	5mL/5mL	5mL/5mL	1.00
A9E0719-09RE1	Water	EPA 8260C	05/21/19 08:55	05/23/19 12:00	5mL/5mL	5mL/5mL	1.00

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QUALIFIER DEFINITIONS

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

Apex Laboratories

A-01	Blank Spike recovery is below in-house lower QC limit but passes recommended NWTPH method limits. Data quality is unaffected.
F-18	Result for Diesel (Diesel Range Organics, C12-C24) is due to overlap from Gasoline or a Gasoline Range product.
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. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

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.

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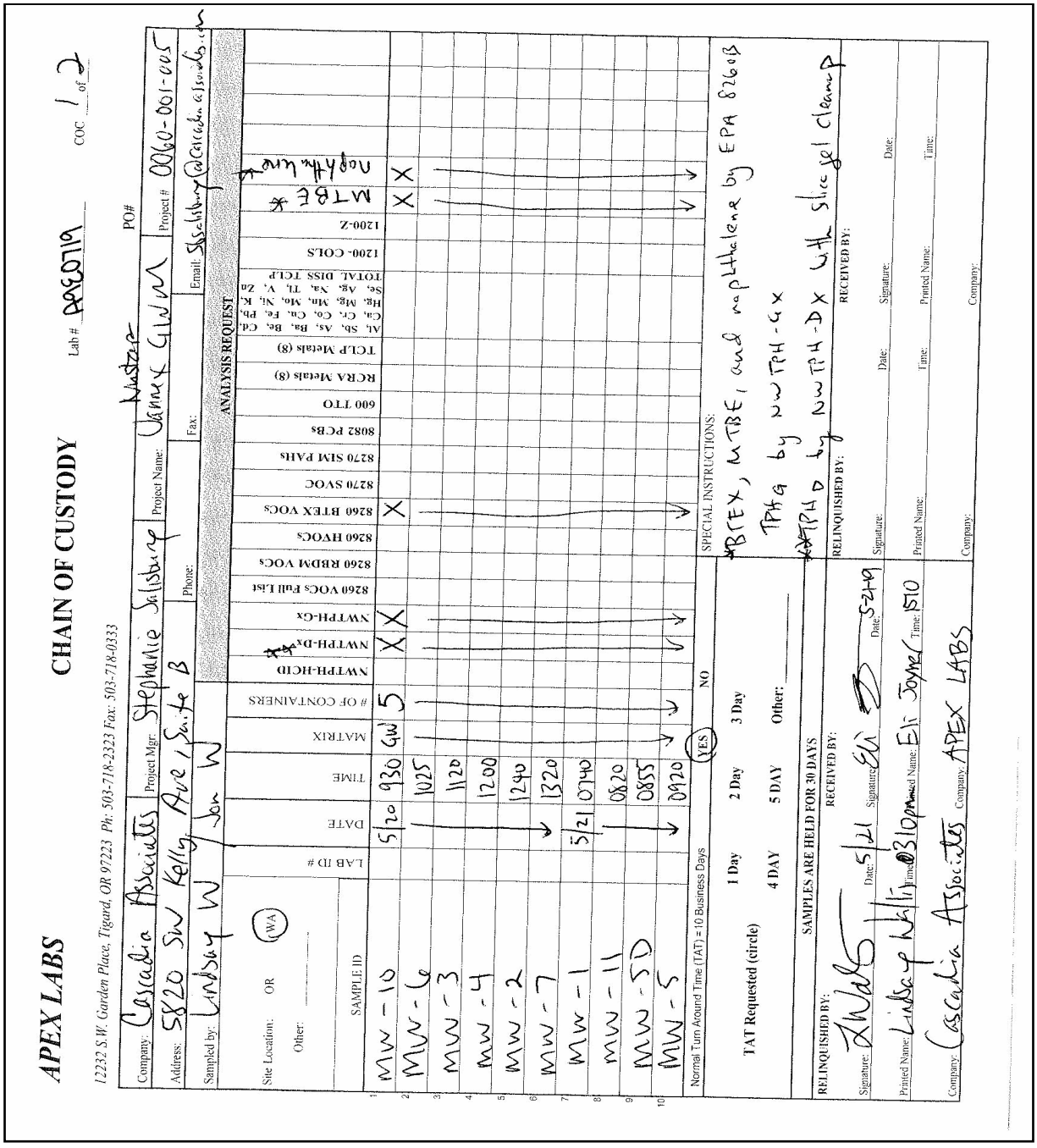

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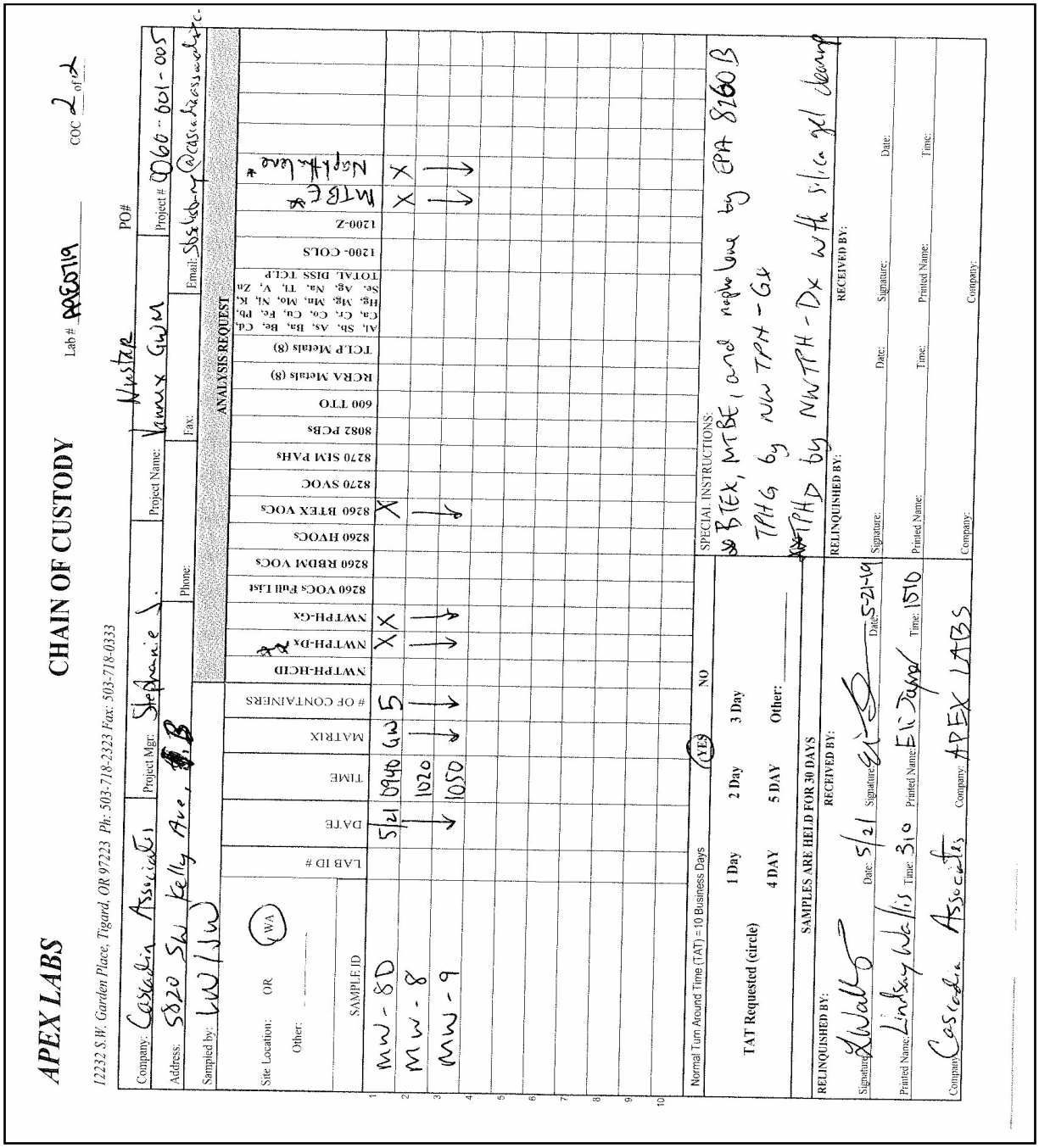
EPA ID: OR01039

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**	**A9E0719 - 06 04 19 1301**



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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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**	**A9E0719 - 06 04 19 1301**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9E0719

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

Delivery Info:

Date/time received: 5-21-19 @ 1510 By: EJ

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

Cooler Inspection Date/time inspected: 5-21-19 @ 1701 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)	1.4	1.2	1.1				
Received on ice? (Y/N)	Y	Y	Y				
Temp. blanks? (Y/N)	Y	Y	Y				
Ice type: (Gel/Real/Other)	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: 5-22-19 @ 12:00 By: TAM

All samples intact? Yes X No ___ Comments: ___

Bottle labels/COCs agree? Yes X No ___ Comments: ___

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 MW-8 3/3 voas have sed.

Water samples: pH checked: Yes X No ___ NA ___ pH appropriate? Yes X No ___ NA ___

Comments: ___

Additional information: ___

Labeled by: TAM Witness: [illegible] Cooler Inspected by: EJ See Project Contact Form: Y

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Tuesday, September 10, 2019

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

RE: A9I0015 - 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 A9I0015, which was received by the laboratory on 8/30/2019 at 1:54:00PM.

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	1.1 degC	Cooler #2	2.7 degC
Cooler #3	0.9 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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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**	**A9I0015 - 09 10 19 0932**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-9	A9I0015-01	Water	08/28/19 09:40	08/30/19 13:54
MW-5	A9I0015-02	Water	08/28/19 10:39	08/30/19 13:54
MW-5 DUP	A9I0015-03	Water	08/28/19 10:39	08/30/19 13:54
MW-5D	A9I0015-04	Water	08/28/19 11:39	08/30/19 13:54
MW-8	A9I0015-05	Water	08/28/19 12:26	08/30/19 13:54
MW-8D	A9I0015-06	Water	08/28/19 13:30	08/30/19 13:54
MW-7	A9I0015-07	Water	08/28/19 14:40	08/30/19 13:54
MW-1	A9I0015-08	Water	08/29/19 09:24	08/30/19 13:54
MW-11	A9I0015-09	Water	08/29/19 10:21	08/30/19 13:54
MW-6	A9I0015-10	Water	08/29/19 11:14	08/30/19 13:54
MW-10	A9I0015-11	Water	08/29/19 12:24	08/30/19 13:54
MW-2	A9I0015-12	Water	08/29/19 13:48	08/30/19 13:54
Trip Blank	A9I0015-13	Water	08/28/19 00:00	08/30/19 13:54

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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**	**A9I0015 - 09 10 19 0932**

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-9 (A9I0015-01)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0748	mg/L	1	09/05/19 01:10	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	09/05/19 01:10	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 62 %*		*Limits: 50-150 %*	*1*	*09/05/19 01:10*	*NWTPH-Dx/SGC*	
MW-5 (A9I0015-02)				**Matrix: Water**		**Batch: 9090490**		
Diesel	**0.963**	---	0.0769	mg/L	1	09/05/19 01:34	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.154	mg/L	1	09/05/19 01:34	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 67 %*		*Limits: 50-150 %*	*1*	*09/05/19 01:34*	*NWTPH-Dx/SGC*	
MW-5 DUP (A9I0015-03)				**Matrix: Water**		**Batch: 9090490**		
Diesel	**0.879**	---	0.0769	mg/L	1	09/05/19 02:00	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.154	mg/L	1	09/05/19 02:00	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 73 %*		*Limits: 50-150 %*	*1*	*09/05/19 02:00*	*NWTPH-Dx/SGC*	
MW-5D (A9I0015-04)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0748	mg/L	1	09/05/19 02:25	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	09/05/19 02:25	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*09/05/19 02:25*	*NWTPH-Dx/SGC*	
MW-8 (A9I0015-05)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0825	mg/L	1	09/05/19 02:50	NWTPH-Dx/SGC	
Oil	ND	---	0.165	mg/L	1	09/05/19 02:50	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*		*Limits: 50-150 %*	*1*	*09/05/19 02:50*	*NWTPH-Dx/SGC*	
MW-8D (A9I0015-06)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0755	mg/L	1	09/05/19 03:16	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	09/05/19 03:16	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 85 %*		*Limits: 50-150 %*	*1*	*09/05/19 03:16*	*NWTPH-Dx/SGC*	
MW-7 (A9I0015-07)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0777	mg/L	1	09/05/19 03:41	NWTPH-Dx/SGC	
Oil	ND	---	0.155	mg/L	1	09/05/19 03:41	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*		*Limits: 50-150 %*	*1*	*09/05/19 03:41*	*NWTPH-Dx/SGC*	
MW-1 (A9I0015-08)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0748	mg/L	1	09/05/19 04:06	NWTPH-Dx/SGC	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
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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**	**A9I0015 - 09 10 19 0932**

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-1 (A9I0015-08)				**Matrix: Water**		**Batch: 9090490**		
Oil	ND	---	0.150	mg/L	1	09/05/19 04:06	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 80 %*		*Limits: 50-150 %*	*1*	*09/05/19 04:06*	*NWTPH-Dx/SGC*	
MW-11 (A9I0015-09)				**Matrix: Water**		**Batch: 9090490**		
Diesel	**0.0940**	---	0.0748	mg/L	1	09/05/19 04:32	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.150	mg/L	1	09/05/19 04:32	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 74 %*		*Limits: 50-150 %*	*1*	*09/05/19 04:32*	*NWTPH-Dx/SGC*	
MW-6 (A9I0015-10)				**Matrix: Water**		**Batch: 9090490**		
Diesel	**1.64**	---	0.0755	mg/L	1	09/05/19 04:57	NWTPH-Dx/SGC	**F-20**
Oil	ND	---	0.151	mg/L	1	09/05/19 04:57	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 59 %*		*Limits: 50-150 %*	*1*	*09/05/19 04:57*	*NWTPH-Dx/SGC*	
MW-10 (A9I0015-11)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0748	mg/L	1	09/05/19 05:22	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	09/05/19 05:22	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 61 %*		*Limits: 50-150 %*	*1*	*09/05/19 05:22*	*NWTPH-Dx/SGC*	
MW-2 (A9I0015-12)				**Matrix: Water**		**Batch: 9090490**		
Diesel	ND	---	0.0755	mg/L	1	09/05/19 05:48	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	09/05/19 05:48	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 62 %*		*Limits: 50-150 %*	*1*	*09/05/19 05:48*	*NWTPH-Dx/SGC*	

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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**	**A9I0015 - 09 10 19 0932**

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-9 (A9I0015-01)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 18:47	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*108 %*	*Limits: 50-150 %*	*1*	*09/03/19 18:47*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*102 %*	*50-150 %*	*1*	*09/03/19 18:47*	*NWTPH-Gx (MS)*	
MW-5 (A9I0015-02)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	**24.8**	---	2.00	mg/L	20	09/03/19 21:56	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*105 %*	*Limits: 50-150 %*	*1*	*09/03/19 21:56*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*99 %*	*50-150 %*	*1*	*09/03/19 21:56*	*NWTPH-Gx (MS)*	
MW-5 DUP (A9I0015-03)				**Matrix: Water**		**Batch: 9090422**		
Gasoline Range Organics	**21.7**	---	2.00	mg/L	20	09/03/19 22:17	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*104 %*	*Limits: 50-150 %*	*1*	*09/03/19 22:17*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*134 %*	*50-150 %*	*1*	*09/03/19 22:17*	*NWTPH-Gx (MS)*	
MW-5D (A9I0015-04)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	**0.309**	---	0.100	mg/L	1	09/03/19 19:14	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*102 %*	*Limits: 50-150 %*	*1*	*09/03/19 19:14*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*09/03/19 19:14*	*NWTPH-Gx (MS)*	
MW-8 (A9I0015-05)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 19:41	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*105 %*	*Limits: 50-150 %*	*1*	*09/03/19 19:41*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*103 %*	*50-150 %*	*1*	*09/03/19 19:41*	*NWTPH-Gx (MS)*	
MW-8D (A9I0015-06)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 20:08	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*106 %*	*Limits: 50-150 %*	*1*	*09/03/19 20:08*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*102 %*	*50-150 %*	*1*	*09/03/19 20:08*	*NWTPH-Gx (MS)*	
MW-7 (A9I0015-07)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 20:35	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*108 %*	*Limits: 50-150 %*	*1*	*09/03/19 20:35*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*103 %*	*50-150 %*	*1*	*09/03/19 20:35*	*NWTPH-Gx (MS)*	
MW-1 (A9I0015-08)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 21:02	NWTPH-Gx (MS)	

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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**	**A9I0015 - 09 10 19 0932**

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-1 (A9I0015-08)				**Matrix: Water**		**Batch: 9090423**		
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*106 %*	*Limits: 50-150 %*	*1*	*09/03/19 21:02*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*103 %*	*50-150 %*	*1*	*09/03/19 21:02*	*NWTPH-Gx (MS)*	
MW-11 (A9I0015-09RE1)				**Matrix: Water**		**Batch: 9090470**		
Gasoline Range Organics	**17.4**	---	1.00	mg/L	10	09/04/19 17:09	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*111 %*	*Limits: 50-150 %*	*1*	*09/04/19 17:09*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*102 %*	*50-150 %*	*1*	*09/04/19 17:09*	*NWTPH-Gx (MS)*	
MW-6 (A9I0015-10)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	**16.8**	---	2.00	mg/L	20	09/03/19 22:50	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*104 %*	*Limits: 50-150 %*	*1*	*09/03/19 22:50*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*09/03/19 22:50*	*NWTPH-Gx (MS)*	
MW-10 (A9I0015-11)				**Matrix: Water**		**Batch: 9090422**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 21:23	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*101 %*	*Limits: 50-150 %*	*1*	*09/03/19 21:23*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*101 %*	*50-150 %*	*1*	*09/03/19 21:23*	*NWTPH-Gx (MS)*	
MW-2 (A9I0015-12)				**Matrix: Water**		**Batch: 9090423**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	09/03/19 21:29	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*106 %*	*Limits: 50-150 %*	*1*	*09/03/19 21:29*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*103 %*	*50-150 %*	*1*	*09/03/19 21:29*	*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**	**A9I0015 - 09 10 19 0932**

ANALYTICAL SAMPLE RESULTS

BTEX Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A9I0015-13)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 18:19	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 18:19	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 18:19	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 18:19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits:* *80-120 %*	*1*	*09/03/19 18:19*	*EPA 8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*09/03/19 18:19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 18:19*	*EPA 8260C*	

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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**	**A9I0015 - 09 10 19 0932**

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-9 (A9I0015-01)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 18:47	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 18:47	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 18:47	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 18:47	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 18:47	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 18:47	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits: 80-120 %*	*1*	*09/03/19 18:47*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 18:47*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 18:47*	*EPA 8260C*	
MW-5 (A9I0015-02)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	4.00	ug/L	20	09/03/19 21:56	EPA 8260C	
Ethylbenzene	**239**	---	10.0	ug/L	20	09/03/19 21:56	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	09/03/19 21:56	EPA 8260C	
Naphthalene	**2070**	---	40.0	ug/L	20	09/03/19 21:56	EPA 8260C	
Toluene	ND	---	20.0	ug/L	20	09/03/19 21:56	EPA 8260C	
Xylenes, total	**1100**	---	30.0	ug/L	20	09/03/19 21:56	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*102 %*	*Limits: 80-120 %*	*1*	*09/03/19 21:56*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*09/03/19 21:56*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*09/03/19 21:56*	*EPA 8260C*	
MW-5 DUP (A9I0015-03)				**Matrix: Water**		**Batch: 9090422**		
Benzene	ND	---	4.00	ug/L	20	09/03/19 22:17	EPA 8260C	
Ethylbenzene	**179**	---	10.0	ug/L	20	09/03/19 22:17	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	09/03/19 22:17	EPA 8260C	
Naphthalene	**1440**	---	40.0	ug/L	20	09/03/19 22:17	EPA 8260C	
Toluene	ND	---	20.0	ug/L	20	09/03/19 22:17	EPA 8260C	
Xylenes, total	**836**	---	30.0	ug/L	20	09/03/19 22:17	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*09/03/19 22:17*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*09/03/19 22:17*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*09/03/19 22:17*	*EPA 8260C*	
MW-5D (A9I0015-04)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 19:14	EPA 8260C	
Ethylbenzene	**0.780**	---	0.500	ug/L	1	09/03/19 19:14	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 19:14	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 19:14	EPA 8260C	

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Apex Laboratories, LLC

6700 S.W. Sandburg Street
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**	**A9I0015 - 09 10 19 0932**

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-5D (A9I0015-04)				**Matrix: Water**		**Batch: 9090423**		
Toluene	ND	---	1.00	ug/L	1	09/03/19 19:14	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 19:14	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 101 %*		*Limits: 80-120 %*	*1*	*09/03/19 19:14*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 19:14*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*09/03/19 19:14*	*EPA 8260C*	
MW-8 (A9I0015-05)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 19:41	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 19:41	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 19:41	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 19:41	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 19:41	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 19:41	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*	*1*	*09/03/19 19:41*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 19:41*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 19:41*	*EPA 8260C*	
MW-8D (A9I0015-06)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 20:08	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 20:08	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 20:08	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 20:08	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 20:08	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 20:08	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 106 %*		*Limits: 80-120 %*	*1*	*09/03/19 20:08*	*EPA 8260C*	
Toluene-d8 (Surr)			*96 %*	*80-120 %*	*1*	*09/03/19 20:08*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*09/03/19 20:08*	*EPA 8260C*	
MW-7 (A9I0015-07)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 20:35	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 20:35	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 20:35	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 20:35	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 20:35	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 20:35	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*	*1*	*09/03/19 20:35*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 20:35*	*EPA 8260C*	

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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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**	**A9I0015 - 09 10 19 0932**

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-7 (A9I0015-07)				**Matrix: Water**		**Batch: 9090423**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 95 %*	*Limits: 80-120 %*		*1*	*09/03/19 20:35*	*EPA 8260C*	
MW-1 (A9I0015-08)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 21:02	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 21:02	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 21:02	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 21:02	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 21:02	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 21:02	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 106 %*	*Limits: 80-120 %*		*1*	*09/03/19 21:02*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 21:02*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 21:02*	*EPA 8260C*	
MW-11 (A9I0015-09RE1)				**Matrix: Water**		**Batch: 9090470**		
Benzene	**3.80**	---	2.00	ug/L	10	09/04/19 17:09	EPA 8260C	
Ethylbenzene	**1180**	---	5.00	ug/L	10	09/04/19 17:09	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	09/04/19 17:09	EPA 8260C	
Naphthalene	**121**	---	20.0	ug/L	10	09/04/19 17:09	EPA 8260C	
Toluene	**240**	---	10.0	ug/L	10	09/04/19 17:09	EPA 8260C	
Xylenes, total	**2520**	---	15.0	ug/L	10	09/04/19 17:09	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 103 %*	*Limits: 80-120 %*		*1*	*09/04/19 17:09*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/04/19 17:09*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*09/04/19 17:09*	*EPA 8260C*	
MW-6 (A9I0015-10)				**Matrix: Water**		**Batch: 9090423**		
Benzene	**177**	---	4.00	ug/L	20	09/03/19 22:50	EPA 8260C	
Ethylbenzene	**1690**	---	10.0	ug/L	20	09/03/19 22:50	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	09/03/19 22:50	EPA 8260C	
Naphthalene	**561**	---	40.0	ug/L	20	09/03/19 22:50	EPA 8260C	**Q-42**
Toluene	**39.4**	---	20.0	ug/L	20	09/03/19 22:50	EPA 8260C	
Xylenes, total	**585**	---	30.0	ug/L	20	09/03/19 22:50	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 101 %*	*Limits: 80-120 %*		*1*	*09/03/19 22:50*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 22:50*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 22:50*	*EPA 8260C*	
MW-10 (A9I0015-11)				**Matrix: Water**		**Batch: 9090422**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 21:23	EPA 8260C	

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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**	**A9I0015 - 09 10 19 0932**

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-10 (A9I0015-11)				**Matrix: Water**		**Batch: 9090422**		
Ethylbenzene	ND	---	0.500	ug/L	1	09/03/19 21:23	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	09/03/19 21:23	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 21:23	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 21:23	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 21:23	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*103 %*	*Limits: 80-120 %*	*1*	*09/03/19 21:23*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*09/03/19 21:23*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*09/03/19 21:23*	*EPA 8260C*	
MW-2 (A9I0015-12)				**Matrix: Water**		**Batch: 9090423**		
Benzene	ND	---	0.200	ug/L	1	09/03/19 21:29	EPA 8260C	
Ethylbenzene	**0.690**	---	0.500	ug/L	1	09/03/19 21:29	EPA 8260C	
Methyl tert-butyl ether (MTBE)	**1.25**	---	1.00	ug/L	1	09/03/19 21:29	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	09/03/19 21:29	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	09/03/19 21:29	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	09/03/19 21:29	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*09/03/19 21:29*	*EPA 8260C*	
Toluene-d8 (Surr)			*97 %*	*80-120 %*	*1*	*09/03/19 21:29*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*96 %*	*80-120 %*	*1*	*09/03/19 21:29*	*EPA 8260C*	

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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**	**A9I0015 - 09 10 19 0932**

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 9090490 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel												**Water**
Blank (9090490-BLK1)			Prepared: 09/04/19 13:00		Analyzed: 09/04/19 23:53							
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 82 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS (9090490-BS1)			Prepared: 09/04/19 13:00		Analyzed: 09/05/19 00:19							
NWTPH-Dx/SGC												
Diesel	0.363	---	0.0800	mg/L	1	0.500	---	73	58 - 115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 87 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS Dup (9090490-BSD1)			Prepared: 09/04/19 13:00		Analyzed: 09/05/19 00:45							**Q-19**
NWTPH-Dx/SGC												
Diesel	0.364	---	0.0800	mg/L	1	0.500	---	73	58 - 115%	0.4	20%	
Surr: o-Terphenyl (Surr)			*Recovery: 87 %*		*Limits: 50-150 %*		*Dilution: 1x*					

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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**	**A9I0015 - 09 10 19 0932**

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 9090422 - EPA 5030B									Water			
Blank (9090422-BLK1)		Prepared: 09/03/19 09:00		Analyzed: 09/03/19 12:48								
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)			*95 %*		*50-150 %*			*"*				
LCS (9090422-BS1)		Prepared: 09/03/19 09:00		Analyzed: 09/03/19 11:27								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.539	---	0.100	mg/L	1	0.500	---	108	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 104 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*117 %*		*50-150 %*			*"*				

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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**	**A9I0015 - 09 10 19 0932**

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 9090423 - EPA 5030B									Water			
Blank (9090423-BLK1)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 12:27								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 103 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*103 %*		*50-150 %*			*"*					
LCS (9090423-BS2)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 12:00								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.476	---	0.100	mg/L	1	0.500	---	95	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 101 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*96 %*		*50-150 %*			*"*					
Duplicate (9090423-DUP2)		Prepared: 09/03/19 12:07		Analyzed: 09/03/19 22:23								
QC Source Sample: MW-5 (A9I0015-02)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**24.1**	---	2.00	mg/L	20	---	24.8	---	---	3	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*99 %*		*50-150 %*			*"*					

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0015 - 09 10 19 0932**

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 9090470 - EPA 5030B									Water			
Blank (9090470-BLK1)		Prepared: 09/04/19 09:00		Analyzed: 09/04/19 11:17								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 104 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*102 %*		*50-150 %*			*"*				
LCS (9090470-BS2)		Prepared: 09/04/19 09:00		Analyzed: 09/04/19 10:49								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.491	---	0.100	mg/L	1	0.500	---	98	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*98 %*		*50-150 %*			*"*				
Duplicate (9090470-DUP1)		Prepared: 09/04/19 11:29		Analyzed: 09/04/19 17:36								
QC Source Sample: MW-11 (A9I0015-09RE1)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**16.0**	---	1.00	mg/L	10	---	17.4	---	---	9	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 108 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)			*101 %*		*50-150 %*			*"*				

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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**	**A9I0015 - 09 10 19 0932**

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 9090423 - EPA 5030B												**Water**
Blank (9090423-BLK1)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 12:27								
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: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
LCS (9090423-BS1)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 11:33								
EPA 8260C												
Benzene	19.4	---	0.200	ug/L	1	20.0	---	97	80 - 120%	---	---	
Toluene	18.3	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
Ethylbenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Xylenes, total	57.3	---	1.50	ug/L	1	60.0	---	95	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 98 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
Duplicate (9090423-DUP2)		Prepared: 09/03/19 12:07		Analyzed: 09/03/19 22:23								
QC Source Sample: MW-5 (A9I0015-02)												
EPA 8260C												
Benzene	ND	---	4.00	ug/L	20	---	ND	---	---	---	30%	
Toluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Ethylbenzene	**244**	---	10.0	ug/L	20	---	239	---	---	2	30%	
Xylenes, total	**1140**	---	30.0	ug/L	20	---	1100	---	---	4	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 103 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
Matrix Spike (9090423-MS1)		Prepared: 09/03/19 12:07		Analyzed: 09/03/19 23:17								**T-02**
QC Source Sample: MW-6 (A9I0015-10)												
EPA 8260C												

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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**	**A9I0015 - 09 10 19 0932**

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 9090423 - EPA 5030B							**Water**					
Matrix Spike (9090423-MS1)		Prepared: 09/03/19 12:07		Analyzed: 09/03/19 23:17								**T-02**
QC Source Sample: MW-6 (A9I0015-10)												
Benzene	629	---	4.00	ug/L	20	400	177	113	79 - 120%	---	---	
Toluene	447	---	20.0	ug/L	20	400	39.4	102	80 - 121%	---	---	
Ethylbenzene	2170	---	10.0	ug/L	20	400	1690	120	79 - 121%	---	---	
Xylenes, total	1930	---	30.0	ug/L	20	1200	585	112	79 - 121%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 101 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*96 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					

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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**	**A9I0015 - 09 10 19 0932**

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 9090422 - EPA 5030B							**Water**					
Blank (9090422-BLK1)		Prepared: 09/03/19 09:00		Analyzed: 09/03/19 12:48								
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:*	*104 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*105 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*			*"*				
LCS (9090422-BS2)		Prepared: 09/03/19 09:00		Analyzed: 09/03/19 11:54								
EPA 8260C												
Benzene	21.8	---	0.200	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.4	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Ethylbenzene	18.0	---	0.500	ug/L	1	20.0	---	90	80 - 120%	---	---	
Isopropylbenzene	17.3	---	1.00	ug/L	1	20.0	---	87	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	19.5	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
Naphthalene	18.9	---	2.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Toluene	18.9	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,2,4-Trimethylbenzene	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,3,5-Trimethylbenzene	20.0	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Xylenes, total	53.2	---	1.50	ug/L	1	60.0	---	89	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*105 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*101 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*103 %*		*80-120 %*			*"*				

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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**	**A9I0015 - 09 10 19 0932**

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 9090423 - EPA 5030B									Water			
Blank (9090423-BLK1)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 12:27								
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)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
LCS (9090423-BS1)		Prepared: 09/03/19 10:00		Analyzed: 09/03/19 11:33								
EPA 8260C												
Benzene	19.4	---	0.200	ug/L	1	20.0	---	97	80 - 120%	---	---	
Ethylbenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	21.0	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Naphthalene	21.7	---	2.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Toluene	18.3	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
Xylenes, total	57.3	---	1.50	ug/L	1	60.0	---	95	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 98 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
Duplicate (9090423-DUP2)		Prepared: 09/03/19 12:07		Analyzed: 09/03/19 22:23								
QC Source Sample: MW-5 (A9I0015-02)												
EPA 8260C												
Benzene	ND	---	4.00	ug/L	20	---	ND	---	---	---	30%	
Ethylbenzene	**244**	---	10.0	ug/L	20	---	239	---	---	2	30%	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Naphthalene	**2160**	---	40.0	ug/L	20	---	2070	---	---	4	30%	
Toluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Xylenes, total	**1140**	---	30.0	ug/L	20	---	1100	---	---	4	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 103 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					

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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**	**A9I0015 - 09 10 19 0932**

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 9090423 - EPA 5030B									**Water**			
Duplicate (9090423-DUP2)			Prepared: 09/03/19 12:07		Analyzed: 09/03/19 22:23							
QC Source Sample: MW-5 (A9I0015-02)												
Surr: 4-Bromofluorobenzene (Surr)			*Recovery: 97 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Matrix Spike (9090423-MS1)			Prepared: 09/03/19 12:07		Analyzed: 09/03/19 23:17							**T-02**
QC Source Sample: MW-6 (A9I0015-10)												
EPA 8260C												
Benzene	629	---	4.00	ug/L	20	400	177	113	79 - 120%	---	---	
Ethylbenzene	2170	---	10.0	ug/L	20	400	1690	120	79 - 121%	---	---	
Methyl tert-butyl ether (MTBE)	454	---	20.0	ug/L	20	400	ND	113	71 - 124%	---	---	
Naphthalene	1090	---	40.0	ug/L	20	400	561	**131**	**61 - 128%**	---	---	Q-01
Toluene	447	---	20.0	ug/L	20	400	39.4	102	80 - 121%	---	---	
Xylenes, total	1930	---	30.0	ug/L	20	1200	585	112	79 - 121%	---	---	
Surr: 1,4-Difluorobenzene (Surr)			*Recovery: 101 %*		*Limits: 80-120 %*			*Dilution: 1x*				
Toluene-d8 (Surr)			*96 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*97 %*		*80-120 %*			*"*				

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0015 - 09 10 19 0932**

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 9090470 - EPA 5030B												**Water**
Blank (9090470-BLK1)		Prepared: 09/04/19 09:00		Analyzed: 09/04/19 11:17								
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: 106 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
LCS (9090470-BS1)		Prepared: 09/04/19 09:00		Analyzed: 09/04/19 10:22								
EPA 8260C												
Benzene	20.3	---	0.200	ug/L	1	20.0	---	102	80 - 120%	---	---	
Ethylbenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	21.9	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
Naphthalene	22.5	---	2.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Toluene	18.9	---	1.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
Xylenes, total	58.6	---	1.50	ug/L	1	60.0	---	98	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*96 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					
Duplicate (9090470-DUP1)		Prepared: 09/04/19 11:29		Analyzed: 09/04/19 17:36								
QC Source Sample: MW-11 (A9I0015-09RE1)												
EPA 8260C												
Benzene	**3.80**	---	2.00	ug/L	10	---	3.80	---	---	0	30%	
Ethylbenzene	**1100**	---	5.00	ug/L	10	---	1180	---	---	7	30%	
Methyl tert-butyl ether (MTBE)	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Naphthalene	**116**	---	20.0	ug/L	10	---	121	---	---	5	30%	
Toluene	**227**	---	10.0	ug/L	10	---	240	---	---	6	30%	
Xylenes, total	**2350**	---	15.0	ug/L	10	---	2520	---	---	7	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					

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5820 SW Kelly Ave Unit B	Project Number: **0060-001-005**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0015 - 09 10 19 0932**

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 9090470 - EPA 5030B												**Water**
Duplicate (9090470-DUP1)	Prepared: 09/04/19 11:29 Analyzed: 09/04/19 17:36											
QC Source Sample: MW-11 (A9I0015-09RE1)												
Surr: 4-Bromofluorobenzene (Surr)	*Recovery: 98 %*		*Limits: 80-120 %*		*Dilution: 1x*							

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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**	**A9I0015 - 09 10 19 0932**

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: 9090490							
A9I0015-01	Water	NWTPH-Dx/SGC	08/28/19 09:40	09/04/19 13:00			0.94
A9I0015-02	Water	NWTPH-Dx/SGC	08/28/19 10:39	09/04/19 13:00			0.96
A9I0015-03	Water	NWTPH-Dx/SGC	08/28/19 10:39	09/04/19 13:00			0.96
A9I0015-04	Water	NWTPH-Dx/SGC	08/28/19 11:39	09/04/19 13:00			0.94
A9I0015-05	Water	NWTPH-Dx/SGC	08/28/19 12:26	09/04/19 13:00			1.03
A9I0015-06	Water	NWTPH-Dx/SGC	08/28/19 13:30	09/04/19 13:00			0.94
A9I0015-07	Water	NWTPH-Dx/SGC	08/28/19 14:40	09/04/19 13:00			0.97
A9I0015-08	Water	NWTPH-Dx/SGC	08/29/19 09:24	09/04/19 13:00			0.94
A9I0015-09	Water	NWTPH-Dx/SGC	08/29/19 10:21	09/04/19 13:00			0.94
A9I0015-10	Water	NWTPH-Dx/SGC	08/29/19 11:14	09/04/19 14:26			0.94
A9I0015-11	Water	NWTPH-Dx/SGC	08/29/19 12:24	09/04/19 14:26			0.94
A9I0015-12	Water	NWTPH-Dx/SGC	08/29/19 13:48	09/04/19 14:26			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: 9090422							
A9I0015-03	Water	NWTPH-Gx (MS)	08/28/19 10:39	09/03/19 13:50	5mL/5mL	5mL/5mL	1.00
A9I0015-11	Water	NWTPH-Gx (MS)	08/29/19 12:24	09/03/19 13:50	5mL/5mL	5mL/5mL	1.00
Batch: 9090423							
A9I0015-01	Water	NWTPH-Gx (MS)	08/28/19 09:40	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-02	Water	NWTPH-Gx (MS)	08/28/19 10:39	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-04	Water	NWTPH-Gx (MS)	08/28/19 11:39	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-05	Water	NWTPH-Gx (MS)	08/28/19 12:26	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-06	Water	NWTPH-Gx (MS)	08/28/19 13:30	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-07	Water	NWTPH-Gx (MS)	08/28/19 14:40	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-08	Water	NWTPH-Gx (MS)	08/29/19 09:24	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-10	Water	NWTPH-Gx (MS)	08/29/19 11:14	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-12	Water	NWTPH-Gx (MS)	08/29/19 13:48	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
Batch: 9090470							
A9I0015-09RE1	Water	NWTPH-Gx (MS)	08/29/19 10:21	09/04/19 11:29	5mL/5mL	5mL/5mL	1.00

BTEX Compounds by EPA 8260C

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

6700 S.W. Sandburg Street
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**	**A9I0015 - 09 10 19 0932**

SAMPLE PREPARATION INFORMATION

BTEX Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9090423							
A9I0015-13	Water	EPA 8260C	08/28/19 00:00	09/03/19 12:07	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: 9090422							
A9I0015-03	Water	EPA 8260C	08/28/19 10:39	09/03/19 13:50	5mL/5mL	5mL/5mL	1.00
A9I0015-11	Water	EPA 8260C	08/29/19 12:24	09/03/19 13:50	5mL/5mL	5mL/5mL	1.00
Batch: 9090423							
A9I0015-01	Water	EPA 8260C	08/28/19 09:40	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-02	Water	EPA 8260C	08/28/19 10:39	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-04	Water	EPA 8260C	08/28/19 11:39	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-05	Water	EPA 8260C	08/28/19 12:26	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-06	Water	EPA 8260C	08/28/19 13:30	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-07	Water	EPA 8260C	08/28/19 14:40	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-08	Water	EPA 8260C	08/29/19 09:24	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-10	Water	EPA 8260C	08/29/19 11:14	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
A9I0015-12	Water	EPA 8260C	08/29/19 13:48	09/03/19 12:07	5mL/5mL	5mL/5mL	1.00
Batch: 9090470							
A9I0015-09RE1	Water	EPA 8260C	08/29/19 10:21	09/04/19 11:29	5mL/5mL	5mL/5mL	1.00

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

6700 S.W. Sandburg Street
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**	**A9I0015 - 09 10 19 0932**

QUALIFIER DEFINITIONS

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

Apex Laboratories

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-01	Spike recovery and/or RPD is outside acceptance 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.)
T-02	This Batch QC sample was analyzed outside of the method specified 12 hour tune window. Results are estimated.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0015 - 09 10 19 0932**

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. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

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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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**	**A9I0015 - 09 10 19 0932**

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, LLC

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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**	**A9I0015 - 09 10 19 0932**

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 Domenighini, Client Services Manager

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Apex Laboratories, LLC
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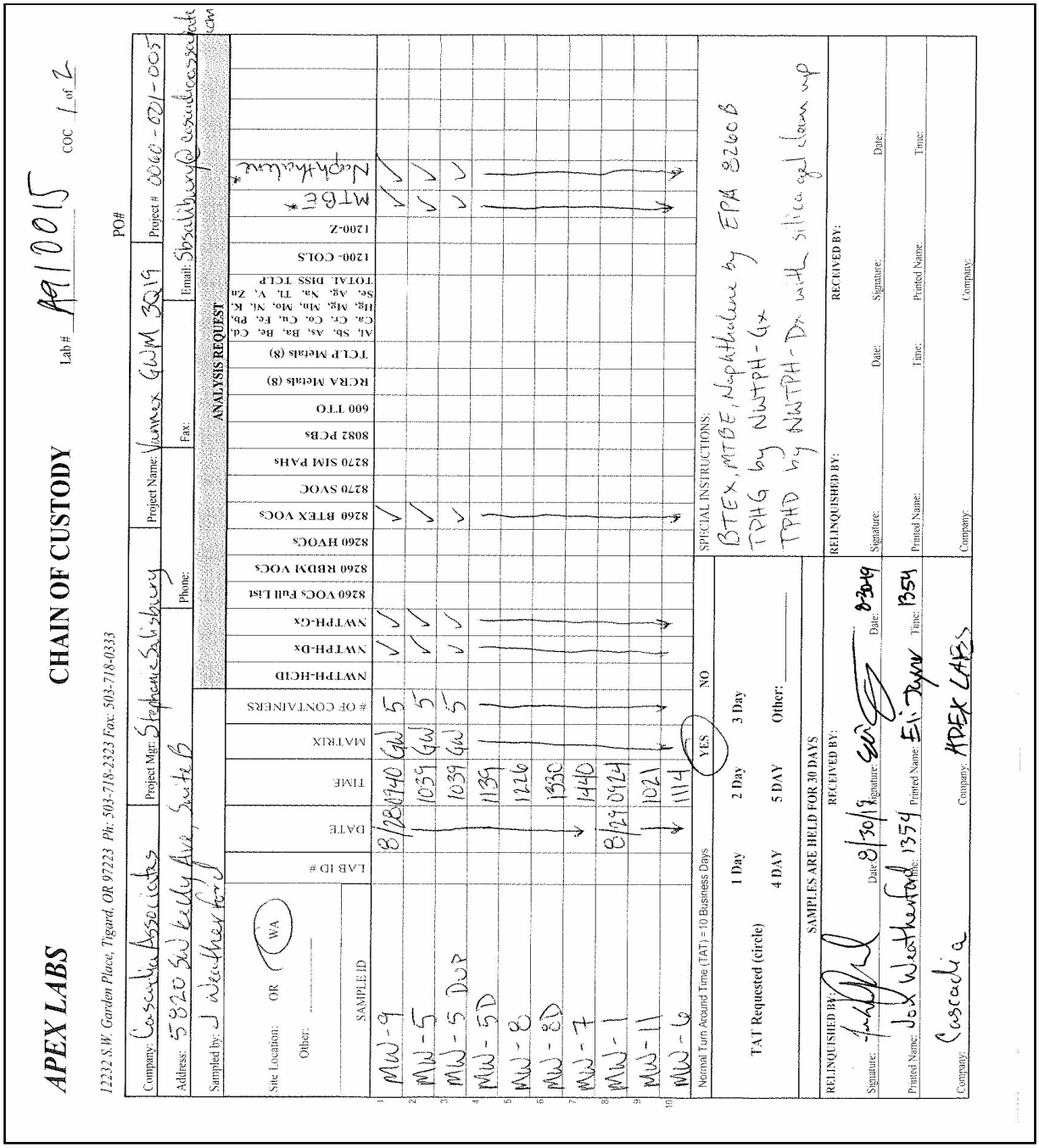
503-718-2323
EPA ID: OR01039

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**	**A9I0015 - 09 10 19 0932**



APEX LABS

CHAIN OF CUSTODY

Lab # A9I0015 COC 1 of 2

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

PO#

Company: Cascadia Associates | Project Mgr: Stephanie Salisbury | Project Name: Vannex GWM 3Q19 | Project #: 0060-001-005

Address: 5820 SW Kelly Ave, Suite B | Phone: | Fax: | Email: ssalisbury@cascadiaassociates.com

Sampled by: J Weatherford

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	MTBE*	Naphthalene*
1	MW-9		8/28	1740	GW	5		✓	✓				✓									✓	✓
2	MW-5			1039	GW	5		✓	✓				✓									✓	✓
3	MW-5 Dup			1039	GW	5		✓	✓				✓									✓	✓
4	MW-5D			1139																			
5	MW-8			1226																			
6	MW-8D			1335																			
7	MW-7		↓	1440	↓	↓																	
8	MW-1		8/29	0924																			
9	MW-11		↓	1021	↓	↓																	
10	MW-6		↓	1114	↓	↓																	

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, Naphthalene by EPA 8260B
TPHG by NWTPH-Gx
TPHD by NWTPH-Dx with silica gel clean up

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Signature: _____ Date: 8/30/19 Printed Name: J. Weatherford Time: 1354 Company: Cascadia

RECEIVED BY: Signature: _____ Date: 8/30/19 Printed Name: Eli Dyer Time: 1354 Company: APEX LABS

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

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

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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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**	**A9I0015 - 09 10 19 0932**

APEX LABS — **CHAIN OF CUSTODY** — Lab # A9I0015 — COC 2 of 2

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

PO#

Company: Cascadia Associates | Project Mgr: S Salisbury | Project Name: Vannex GWM 3Q19 | Project # 0060-001-005

Address: 5820 SW Kelly Ave, Suite B | Phone: | Fax: | Email: Ssalisbury@cascadiaassociates.com

Sampled by: J Weatherford

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	MTBE*	Naphthalene*				
1	MW-10		8/29	1224	GW	5		✓	✓				✓										✓	✓				
2	MW-2		↓	1348	↓	↓		H	H				H										H	H				
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: ______

SAMPLES ARE HELD FOR 30 DAYS

SPECIAL INSTRUCTIONS:
H = hold for potential analysis
* BTEX, MTBE, Naphthalene by EPA 8260B
TPHG by NWTPH-Gx
TPHD by NWTPH-Dx w/ Silica gel clean up

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 8/30/19	Signature: [signature] Date: 8-30-19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1354	Printed Name: Eli Joyner Time: 1354	Printed Name: Time:	Printed Name: Time:
Company: Cascadia	Company: APEX LABS	Company:	Company:

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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**	**A9I0015 - 09 10 19 0932**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9 10015

Project/Project #: Vannex GWM 3Q19 0060-001-005

Delivery Info:

Date/time received: 8-30-19 @ 1354 By: EJ

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

Cooler Inspection Date/time inspected: 8-30-19 @ 1537 By: EJ

Chain of Custody included? Yes Y 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)	1.1	2.7	0.9	~~5.3~~ CB 9/3/19			
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 CB 9/3/19

Samples Inspection: Date/time inspected: 9/3/19 @ 1200 By: CB

All samples intact? Yes X No ___ Comments: ___

CB 9/3/19

Bottle labels/COCs agree? Yes ~~X~~ No ~~X~~ Comments: (3) TB # 2415 provided, not listed on COC. 1/2 HCl ambers MW-2 read T of 1345

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 X No ___ NA ___

Comments: ___

Additional information: * 2/3 Trip Blanks found out of temp after being stored in coolers over weekend.

Labeled by: CB Witness: CB Cooler Inspected by: CB See Project Contact Form: Y

Apex Laboratories

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Wednesday, December 4, 2019

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

RE: A9K0658 - Nustar Vannex - [none]

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 A9K0658, which was received by the laboratory on 11/20/2019 at 10:55:00AM.

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 sample reciept, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler#1	1.1 degC	Cooler#2	2.3 degC
Cooler#3	0.3 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

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-5D	A9K0658-01	Water	11/18/19 09:45	11/20/19 10:55
MW-5	A9K0658-02	Water	11/18/19 10:27	11/20/19 10:55
MW-5 Dup	A9K0658-03	Water	11/18/19 10:27	11/20/19 10:55
MW-8	A9K0658-04	Water	11/18/19 12:14	11/20/19 10:55
MW-8D	A9K0658-05	Water	11/18/19 13:11	11/20/19 10:55
MW-9	A9K0658-06	Water	11/18/19 13:52	11/20/19 10:55
MW-7	A9K0658-07	Water	11/18/19 14:34	11/20/19 10:55
MW-6	A9K0658-08	Water	11/19/19 07:49	11/20/19 10:55
MW-1	A9K0658-09	Water	11/19/19 09:18	11/20/19 10:55
MW-11	A9K0658-10	Water	11/19/19 10:07	11/20/19 10:55
MW-10	A9K0658-11	Water	11/19/19 10:50	11/20/19 10:55
MW-4	A9K0658-12	Water	11/19/19 11:48	11/20/19 10:55
MW-3	A9K0658-13	Water	11/19/19 13:06	11/20/19 10:55
MW-2	A9K0658-14	Water	11/19/19 14:15	11/20/19 10:55

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Lisa Domenighini, Client Services Manager

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6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-5D (A9K0658-01)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0755	mg/L	1	11/21/19 22:30	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	11/21/19 22:30	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 65 %*		*Limits: 50-150 %*	*1*	*11/21/19 22:30*	*NWTPH-Dx/SGC*	
MW-5 (A9K0658-02)				**Matrix: Water**		**Batch: 9111072**		
Diesel	**0.771**	---	0.0762	mg/L	1	11/21/19 22:52	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.152	mg/L	1	11/21/19 22:52	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 64 %*		*Limits: 50-150 %*	*1*	*11/21/19 22:52*	*NWTPH-Dx/SGC*	
MW-5 Dup (A9K0658-03)				**Matrix: Water**		**Batch: 9111072**		
Diesel	**0.696**	---	0.0762	mg/L	1	11/21/19 23:15	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.152	mg/L	1	11/21/19 23:15	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 62 %*		*Limits: 50-150 %*	*1*	*11/21/19 23:15*	*NWTPH-Dx/SGC*	
MW-8 (A9K0658-04)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0755	mg/L	1	11/21/19 21:25	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	11/21/19 21:25	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*11/21/19 21:25*	*NWTPH-Dx/SGC*	
MW-8D (A9K0658-05)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0762	mg/L	1	11/21/19 21:46	NWTPH-Dx/SGC	
Oil	ND	---	0.152	mg/L	1	11/21/19 21:46	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 73 %*		*Limits: 50-150 %*	*1*	*11/21/19 21:46*	*NWTPH-Dx/SGC*	
MW-9 (A9K0658-06)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0762	mg/L	1	11/21/19 22:08	NWTPH-Dx/SGC	
Oil	ND	---	0.152	mg/L	1	11/21/19 22:08	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 66 %*		*Limits: 50-150 %*	*1*	*11/21/19 22:08*	*NWTPH-Dx/SGC*	
MW-7 (A9K0658-07)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0748	mg/L	1	11/21/19 22:30	NWTPH-Dx/SGC	
Oil	ND	---	0.150	mg/L	1	11/21/19 22:30	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 72 %*		*Limits: 50-150 %*	*1*	*11/21/19 22:30*	*NWTPH-Dx/SGC*	
MW-6 (A9K0658-08)				**Matrix: Water**		**Batch: 9111072**		
Diesel	**1.95**	---	0.0748	mg/L	1	11/21/19 22:52	NWTPH-Dx/SGC	**F-13, F-20**

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 (A9K0658-08)				**Matrix: Water**		**Batch: 9111072**		
Oil	ND	---	0.150	mg/L	1	11/21/19 22:52	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 61 %*		*Limits: 50-150 %*	*1*	*11/21/19 22:52*	*NWTPH-Dx/SGC*	
MW-1 (A9K0658-09)				**Matrix: Water**		**Batch: 9111072**		
Diesel	ND	---	0.0755	mg/L	1	11/21/19 23:15	NWTPH-Dx/SGC	
Oil	ND	---	0.151	mg/L	1	11/21/19 23:15	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 84 %*		*Limits: 50-150 %*	*1*	*11/21/19 23:15*	*NWTPH-Dx/SGC*	
MW-11 (A9K0658-10)				**Matrix: Water**		**Batch: 9111116**		
Diesel	**0.239**	---	0.0755	mg/L	1	11/22/19 22:28	NWTPH-Dx/SGC	**F-18**
Oil	ND	---	0.151	mg/L	1	11/22/19 22:28	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 61 %*		*Limits: 50-150 %*	*1*	*11/22/19 22:28*	*NWTPH-Dx/SGC*	
MW-10 (A9K0658-11)				**Matrix: Water**		**Batch: 9111116**		
Diesel	ND	---	0.0762	mg/L	1	11/22/19 22:48	NWTPH-Dx/SGC	
Oil	ND	---	0.152	mg/L	1	11/22/19 22:48	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 61 %*		*Limits: 50-150 %*	*1*	*11/22/19 22:48*	*NWTPH-Dx/SGC*	
MW-4 (A9K0658-12)				**Matrix: Water**		**Batch: 9111116**		
Diesel	ND	---	0.0784	mg/L	1	11/22/19 23:08	NWTPH-Dx/SGC	
Oil	ND	---	0.157	mg/L	1	11/22/19 23:08	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 63 %*		*Limits: 50-150 %*	*1*	*11/22/19 23:08*	*NWTPH-Dx/SGC*	
MW-3 (A9K0658-13)				**Matrix: Water**		**Batch: 9111116**		
Diesel	ND	---	0.0769	mg/L	1	11/22/19 23:28	NWTPH-Dx/SGC	
Oil	ND	---	0.154	mg/L	1	11/22/19 23:28	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 54 %*		*Limits: 50-150 %*	*1*	*11/22/19 23:28*	*NWTPH-Dx/SGC*	
MW-2 (A9K0658-14)				**Matrix: Water**		**Batch: 9111116**		
Diesel	ND	---	0.0762	mg/L	1	11/22/19 23:48	NWTPH-Dx/SGC	
Oil	ND	---	0.152	mg/L	1	11/22/19 23:48	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		*Recovery: 51 %*		*Limits: 50-150 %*	*1*	*11/22/19 23:48*	*NWTPH-Dx/SGC*	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-5D (A9K0658-01)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 12:02	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*102 %*	*Limits: 50-150 %*	*1*	*11/21/19 12:02*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*11/21/19 12:02*	*NWTPH-Gx (MS)*	
MW-5 (A9K0658-02)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	**23.5**	---	2.00	mg/L	20	11/21/19 15:12	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*98 %*	*Limits: 50-150 %*	*1*	*11/21/19 15:12*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*147 %*	*50-150 %*	*1*	*11/21/19 15:12*	*NWTPH-Gx (MS)*	
MW-5 Dup (A9K0658-03)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	**20.0**	---	5.00	mg/L	50	11/21/19 17:51	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*104 %*	*Limits: 50-150 %*	*1*	*11/21/19 17:51*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*102 %*	*50-150 %*	*1*	*11/21/19 17:51*	*NWTPH-Gx (MS)*	
MW-8 (A9K0658-04)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 12:29	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*104 %*	*Limits: 50-150 %*	*1*	*11/21/19 12:29*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*100 %*	*50-150 %*	*1*	*11/21/19 12:29*	*NWTPH-Gx (MS)*	
MW-8D (A9K0658-05)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 12:56	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*101 %*	*Limits: 50-150 %*	*1*	*11/21/19 12:56*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*95 %*	*50-150 %*	*1*	*11/21/19 12:56*	*NWTPH-Gx (MS)*	
MW-9 (A9K0658-06)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 13:23	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*103 %*	*Limits: 50-150 %*	*1*	*11/21/19 13:23*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*97 %*	*50-150 %*	*1*	*11/21/19 13:23*	*NWTPH-Gx (MS)*	
MW-7 (A9K0658-07)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 15:08	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)		*Recovery:*	*109 %*	*Limits: 50-150 %*	*1*	*11/21/19 15:08*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*108 %*	*50-150 %*	*1*	*11/21/19 15:08*	*NWTPH-Gx (MS)*	
MW-6 (A9K0658-08)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	**6.30**	---	2.00	mg/L	20	11/21/19 18:18	NWTPH-Gx (MS)	

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

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 (A9K0658-08)				**Matrix: Water**		**Batch: 9111046**		
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 106 %*	*Limits: 50-150 %*	*1*	*11/21/19 18:18*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*103 %*	*50-150 %*	*1*	*11/21/19 18:18*	*NWTPH-Gx (MS)*	
MW-1 (A9K0658-09)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 15:35	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 110 %*	*Limits: 50-150 %*	*1*	*11/21/19 15:35*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*109 %*	*50-150 %*	*1*	*11/21/19 15:35*	*NWTPH-Gx (MS)*	
MW-11 (A9K0658-10)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	**45.0**	---	2.00	mg/L	20	11/21/19 18:45	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 106 %*	*Limits: 50-150 %*	*1*	*11/21/19 18:45*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*101 %*	*50-150 %*	*1*	*11/21/19 18:45*	*NWTPH-Gx (MS)*	
MW-10 (A9K0658-11)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 16:30	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 108 %*	*Limits: 50-150 %*	*1*	*11/21/19 16:30*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*109 %*	*50-150 %*	*1*	*11/21/19 16:30*	*NWTPH-Gx (MS)*	
MW-4 (A9K0658-12)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 16:57	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 111 %*	*Limits: 50-150 %*	*1*	*11/21/19 16:57*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*112 %*	*50-150 %*	*1*	*11/21/19 16:57*	*NWTPH-Gx (MS)*	
MW-3 (A9K0658-13)				**Matrix: Water**		**Batch: 9111046**		
Gasoline Range Organics	**0.114**	---	0.100	mg/L	1	11/21/19 17:24	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 110 %*	*Limits: 50-150 %*	*1*	*11/21/19 17:24*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*109 %*	*50-150 %*	*1*	*11/21/19 17:24*	*NWTPH-Gx (MS)*	
MW-2 (A9K0658-14)				**Matrix: Water**		**Batch: 9111045**		
Gasoline Range Organics	ND	---	0.100	mg/L	1	11/21/19 13:50	NWTPH-Gx (MS)	
Surrogate: 4-Bromofluorobenzene (Sur)			*Recovery: 95 %*	*Limits: 50-150 %*	*1*	*11/21/19 13:50*	*NWTPH-Gx (MS)*	
1,4-Difluorobenzene (Sur)			*98 %*	*50-150 %*	*1*	*11/21/19 13:50*	*NWTPH-Gx (MS)*	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-5D (A9K0658-01)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 12:02	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 12:02	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 12:02	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 12:02	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 12:02	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 12:02	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*92 %*	*Limits:* *80-120 %*	*1*	*11/21/19 12:02*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*11/21/19 12:02*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*11/21/19 12:02*	*EPA 8260C*	
MW-5 (A9K0658-02)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	4.00	ug/L	20	11/21/19 15:12	EPA 8260C	
Ethylbenzene	**257**	---	10.0	ug/L	20	11/21/19 15:12	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	11/21/19 15:12	EPA 8260C	
Naphthalene	**1620**	---	40.0	ug/L	20	11/21/19 15:12	EPA 8260C	
Toluene	ND	---	20.0	ug/L	20	11/21/19 15:12	EPA 8260C	
Xylenes, total	**1190**	---	30.0	ug/L	20	11/21/19 15:12	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*91 %*	*Limits:* *80-120 %*	*1*	*11/21/19 15:12*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*11/21/19 15:12*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 15:12*	*EPA 8260C*	
MW-5 Dup (A9K0658-03)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	10.0	ug/L	50	11/21/19 17:51	EPA 8260C	
Ethylbenzene	**284**	---	25.0	ug/L	50	11/21/19 17:51	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	50.0	ug/L	50	11/21/19 17:51	EPA 8260C	
Naphthalene	**1510**	---	100	ug/L	50	11/21/19 17:51	EPA 8260C	
Toluene	ND	---	50.0	ug/L	50	11/21/19 17:51	EPA 8260C	
Xylenes, total	**1460**	---	75.0	ug/L	50	11/21/19 17:51	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*102 %*	*Limits:* *80-120 %*	*1*	*11/21/19 17:51*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*11/21/19 17:51*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*11/21/19 17:51*	*EPA 8260C*	
MW-8 (A9K0658-04)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 12:29	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 12:29	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 12:29	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 12:29	EPA 8260C	

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6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-8 (A9K0658-04)				**Matrix: Water**		**Batch: 9111045**		
Toluene	ND	---	1.00	ug/L	1	11/21/19 12:29	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 12:29	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits: 80-120 %*	*1*	*11/21/19 12:29*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 12:29*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*11/21/19 12:29*	*EPA 8260C*	
MW-8D (A9K0658-05)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 12:56	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 12:56	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 12:56	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 12:56	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 12:56	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 12:56	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*91 %*	*Limits: 80-120 %*	*1*	*11/21/19 12:56*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*11/21/19 12:56*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*11/21/19 12:56*	*EPA 8260C*	
MW-9 (A9K0658-06)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 13:23	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 13:23	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 13:23	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 13:23	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 13:23	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 13:23	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits: 80-120 %*	*1*	*11/21/19 13:23*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 13:23*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*96 %*	*80-120 %*	*1*	*11/21/19 13:23*	*EPA 8260C*	
MW-7 (A9K0658-07)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 15:08	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 15:08	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 15:08	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 15:08	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 15:08	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 15:08	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*11/21/19 15:08*	*EPA 8260C*	
Toluene-d8 (Surr)			*98 %*	*80-120 %*	*1*	*11/21/19 15:08*	*EPA 8260C*	

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6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-7 (A9K0658-07)				**Matrix: Water**		**Batch: 9111046**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 101 %*		*Limits: 80-120 %*	*1*	*11/21/19 15:08*	*EPA 8260C*	
MW-6 (A9K0658-08)				**Matrix: Water**		**Batch: 9111046**		
Benzene	**71.2**	---	4.00	ug/L	20	11/21/19 18:18	EPA 8260C	
Ethylbenzene	**709**	---	10.0	ug/L	20	11/21/19 18:18	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	11/21/19 18:18	EPA 8260C	
Naphthalene	**163**	---	40.0	ug/L	20	11/21/19 18:18	EPA 8260C	
Toluene	ND	---	20.0	ug/L	20	11/21/19 18:18	EPA 8260C	
Xylenes, total	**127**	---	30.0	ug/L	20	11/21/19 18:18	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*11/21/19 18:18*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 18:18*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 18:18*	*EPA 8260C*	
MW-1 (A9K0658-09)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 15:35	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 15:35	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 15:35	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 15:35	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 15:35	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 15:35	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*	*1*	*11/21/19 15:35*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 15:35*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*11/21/19 15:35*	*EPA 8260C*	
MW-11 (A9K0658-10)				**Matrix: Water**		**Batch: 9111046**		
Benzene	**52.6**	---	4.00	ug/L	20	11/21/19 18:45	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	11/21/19 18:45	EPA 8260C	
Naphthalene	**414**	---	40.0	ug/L	20	11/21/19 18:45	EPA 8260C	
Toluene	**159**	---	20.0	ug/L	20	11/21/19 18:45	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*	*1*	*11/21/19 18:45*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 18:45*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*	*80-120 %*	*1*	*11/21/19 18:45*	*EPA 8260C*	
MW-11 (A9K0658-10RE1)				**Matrix: Water**		**Batch: 9111096**		
Ethylbenzene	**4330**	---	100	ug/L	200	11/22/19 20:44	EPA 8260C	
Xylenes, total	**7730**	---	300	ug/L	200	11/22/19 20:44	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 102 %*		*Limits: 80-120 %*	*1*	*11/22/19 20:44*	*EPA 8260C*	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 (A9K0658-10RE1)				**Matrix: Water**		**Batch: 9111096**		
Surrogate: Toluene-d8 (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*11/22/19 20:44*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*11/22/19 20:44*	*EPA 8260C*	
MW-10 (A9K0658-11)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 16:30	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 16:30	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 16:30	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 16:30	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 16:30	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 16:30	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*107 %*	*Limits: 80-120 %*	*1*	*11/21/19 16:30*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 16:30*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*11/21/19 16:30*	*EPA 8260C*	
MW-4 (A9K0658-12)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 16:57	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 16:57	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 16:57	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 16:57	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 16:57	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 16:57	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*11/21/19 16:57*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*11/21/19 16:57*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*11/21/19 16:57*	*EPA 8260C*	
MW-3 (A9K0658-13)				**Matrix: Water**		**Batch: 9111046**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 17:24	EPA 8260C	
Ethylbenzene	**6.61**	---	0.500	ug/L	1	11/21/19 17:24	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 17:24	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 17:24	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 17:24	EPA 8260C	
Xylenes, total	**11.3**	---	1.50	ug/L	1	11/21/19 17:24	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*106 %*	*Limits: 80-120 %*	*1*	*11/21/19 17:24*	*EPA 8260C*	
Toluene-d8 (Surr)			*99 %*	*80-120 %*	*1*	*11/21/19 17:24*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*11/21/19 17:24*	*EPA 8260C*	
MW-2 (A9K0658-14)				**Matrix: Water**		**Batch: 9111045**		

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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-2 (A9K0658-14)				**Matrix: Water**		**Batch: 9111045**		
Benzene	ND	---	0.200	ug/L	1	11/21/19 13:50	EPA 8260C	
Ethylbenzene	ND	---	0.500	ug/L	1	11/21/19 13:50	EPA 8260C	
Methyl tert-butyl ether (MTBE)	ND	---	1.00	ug/L	1	11/21/19 13:50	EPA 8260C	
Naphthalene	ND	---	2.00	ug/L	1	11/21/19 13:50	EPA 8260C	
Toluene	ND	---	1.00	ug/L	1	11/21/19 13:50	EPA 8260C	
Xylenes, total	ND	---	1.50	ug/L	1	11/21/19 13:50	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits:* *80-120 %*	*1*	*11/21/19 13:50*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*11/21/19 13:50*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*103 %*	*80-120 %*	*1*	*11/21/19 13:50*	*EPA 8260C*	

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111072 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel									Water			
Blank (9111072-BLK2)			Prepared: 11/21/19 13:16		Analyzed: 11/22/19 09:35							
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 (9111072-BS1)			Prepared: 11/21/19 13:16		Analyzed: 11/21/19 21:46							
NWTPH-Dx/SGC												
Diesel	0.414	---	0.0800	mg/L	1	0.500	---	83	58 - 115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 90 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS Dup (9111072-BSD1)			Prepared: 11/21/19 13:16		Analyzed: 11/21/19 22:08							
NWTPH-Dx/SGC												
Diesel	0.414	---	0.0800	mg/L	1	0.500	---	83	58 - 115%	0	20%	Q-19
Surr: o-Terphenyl (Surr)			*Recovery: 90 %*		*Limits: 50-150 %*		*Dilution: 1x*					Q-19
Batch 9111116 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel									Water			
Blank (9111116-BLK1)			Prepared: 11/22/19 12:50		Analyzed: 11/22/19 21:28							
NWTPH-Dx/SGC												
Diesel	ND	---	0.0727	mg/L	1	---	---	---	---	---	---	
Oil	ND	---	0.145	mg/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 88 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS (9111116-BS1)			Prepared: 11/22/19 12:50		Analyzed: 11/22/19 21:48							
NWTPH-Dx/SGC												
Diesel	0.435	---	0.0800	mg/L	1	0.500	---	87	58 - 115%	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 93 %*		*Limits: 50-150 %*		*Dilution: 1x*					
LCS Dup (9111116-BSD1)			Prepared: 11/22/19 12:50		Analyzed: 11/22/19 22:08							**Q-19**
NWTPH-Dx/SGC												
Diesel	0.465	---	0.0800	mg/L	1	0.500	---	93	58 - 115%	7	20%	
Surr: o-Terphenyl (Surr)			*Recovery: 98 %*		*Limits: 50-150 %*		*Dilution: 1x*					

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111045 - EPA 5030B									Water			
Blank (9111045-BLK1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 11:35								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*98 %*		*50-150 %*			*"*					
LCS (9111045-BS2)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 11:08								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.472	---	0.100	mg/L	1	0.500	---	94	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 102 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*117 %*		*50-150 %*			*"*					
Duplicate (9111045-DUP1)		Prepared: 11/21/19 11:32		Analyzed: 11/21/19 15:39								
QC Source Sample: MW-5 (A9K0658-02)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**22.4**	---	2.00	mg/L	20	---	23.5	---	---	5	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 98 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*146 %*		*50-150 %*			*"*					

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111046 - EPA 5030B									Water			
Blank (9111046-BLK1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 11:20								
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	---	---	---	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 108 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*107 %*		*50-150 %*			*"*					
LCS (9111046-BS2)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 10:53								
NWTPH-Gx (MS)												
Gasoline Range Organics	0.493	---	0.100	mg/L	1	0.500	---	99	80 - 120%	---	---	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 103 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*102 %*		*50-150 %*			*"*					
Duplicate (9111046-DUP1)		Prepared: 11/21/19 11:23		Analyzed: 11/21/19 16:02								
QC Source Sample: MW-1 (A9K0658-09)												
NWTPH-Gx (MS)												
Gasoline Range Organics	ND	---	0.100	mg/L	1	---	ND	---	---	---	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 109 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*107 %*		*50-150 %*			*"*					
Duplicate (9111046-DUP2)		Prepared: 11/21/19 11:23		Analyzed: 11/21/19 19:12								
QC Source Sample: MW-11 (A9K0658-10)												
NWTPH-Gx (MS)												
Gasoline Range Organics	**47.3**	---	2.00	mg/L	20	---	45.0	---	---	5	30%	
Surr: 4-Bromofluorobenzene (Sur)		*Recovery: 106 %*		*Limits: 50-150 %*			*Dilution: 1x*					
1,4-Difluorobenzene (Sur)		*101 %*		*50-150 %*			*"*					

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111045 - EPA 5030B												**Water**
Blank (9111045-BLK1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 11:35								
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:*	*93 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*97 %*		*80-120 %*			*"*				
LCS (9111045-BS1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 10:41								
EPA 8260C												
Benzene	18.5	---	0.200	ug/L	1	20.0	---	92	80 - 120%	---	---	
Ethylbenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	18.8	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Naphthalene	17.0	---	2.00	ug/L	1	20.0	---	85	80 - 120%	---	---	
Toluene	19.1	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
Xylenes, total	56.6	---	1.50	ug/L	1	60.0	---	94	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*100 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*96 %*		*80-120 %*			*"*				
Duplicate (9111045-DUP1)		Prepared: 11/21/19 11:32		Analyzed: 11/21/19 15:39								
QC Source Sample: MW-5 (A9K0658-02)												
EPA 8260C												
Benzene	ND	---	4.00	ug/L	20	---	ND	---	---	---	30%	
Ethylbenzene	**246**	---	10.0	ug/L	20	---	257	---	---	4	30%	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Naphthalene	**1560**	---	40.0	ug/L	20	---	1620	---	---	4	30%	
Toluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Xylenes, total	**1150**	---	30.0	ug/L	20	---	1190	---	---	3	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*103 %*		*80-120 %*			*"*				

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111045 - EPA 5030B							**Water**					
Duplicate (9111045-DUP1)		Prepared: 11/21/19 11:32 Analyzed: 11/21/19 15:39										
QC Source Sample: MW-5 (A9K0658-02)												
Surr: 4-Bromofluorobenzene (Surr)		*Recovery: 100 %*	*Limits: 80-120 %*		*Dilution: 1x*							
Matrix Spike (9111045-MS1)		Prepared: 11/21/19 11:32 Analyzed: 11/21/19 14:17										
QC Source Sample: MW-2 (A9K0658-14)												
EPA 8260C												
Benzene	19.4	---	0.200	ug/L	1	20.0	ND	97	79 - 120%	---	---	
Ethylbenzene	19.4	---	0.500	ug/L	1	20.0	ND	97	79 - 121%	---	---	
Methyl tert-butyl ether (MTBE)	19.2	---	1.00	ug/L	1	20.0	ND	96	71 - 124%	---	---	
Naphthalene	16.2	---	2.00	ug/L	1	20.0	ND	81	61 - 128%	---	---	
Toluene	19.4	---	1.00	ug/L	1	20.0	ND	97	80 - 121%	---	---	
Xylenes, total	56.5	---	1.50	ug/L	1	60.0	ND	94	79 - 121%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 93 %*	*Limits: 80-120 %*		*Dilution: 1x*							
Toluene-d8 (Surr)		*96 %*	*80-120 %*		*"*							
4-Bromofluorobenzene (Surr)		*94 %*	*80-120 %*		*"*							

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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111046 - EPA 5030B									Water			
Blank (9111046-BLK1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 11:20								
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:*	*106 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*98 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*103 %*		*80-120 %*			*"*				
LCS (9111046-BS1)		Prepared: 11/21/19 09:00		Analyzed: 11/21/19 10:26								
EPA 8260C												
Benzene	20.0	---	0.200	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.8	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Ethylbenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Isopropylbenzene	20.7	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Naphthalene	19.4	---	2.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
Toluene	18.6	---	1.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2,4-Trimethylbenzene	20.4	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3,5-Trimethylbenzene	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Xylenes, total	64.0	---	1.50	ug/L	1	60.0	---	107	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*98 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*			*"*				
Duplicate (9111046-DUP1)		Prepared: 11/21/19 11:23		Analyzed: 11/21/19 16:02								

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111046 - EPA 5030B							**Water**					
Duplicate (9111046-DUP1)		Prepared: 11/21/19 11:23 Analyzed: 11/21/19 16:02										
QC Source Sample: MW-1 (A9K0658-09)												
EPA 8260C												
Benzene	ND	---	0.200	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Ethylbenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Isopropylbenzene	ND	---	1.00	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%	
1,2,4-Trimethylbenzene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,3,5-Trimethylbenzene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Xylenes, total	ND	---	1.50	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 107 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*101 %*		*80-120 %*			*"*					
Duplicate (9111046-DUP2)		Prepared: 11/21/19 11:23 Analyzed: 11/21/19 19:12										
QC Source Sample: MW-11 (A9K0658-10)												
EPA 8260C												
Benzene	**56.4**	---	4.00	ug/L	20	---	52.6	---	---	7	30%	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Ethylbenzene	**4260**	---	10.0	ug/L	20	---	4050	---	---	5	30%	E
Isopropylbenzene	**89.8**	---	20.0	ug/L	20	---	83.0	---	---	8	30%	
Methyl tert-butyl ether (MTBE)	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Naphthalene	**424**	---	40.0	ug/L	20	---	414	---	---	2	30%	
Toluene	**167**	---	20.0	ug/L	20	---	159	---	---	5	30%	
1,2,4-Trimethylbenzene	**1520**	---	20.0	ug/L	20	---	1460	---	---	4	30%	
1,3,5-Trimethylbenzene	**202**	---	20.0	ug/L	20	---	193	---	---	5	30%	
Xylenes, total	**7640**	---	30.0	ug/L	20	---	7270	---	---	5	30%	E
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					

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EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111046 - EPA 5030B												**Water**
Duplicate (9111046-DUP2)	Prepared: 11/21/19 11:23 Analyzed: 11/21/19 19:12											
QC Source Sample: MW-11 (A9K0658-10)												
Surr: 4-Bromofluorobenzene (Surr)	*Recovery: 101 %*		*Limits: 80-120 %*		*Dilution: 1x*							

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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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 9111096 - EPA 5030B							**Water**					
Blank (9111096-BLK1)		Prepared: 11/22/19 09:00		Analyzed: 11/22/19 11:17								
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)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*			*"*				
LCS (9111096-BS1)		Prepared: 11/22/19 09:00		Analyzed: 11/22/19 10:23								
EPA 8260C												
Benzene	21.0	---	0.200	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	21.7	---	0.500	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	21.4	---	0.500	ug/L	1	20.0	---	107	80 - 120%	---	---	
Ethylbenzene	21.1	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Isopropylbenzene	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Methyl tert-butyl ether (MTBE)	22.8	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Naphthalene	20.6	---	2.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
Toluene	19.9	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2,4-Trimethylbenzene	22.0	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,3,5-Trimethylbenzene	22.4	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Xylenes, total	68.5	---	1.50	ug/L	1	60.0	---	114	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*97 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*99 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*			*"*				

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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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: 9111072							
A9K0658-01	Water	NWTPH-Dx/SGC	11/18/19 09:45	11/21/19 13:16			0.94
A9K0658-02	Water	NWTPH-Dx/SGC	11/18/19 10:27	11/21/19 13:16			0.95
A9K0658-03	Water	NWTPH-Dx/SGC	11/18/19 10:27	11/21/19 13:16			0.95
A9K0658-04	Water	NWTPH-Dx/SGC	11/18/19 12:14	11/21/19 13:16			0.94
A9K0658-05	Water	NWTPH-Dx/SGC	11/18/19 13:11	11/21/19 13:16			0.95
A9K0658-06	Water	NWTPH-Dx/SGC	11/18/19 13:52	11/21/19 13:16			0.95
A9K0658-07	Water	NWTPH-Dx/SGC	11/18/19 14:34	11/21/19 13:16			0.94
A9K0658-08	Water	NWTPH-Dx/SGC	11/19/19 07:49	11/21/19 13:16			0.94
A9K0658-09	Water	NWTPH-Dx/SGC	11/19/19 09:18	11/21/19 13:16			0.94
Batch: 9111116							
A9K0658-10	Water	NWTPH-Dx/SGC	11/19/19 10:07	11/22/19 12:50			0.94
A9K0658-11	Water	NWTPH-Dx/SGC	11/19/19 10:50	11/22/19 12:50			0.95
A9K0658-12	Water	NWTPH-Dx/SGC	11/19/19 11:48	11/22/19 12:50			0.98
A9K0658-13	Water	NWTPH-Dx/SGC	11/19/19 13:06	11/22/19 12:50			0.96
A9K0658-14	Water	NWTPH-Dx/SGC	11/19/19 14:15	11/22/19 12:50			0.95

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: 9111045							
A9K0658-01	Water	NWTPH-Gx (MS)	11/18/19 09:45	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-02	Water	NWTPH-Gx (MS)	11/18/19 10:27	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-04	Water	NWTPH-Gx (MS)	11/18/19 12:14	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-05	Water	NWTPH-Gx (MS)	11/18/19 13:11	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-06	Water	NWTPH-Gx (MS)	11/18/19 13:52	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-14	Water	NWTPH-Gx (MS)	11/19/19 14:15	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
Batch: 9111046							
A9K0658-03	Water	NWTPH-Gx (MS)	11/18/19 10:27	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-07	Water	NWTPH-Gx (MS)	11/18/19 14:34	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-08	Water	NWTPH-Gx (MS)	11/19/19 07:49	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-09	Water	NWTPH-Gx (MS)	11/19/19 09:18	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-10	Water	NWTPH-Gx (MS)	11/19/19 10:07	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-11	Water	NWTPH-Gx (MS)	11/19/19 10:50	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-12	Water	NWTPH-Gx (MS)	11/19/19 11:48	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00

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Lisa Domenighini, Client Services Manager

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Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

SAMPLE PREPARATION INFORMATION

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
A9K0658-13	Water	NWTPH-Gx (MS)	11/19/19 13:06	11/21/19 11:23	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: 9111045							
A9K0658-01	Water	EPA 8260C	11/18/19 09:45	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-02	Water	EPA 8260C	11/18/19 10:27	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-04	Water	EPA 8260C	11/18/19 12:14	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-05	Water	EPA 8260C	11/18/19 13:11	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-06	Water	EPA 8260C	11/18/19 13:52	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
A9K0658-14	Water	EPA 8260C	11/19/19 14:15	11/21/19 11:32	5mL/5mL	5mL/5mL	1.00
Batch: 9111046							
A9K0658-03	Water	EPA 8260C	11/18/19 10:27	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-07	Water	EPA 8260C	11/18/19 14:34	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-08	Water	EPA 8260C	11/19/19 07:49	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-09	Water	EPA 8260C	11/19/19 09:18	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-10	Water	EPA 8260C	11/19/19 10:07	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-11	Water	EPA 8260C	11/19/19 10:50	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-12	Water	EPA 8260C	11/19/19 11:48	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
A9K0658-13	Water	EPA 8260C	11/19/19 13:06	11/21/19 11:23	5mL/5mL	5mL/5mL	1.00
Batch: 9111096							
A9K0658-10RE1	Water	EPA 8260C	11/19/19 10:07	11/22/19 11:23	5mL/5mL	5mL/5mL	1.00

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QUALIFIER DEFINITIONS

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

Apex Laboratories

E	Estimated Value. The result is above the calibration range of the instrument.
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-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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Lisa Domenighini, Client Services Manager

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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. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

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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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

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:

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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.

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APEX LABS

6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY

Lab # A9K0658 COC 1 of 2

Company: Cascadia Associates | Project Mgr: Stephanie Salisbury | Project Name: NuStar Vannex GWM 4Q19 | Project #:

Address: 5820 SW Kelly, Unit B Portland | Phone: (503) 906-6577 | Email: sbsalisbury@cascadiaassociates.com

Sampled by: J. Weatherford

Site Location: OR (WA) CA — AK ID ___

ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX VOCs*	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs Full List	8270 SIM PAHs	8270 Semi-Vols Full List	8082 PCBs	8081 Pest	RCRA Metals (8)	Priority Metals (13)	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	TCLP Metals (8)	MTBE*	Naphthalene*					Archive
MW-5D		11/18	0945	GW	5		✓	✓	✓												✓	✓					
MW-5		↓	1027	↓	5		↓	↓	↓												↓	↓					
MW-5 Dup		↓	1027	↓	5		↓	↓	↓												↓	↓					
MW-8		↓	1214	↓	5		↓	↓	↓												↓	↓					
MW-8D		↓	1311	↓	5		↓	↓	↓												↓	↓					
MW-9		↓	1352	↓	5		↓	↓	↓												↓	↓					
MW-7		↓	1434	↓	5		↓	↓	↓												↓	↓					
MW-6		11/19	0749	↓	5		↓	↓	↓												↓	↓					
MW-1		↓	0918	↓	↓		↓	↓	↓												↓	↓					
MW-11		↓	1007	↓	↓		↓	↓	↓												↓	↓					

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

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

SAMPLES ARE HELD FOR 30 DAYS

SPECIAL INSTRUCTIONS:
† same as 9/10/19 analysis
* BTEX, MTBE, Naphthalene by EPA 8260B
TPH-G by NWTPH-Gx
TPH-D by NWTPH-Dx w/ silica gel cleanup

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 11/20/19	Signature: [signature] Date: 11-20-19	Signature: Date:	Signature: Date:
Printed Name: Chris Bremer Time: 1055	Printed Name: Michael Machnik Time: 1055	Printed Name: Time:	Printed Name: Time:
Company: Cascadia	Company: Apex Labs	Company:	Company:

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Lisa Domenighini, Client Services Manager

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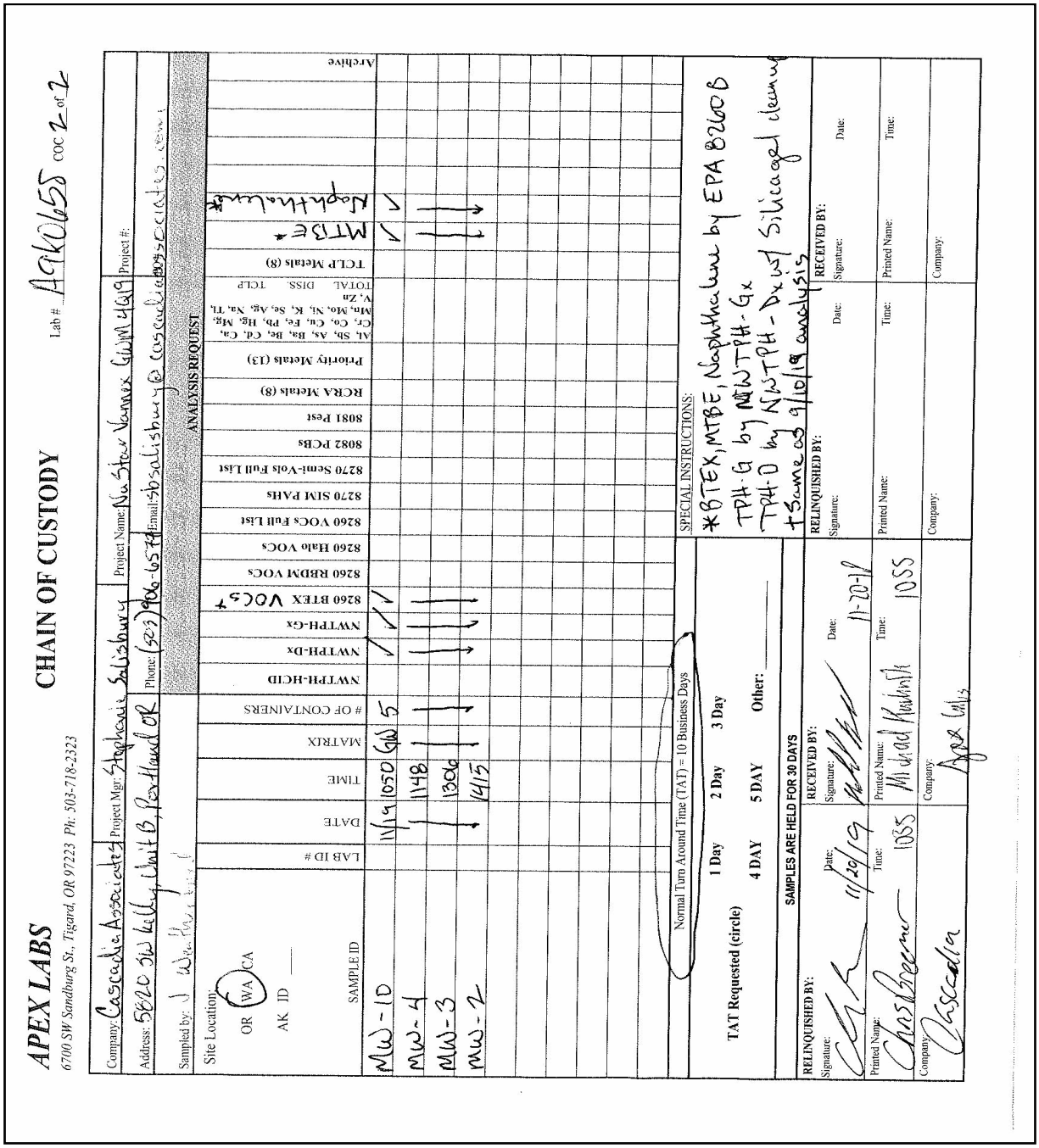
Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**



Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Nustar Vannex**	
5820 SW Kelly Ave Unit B	Project Number: **[none]**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9K0658 - 12 04 19 1217**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Assc. Element WO#: A9 A9K0658

Project/Project #: NuStar Vannex GWM 4Q19

Delivery Info:

Date/time received: 11-20-19 @ 1055 By: MK

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

Cooler Inspection Date/time inspected: 11-20-19 @ 1355 By: MK

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)	1.1	2.3	0.3				
Received on ice? (Y/N)	Y	Y	Y				
Temp. blanks? (Y/N)	Y	Y	Y				
Ice type: (Gel/Real/Other)	Real	"	"				
Condition:	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: 11/21/19 @ 915 By: JS

All samples intact? Yes X No ___ Comments:

Bottle labels/COCs agree? Yes X No ___ Comments:

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 ___ NA X

Comments

Water samples: pH checked: Yes X No ___ NA ___ pH appropriate? Yes X No ___ NA ___

Comments:

Additional information:

Labeled by: JS Witness: JS Cooler Inspected by: NRP See Project Contact Form: Y

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Cascadia
Associates, LLC